Journal of Early Intervention
http://jei.sagepub.com/

Advances in Measurement for Universal Screening and Individual Progress Monitoring of Young Children

Charles R. Greenwood, Judith J. Carta and Scott McConnell

Journal of Early Intervention 2011 33: 254 originally published online 15 December 2011
DOI: 10.1177/1053815111428467

The online version of this article can be found at:
http://jei.sagepub.com/content/33/4/254

Published by:
SAGE
http://www.sagepublications.com

On behalf of:
DEC
Division for Early Childhood of the Council for Exceptional Children

Additional services and information for *Journal of Early Intervention* can be found at:

Email Alerts: http://jei.sagepub.com/cgi/alerts

Subscriptions: http://jei.sagepub.com/subscriptions

Reprints: http://www.sagepub.com/journalsReprints.nav

Permissions: http://www.sagepub.com/journalsPermissions.nav

Citations: http://jei.sagepub.com/content/33/4/254.refs.html

>> Version of Record - Jan 4, 2012

Proof - Dec 15, 2011

What is This?

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

Journal of Early Intervention
Volume 33 Number 4
December 2011 254-267
© 2011 SAGE Publications
10.1177/1053815111428467
http://jei.sagepub.com
hosted at
http://online.sagepub.com

Advances in Measurement for Universal Screening and Individual Progress Monitoring of Young Children

Charles R. Greenwood
Judith J. Carta
University of Kansas, Lawrence
Scott McConnell
University of Minnesota, Twin Cities

In the last two and half decades, much has been learned about conceptualizing and developing measures for use by practitioners designed to inform their intervention decision making, such as when a child would benefit from receiving additional instructional support (universal screening) and whether the child is responding positively to the intervention when delivered (progress monitoring). The authors describe these developments, related issues continuing to face the field, and what is needed in terms of measures, access, and usability in future practice, research, and development.

Keywords: *assessment; infants and toddlers; preschoolers; language; literacy*

Authors' Note: Charles R. Greenwood and Judith J. Carta, Juniper Gardens Children's Project, Institute for Life Span Studies, University of Kansas, and Scott McConnell, Department of Educational Psychology and Center for Early Education and Development, University of Minnesota. Please address correspondence to Charles R. Greenwood, PhD, Juniper Gardens Children's Project, 444 Minnesota Avenue, Suite 300, Kansas City, KS 66101-2914; email: greenwood@ku.edu. Dr. McConnell has developed assessment tools and related resources known as Individual Growth and Development Indicators (IGDIs) and Get it, Got it, Go! This intellectual property is subject of technology commercialization through an Internal Business Unit—Early Learning Labs—within the University of Minnesota. Dr. McConnell may be entitled to royalties through the University of Minnesota for products related to the research described in this article. This relationship has been reviewed and managed by the university in accordance with its conflict of interest policies. Preparation of this manuscript was supported by Grants R324C080011 and R324A07085 from the Institute of Education Sciences to the University of Kansas. The work began in earnest with Grant H024S60010 from the Office of Special Education Programs to the University of Minnesota. We are indebted to these and other funders along the way who helped us move the idea of IGDIs to reality: the U.S. Department of Education (the Office of Special Education Programs) and the Institute of Educational Sciences (National Center for Special Education Research), the Administration for Children and Families (the Office of Planning Research and Evaluation), and our state and local agencies sponsoring early child programs. We would also like to thank the team of researchers in the Early Childhood Research Institute for Measuring Growth and Development to the present that was headed by Scott McConnell, Mary McEvoy, Kristen Missall, Carla Peterson, and Jeff Priest at the University of Minnesota; Ruth Kaminski, Ronald Good, and Mark Shinn at the University of Oregon; and colleagues at the University of Kansas—Judy Carta, Jane Atwater, Jay Buzhardt; Charlie Greenwood, Gayle Luze, Matt Garrett, Barbara Terry, Kere Hughes, Carol Leitschuh, Deb Linebarger, Todd Little, and Dale Walker. Across the three settings, a host of research assistants provided invaluable assistance. A huge "thank you" goes to the staff members of the early childhood programs in Kansas, Iowa, Missouri, Minnesota, and Oregon and others who partnered with us in development studies and were willing to try out a new approach for measuring the progress of children. Finally, we extend our most profound gratitude to the children and families who were involved in the research and development of IGDIs with the hope that this experience proved to be beneficial to them and to other children in the years to come. The work reflects the opinions of the authors and not the funding agencies.

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

In 1990, Office of Special Education Programs (OSEP) funded an Early Childhood Research Institute for Measuring Growth and Development (ECRI-MGD). The goal was to develop a single system, a parsimonious set of outcomes and indicators for measuring the growth and development of individual children between birth and age 8. The measures were intended for use by practitioners to inform their practice. We first reported this effort in 2001 in the *Journal of Early Intervention* (Priest et al., 2001) accompanied by three commentaries (Brown, 2001; Fewell, 2001; Odom, 2001). A subsequent rejoinder followed (McEvoy et al., 2001). While generally recognizing the worthiness of developing such a system, it was considered a "daunting challenge." Nearly all wondered whether it would work as it was supposed to. A cross-cutting question was "What is new about the approach?" Our rejoinder provided greater depth on the little known General Outcome Measurement (GOM) approach used as the basis for this new measurement development effort, and we recognized that much work lay ahead to provide the empirical basis for these measures as well as demonstrations of their utility and applicability to early childhood. Over the course of the Institute and subsequent related projects and developments during intervening years, a set of Individual Growth and Development Indicators (IGDIs) was developed and is supported today by a range of evidence, and the approach is increasingly understood and used in early childhood research and practice (e.g., VanDerHeyden & Snyder, 2006).

Our purpose in this article is to discuss this innovation in measurement conceptualization, development, and application. The IGDIs are a form of measurement that strongly supports the use of curriculum and intervention approaches that can be used universally with all children in a program; IGDIs are measurement for identifying those children who may most likely benefit from a change in intervention; and IGDIs are measurement capable of monitoring individual children's progress over time and informing the need to either continue or change a given child's intervention. We organize this report in two sections, the (a) "Overview" and (b) "Description" of IGDIs, including an example of their contribution in a large-scale application. In this way, we address challenges and concerns expressed in 2001 as a means of indexing progress to date and gaps needing future research. Our intention is to provide examples of evidence produced during the period rather than a review of the literature. For a more comprehensive discussion of this research, readers are referred to Carta, Greenwood, Walker, and Buzhardt (2010), Greenwood et al. (2008), Kaminski, Cummings, Powell-Smith, and Good (2008), and McConnell and Missall (2008).

Overview

The Changing Landscape of Early Childhood

Since PL 99-457, additional changes in national policies and advances in research have influenced the development and use of the IGDI measures. These include directives toward greater program accountability from OSEP (Early Childhood Outcomes Center, 2011) and Head Start (Head Start, 2010), legislation aimed at improving educational achievement in No Child Left Behind, scaling up of state-funded preschools (Barnett, Epstein, Friedman, Sansanelli, & Hustedt, 2009), national reports on measurement in early childhood (National Research Council, 2008), and research evidence identifying preschool skills that best

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

predict later literacy outcomes (Shanahan & Lonigan, 2008). In this context, measurement in early childhood has become a large-scale endeavor addressing purposes of accountability, child outcomes, intervention decision making for individual children, and program improvement. Currently, recommended professional practice (Sandall, McLean, Smith, & McLean, 2005) and, more recently, evidence-based practice (Shavelson & Towne, 2002) require the use of data-based decision making.

What Were the Problems With Traditional Measurement?

One of the first steps our ECRI-MGD group undertook in developing IGDIs was to analyze typical measurement practice critically and to identify key shortcomings (Missall, Carta, McConnell, Walker, & Greenwood, 2008). One significant limitation was the time needed to measure each child's performance and the impracticability of using any existing measure with *all* children in a program frequently enough to monitor progress. Traditional norm-referenced measures were cumbersome, specialized, and took too long to administer to individual children. Most traditional instruments were not sensitive to short-term growth and could not provide formative information within the course of a period of a few weeks or months of instruction. Few existing measures could be administered as frequently as monthly or quarterly with appropriate validity. Another drawback was lack of scoring protocols that reflected change or growth in performance. Most measures produced standard scores reflecting status at a single point in time compared with the norm group rather than a score reflecting slope or rate of growth per month of intervention over time. Benchmarks indexing expected versus risk levels of performance for decision making were lacking. Moreover, too often, a mismatch existed between what was measured and what was actually taught using a specific intervention or environmental change implemented by an early childhood practitioner.

Three teams in the Institute began work with a focus on overcoming these problems using the GOM approach to build new measures appropriate for young children within three developmental and programmatically important age-spans: *infant/toddlers* (6 to 36 months—Part C, Early Head Start [EHS], child care), *preschoolers* (36 to 60 months—Part B or Pre-K, Head Start), and *early elementary students* (Grades K-3). The outcomes, products, and findings of this work and the work of others are addressed below.

Needless to say, at the beginning, it was not clear whether GOM-type measures could be developed for children this young and if so, what exactly would be measured and what form the measures would take. Most existing GOM measures then were focused on the elementary school curriculum and the outcomes of academic instruction. For example, several successful curriculum-based measures (CBMs) used for universal screening and progress monitoring in third- to fifth-grade special education (e.g., oral reading fluency) had just been developed by Stan Deno and Lynn Fuchs (Fuchs, Deno, & Mirkin, 1984). The CBM measures are now a recognized evidence-based practice in special education (National Center on Response to Intervention, 2011). Prior to 2002, however, measures like CBMs that could be used for universal screening and progress monitoring did not exist in early childhood programs.

One reason was that few, if any, well-defined curriculum targets existed in programs serving children younger than kindergarten. This fact is reflected in how we chose to name

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

the new measures: IGDIs for children 6 to 60 months of age and Dynamic Indicators of Early Literacy Skills (DIBELS) for children in Grades K-3. The term *IGDIs* was selected after considerable thought to embrace a range of outcomes in early childhood that were not necessarily a product of instruction but also of experiences at home or in preschool prior to kindergarten. However, *DIBELS* reflected the goal of measuring early literacy skills that research during the period increasingly indicated were precursors to learning to read by third grade.

What is Innovative in the GOM Approach to Measurement in Early Childhood?

The CBM, DIBELS, and IGDIs were influenced heavily by the GOM approach to instructionally relevant measurement development (Fuchs & Deno, 1991). The GOMs were not designed to inform eligibility for Part C or Part B—Section 619 Individuals with Disabilities Education Act (IDEA) services or for states' OSEP accountability reporting—but were intended for teachers and early interventionists who needed to adjust instructional/behavioral interventions based on children's progress in a program. The GOMs are considered "general" because they do not, by design, represent a child's performance on any one single task or skill but instead his or her standing in performance toward a socially valid outcome of early childhood (ECRI-MGD, 1998). A familiar example is the physician's use of the thermometer or blood pressure cuff as brief, repeatable indicators of one's general health status. Scores above or below benchmarks on these measures are used by the physician and the patient to guide their decision making and next steps in treatment.

Developers of a GOM typically begin with a determination of the general outcome through a process of social validity. Following this approach, we chose the general outcomes selected for development for children from birth to age 8 that were rated most highly in a national survey of parents and practitioners (Priest et al., 2001). We then developed IGDIs to represent a few key skills from the universe of possible skills expected of children within a specific chronological period (e.g., 36 to 60 months), simple to complex, that lead to the nominated outcomes. Selection of skills was informed by literature review with a focus on whether specific skills were precursors of more developmentally advanced performance (e.g., vocalizations precede single word utterances) or simpler skills that help a child learn skills to be taught later in the curriculum sequence (e.g., onset sounds before word segmentation skills). Thus, scores on a GOM at any single point in time represent a child's partial attainment on the path toward full attainment of the general outcome as reflected in the child's rate of growth over time.

It is this approach to content development of a growth indicator that is conceptually different from traditional approaches such as skill mastery or domain-based measures that seek to provide a comprehensive assessment of a child's development or achievement. The GOMs do not provide comprehensive profiles of what a child knows and is able to do (Fuchs & Deno, 1991). In addition to being designed for administration by early childhood practitioners to inform their practice decisions, GOMs consist of authentic tasks/situations that are brief to administer, and psychometrically sound, and they are repeatable over short periods of time (e.g., weeks, months, and quarters). Growth charts used in well-child checkups for screening and progress monitoring are another widely used indicator of a child's general developmental status.

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

To offset effects of remembering a repeated test, GOMs typically consist of several equivalent test forms, each based on similar skills of equal content difficulty (National Center on Response to Intervention, 2011). Thus, in addition to introducing a new approach to designing and developing measurement in early childhood, additional challenges and issues were raised and addressed. We turn to that discussion.

Description of IGDIs

How Will the Outcomes Be Operationalized for Actual Practice?

The IGDIs for infants and toddlers use direct observational measurement to record the frequency of responding during a short 6-min semistructure play situation with a familiar adult. Administration of the Early Communication Indicator (ECI) requires the use of two toys, a house and a barn, used on alternate occasions as equivalent forms. During administration, an adult play partner interacts with a child using toys in a nondirective way to evoke child communications. The partner is taught to follow the child's lead by commenting and playing with objects that are of interest to the child. Occurrences of targeted communicative skills or behaviors (e.g., single word, multiple word utterances) are recorded either in vivo or from a videotape. The totals of these target skill are converted to a rate per min score and aggregated to provide a total communication score, an index of expressive communication. The scores are graphed (Carta et al., 2010).

The preschool IGDIs are 1-min probes administered by an adult in a one-on-one arrangement. The Picture Naming IGDI is measure of a child's ability to produce words correctly in response to presentation of a series of individual 5×7 color photo cards from a deck of cards, a measure of expressive vocabulary. The photos represent objects commonly found in a preschooler's environment. For each administration, the deck of cards is shuffled so that each administration is an alternate form. The number of correctly named cards in 1 min is converted to rate per min score and graphed (Missall et al., 2008). Status at a particular age at test and slope scores on IGDIs are important and contribute meaningfully to intervention decision making. The rate score in particular quantifies progress over time and reflects future trend, which is useful in predicting whether the child's current rate of progress will be adequate to reach a future benchmark score (e.g., 36 and 60 months of age, end of kindergarten).

This information enables parents and professionals to judge a child's need for a change in intervention while receiving services, and also the extent that intervention services as provided are increasing the probability of achieving desired short- and long-term outcomes. (?) As IGDIs are relatively brief compared with traditional measurement practices, more professional time can be devoted to designing, implementing, evaluating, and improving interventions and programs. As IGDIs measure growth toward desired outcomes, they can link to a range of instructional strategies that can be implemented by parents and early childhood practitioners.

Results produced by IGDIs for individual children are typically displayed in growth charts that are easy to understand by parents and practitioners. Graphic interpretation of

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

child growth charts contributes to more effective communication with parents as well as experts, as compared with the often-complex score profiles produced by many traditional measures used in early childhood measures. Because IGDIs follow standard administration protocols and are psychometrically sound, IGDI data are comparable within individual children across time (individual growth) and between children over time (differences in individual children's growth). As IGDI data are obtained for individual children, they may be aggregated up to reflect program- and state-level outcomes and used for accountability, program improvement decision making, and research on evidence-based practice.

What GOMs Exist for Early Childhood?

Currently, the field has at least eight IGDIs available with supporting evidence developed by our original group (Carta et al., 2010). For *infants and toddlers* they are as follows: the ECI, the Early Social Indicator (ESI), the Early Movement Indicator (EMI), and the Early Problem Solving (Cognitive) Indicator (EPSI). For *preschoolers*, there are four language and early literacy IGDIs: Picture Naming is an IGDI for spoken vocabulary while Segment Blending, Rhyming, and Alliteration are IGDIs for phonological awareness. In each case, the assessor may enter the scores via websites using online data system tools that compute and graph scores. Plotted against benchmarks (normed values), one can quickly see how a child's current performance and growth over time compare to expected outcomes at specific age points.

While fully developed, the Social, Cognitive Problem Solving, and Movement indicators are based on small samples and remain experimental. They have yet to be used widely by other than the original developers. The ECI, Picture Naming, Segment Blending, Rhyming, and Alliteration indicators have been used extensively with large samples of children with data collected by other users around the country in local and state programs, and research and evaluation studies in the United States and other countries. Additional measures are available and/or are in development and have been reported in the literature; for example, for math and math concepts for young children (e.g., Hojnoski, Silberglitt, & Floyd, 2009). Early literacy preschool IGDIs (Version 2.0) are also currently in development by McConnell and his group at the Center on Response to Intervention in Early Childhood (CRTIEC; Bradfield, Wackerle-Hollman, Albano, & Rodriguez, 2011).

How Will the Indicators Be Used?

The IGDIs are intended for use in data-based instructional decision making. Tilly's (2008) iterative model is one excellent example, wherein IGDIs may play screening and progress monitoring roles in making decisions. The Tilly model consists of five steps in a single cycle that structures the practitioner's decision-making inquiry and reflection. The cycle is repeated if data indicate a failure to accelerate child outcomes after the first five steps. This leads to other decisions to modify or replace the current intervention.

1. *Is there a problem? (universal screening):* This step identifies those among all children in a program whose IGDI score is below a benchmark standard (e.g., −1.0 *SD* below their age-mean) and considered at risk of not making progress.

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

2. *What is causing the problem? (clinical review):* The practitioner considers and rules out a list of clinical issues known to be associated with poor progress that are considered and ruled in or out as possible causes. For example, the question "Is the child experiencing a weak home language environment?" can be evaluated and ruled either in or out for this child leading to an intervention determination in the next step.
3. *What intervention should be used? (intervention selection):* Using information from the prior two steps, the practitioner designs or selects an appropriate intervention selection that includes input from parents and sometimes other instructional team members. Evidence-based strategies are preferred. In the case of a home-visitation model of service, for example, these strategies are shared with parents and caregivers who are taught/coached by the home visitor to use them during daily routines. In a classroom or center-based model, teachers and staff implement the same strategy(ies) that may include a home component as well.
4. *Is the intervention being implemented? (fidelity of implementation):* The fidelity of intervention is monitored by the practitioner, and this information guides subsequent intervention recommendations for parents, teachers, and caregivers involved.
5. *Is the intervention working? (progress monitoring):* The practitioner examines the child's growth before and after intervention onset and analyzes progress. Given progress, the practitioner continues the intervention or revises it until performance is within benchmark. Given a lack of improvement, the practitioner revises the intervention and repeats the cycle. With IGDIs informing the practitioners' use of the decision-making model, practitioners can individualize services to all children, not just those with disabilities. Moreover, they can do this in a timely and dynamic way compared with most traditional approaches not using IGDIs.

Are IGDIs Feasible and Will They Prove Useful?

The design of IGDIs, in combination with website supports for access and implementation, has greatly enhanced the feasibility and usability of the IGDIs by practitioners in local programs. The IGDI websites followed the successful model demonstrated earlier by the DIBELS group to support users' access to information and data processing/reporting services (Good & Kaminski, 2000; Greenwood, Carta, Walker, Buzhardt, & Baggett, 2006; McConnell, 2003). The websites provide public access to information about the IGDIs, including technical reports, procedures, and data collection forms. Reports may be obtained on the progress of individual children as well as groups and subgroups of children within a program or programs within a larger project, such as a district, organization, or state from password protected accounts on the website. These protected sites also include secure accounts for managing data collection activities suitable for individual programs, projects with multiple programs, and research projects. An example of project-level management would be a statewide director being able to access reports on the individual programs they oversee. At the program level, a director can manage the data collection activities of all staff acting as assessors and the database generated for all their children (Buzhardt et al., 2010).

Currently, the infant/toddler IGDI website includes information for 12,507 infants and toddlers (these numbers increase daily) and 1,419 assessors/coders staff representing 158 programs in 23 states and several countries, totaling a database of 36,583 separate

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

administrations. Preschool IGDIs have been used by more than 10,000 schools and to test more than 150,000 children. Phaneuf and Silberglitt (2003) reported that the measures were easy to use and efficient in administration, scoring, and data interpretation in a program serving 68 preschoolers. They also reported finding that the system provided valuable information for making early childhood education and special education decisions.

What Standards Were Used?

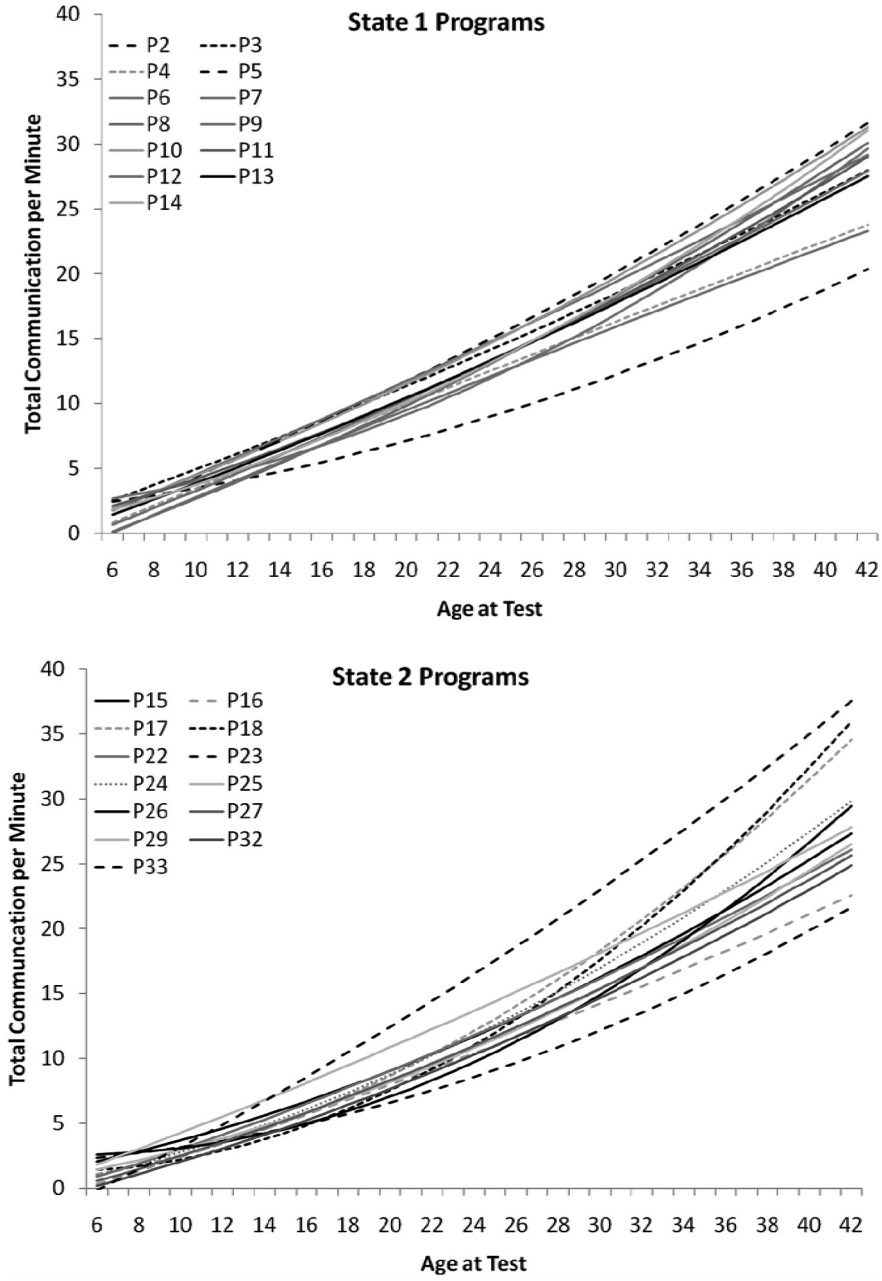
To ensure technical adequacy, development of the IGDIs addressed three measurement standards: the Division of Early Childhood (DEC) *Recommended Practices* (DEC, 2007; Sandall et al., 2005), the *Standards for Educational and Psychological Testing* produced by the American Educational Research Association (American Educational Research Association, 1999), and the *Student Progress Monitoring Standards* of the National Center on Response to Intervention (2011), formerly the National Center for Student Progress Monitoring. We constructed the measures, content, and procedures based on evidence and carried out an iterative process of development. We conducted several studies to document IGDIs psychometric properties (reliability and validity) including longitudinal studies of 7 to 9 months duration for each measure to illustrate sensitivity to age differences and growth over time. With respect to the ECI's ability to predict future proficiency in terms of criterion measures of language and early literacy, we reported a positive relationship between the ECI's multiple words fluency at 24 to 36 months to the Early Literacy IGDI preschool measure of Rapid Picture Naming Fluency at that age ($r = .65$). Work is currently underway to investigate the predictive link from 36 to 60 months of age in a longitudinal study to extend these findings and develop benchmarks. The criterion measures in this study reflect the following: *language*, as measured by the MacArthur–Bates Communicative Development Inventory (CDI; Fenson et al., 2007) and the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 2007); *growth in early literacy skills* (Picture Naming IGDI; Missall et al., 2008) and *phonemic awareness* (Rhyming and Alliteration IGDIs; Missall et al., 2008); and *early literacy* as measured by the Test of Preschool Early Literacy (TOPEL; Lonigan, Wagner, & Torgesen, 2007).

To improve benchmarking and decision-making standards, we recently reported ECI growth norms based on a sample of children served in EHS (N = 5,883; 471 with Individualized Family Service Plans [IFSPs]) by 603 program staff in 27 EHS programs in two states. These ECI data were collected from 2002 to 2007. A goal was to create a normative sample of ECI data referenced to the population of children served by EHS including those with IFSPs. Results indicated that children's ECI total communication growth was conditional on IFSP status but not on gender or home language (English vs. Spanish). Children's patterns of communication on the ECI key skill elements (i.e., gestures, vocalizations, single words, and multiple words) also were conditional on IFSP status. Children with IFSPs had (a) later ages of onset for vocalizations, single words, and multiple words; (b) generally slower growth in total communication over time; and (c) significantly lower mean levels in the most advanced key skill, multiple words, at 36 months of age (Greenwood, Walker, & Buzhardt, 2010).

In this same large sample, it was possible for the first time to examine and compare program-level ECI total communication growth trajectories (see Figure 1). Particularly

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

Figure 1.
ECI total communication trajectories for 26 separate programs in two midwestern states



Note: ECI = Early Communication Indicator. Reprinted with permission from Greenwood, Buzhardt, Walker, Howard, and Anderson (2011).

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

interesting was the similarity and variation in the patterns of growth in total communication over time and in mean outcomes at 36 months of age in different EHS programs. The similarities of the trajectories suggested consistency of programs' staff members in implementing the ECI program wide and the ability to replicate with similar findings. It was also possible to explore the variation in ECI trajectories in terms of variation in programs' sociodemographic composition and IGDI implementation fidelity (Greenwood, Buzhardt, Walker, Howard, & Anderson, 2011). We reported no difference in ECI total communication trajectories due to program composition factors such as percentage of children hearing languages other than English at home, IFSPs, and gender. Differences were noted, however, for implementation quality variables. Programs with greater numbers of ECI outlier scores and higher frequencies of failure to monitor interassessor agreement were more likely to have higher than expected rates of children's total communication at 36 months of age.

Will IGDIs be Useful for Screening, Monitoring Progress, and Intervention Decision Making?

The most convincing evidence that the system functions as intended comes from several small intervention studies and one randomized-control trial using the ECI. Selected lower performing children were exposed to language-promoting strategies implemented by child care providers (e.g., Kirk, 2006). Single-case design studies were used and individual children improved their rates of growth as a function of the intervention. In a larger, wait-list randomized trial, EHS home visitors in five separate programs used the ECI to screen children and monitor the progress of identified children whose parents were taught and coached by the home visitors to use the language-promoting strategies in the home (Buzhardt, Greenwood, Walker, Anderson, Howard, & Carta, 2011; Buzhardt, Walker, Greenwood, & Carta, 2011). The EHS programs had previously adopted use of the ECI as an outcome measure of early communication. The sample included a total of 659 children served by a total of 48 home-visiting staff members. Child participants also included children in EHS receiving Part C services (n = 59, 9%).

All home visitors regardless of assignment to treatment used the ECI for universal quarterly screening of all children in their caseload. All received a didactic training in the use of the ECI for data-based decision making, including Tilly's (2008) model, and benchmarks for deciding when a child was not making expected rates or progress. Also, they all had access to two language-promoting strategies manuals in hard copy and through the IGDI website. All home visitors provided weekly home-visiting services to all families. The experimental group used an online decision-making support tool while the comparison group in a business-as-usual condition did not have access to the tool and made instructional decisions as they typically would. We reported no difference between groups' ECI total communication means at the start of the decision-making intervention; however, after identification and exposure to the intervention, children in the experimental group made a significantly greater increase in mean total communication at 1.69 communicative responses per min per month, compared with only 1.00 for the comparison group. The effect size was d = .41 (Buzhardt, Greenwood, et al., 2011).

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

How Do IGDIs Fit Early Childhood?

The ideas of prevention and early intervention (EI) are key tenets of early childhood programs. In its professional and published literature, early childhood programs are anchored to knowledge that a child's family members are its most important teachers (Greenwood, Bradfield, et al., 2011). EI and early childhood special education (ECSE) have embraced the idea of monitoring progress of individual children, most evident in the use of the IFSP or Individualized Education Program (IEP), and more recently by the use of IGDIs and program accountability measurement models. EI and ECSE also embrace the purposes of assessment to identify children who need additional support, to determine what interventions are needed, and to monitor and report progress. The EI and ECSE have a history of individualization and of serving children in the context of the least restrictive environment. Similarly, there is broad support for intentional teaching/intervention and data-based decision making. However, many of these tenets are just emerging in some sectors of early childhood and are not yet widely embraced in the education and treatment of *all* children. Use of IGDIs as described in this article builds on traditional EI practice including recommended practice because it gives providers systematic procedures and new measures for deciding early on when a child is not making expected progress, when a child is responding to intervention, and when to change/modify an intervention.

Summary of Accomplishments

Considerable progress has been made in developing, operationalizing, validating, and using of IGDIs. We know now that IGDIs for young children are feasible and a growing body of empirical evidence supports their use, including one randomized trial (Buzhardt et al., 2011). A number of large-scale projects with multiple programs as well as individual programs have used IGDIs. Staff members in multiple sites and programs have demonstrated successfully that they can replicate use of the measures with the support provided at the websites. IGDIs also have been used in nationally representative studies of children's growth and development along with other traditional developmental measures (e.g., the Pre-Elementary Education Longitudinal Study, The Head Start Family and Child Experiences Study, and The Early Head Start Family and Child Experiences Study national studies). Websites support wide-scale access and use. In summary, many of the 2001 concerns and issues raised about IGDIs for young children have been addressed.

What Does the Field Need to Know About IGDIs?

1. As of yet, there is no universally agreed on best approach to determining benchmarks and levels of risk with GOMs. Benchmarks are the standard levels of performance that are used for making screening or progress monitoring intervention decisions to determine whether or not a child is on track. Three different procedures are used with IGDIs and DIBELS. They are the developmental trajectory approach, the standard-setting approach, and the predictive-utility approach. All three methods seek to provide a strong empirical basis for decisions linked to level of risk, but they use different criteria for this purpose. To date, there is no guidance on the best approach, and further research is needed.

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

2. With existing measures, only the ECI as far as we know has been used in the context of a randomized trial. This work needs replication, and randomized trials using decision making informed by other IGDIs are needed to increase support for evidence-based practices in early childhood. Can it be demonstrated that IGDIs other than the ECI will lead to better outcomes in controlled studies of decision making and interventions? Such evidence will not only identify measurably superior practices but also confirm the importance of decision making and the IGDIs as evidenced practices (treatment validity).
3. Also with existing measures, many remain experimental with no large-scale use even though they are available on websites. We need to understand what types of professional development are needed to support their use with fidelity and to assist practitioners in using them to inform their decisions about interventions.
4. We need IGDIs that can be used formatively to inform children's growth toward other important outcomes (e.g., in self-regulation and adaptive skills).
5. We need to know more about how practitioners can integrate IGDI short-term decision making with special education eligibility decisions, IFSPs and IEPs, and long-term accountability measurement.
6. We need additional studies demonstrating that practitioners using IGDIs and decision making can effectively individualize interventions for those children at greatest risk.
7. While the majority of work and evidence to date supports use of IGDIs within each of the three chronological age groups of interest, there are no demonstrations of the system of measures used longitudinally with children across age groups (e.g., 6 months to 8 years).
8. There is a need for research and development making IGDIs more efficient and easier to use. Currently, each measure is administered individually, each with its separate item sets or play situations. Even though they are brief to administer, we know little about how they might be combined so that time and materials needed for administration can be more efficient overall and the data yield increased.

Conclusion

Our purpose in this article was to discuss an innovation in measurement conceptualization, development, and application. The IGDIs innovation has sought to enable the field to reach a new level of effectiveness through a data-based approach to screening/identification and monitoring of young children's progress that can be used universally with all children in a program. Compared with traditional measurement and early childhood practice, it seeks to be even more dynamic and responsive to children's observed response to intervention. Consistent with measurement standards and recommended practice, it also promises prevention of the need for special education for some children; in particular, those children lacking exposure to language and early literacy experiences prior to formal schooling who may be identified early and provided service. Moreover, for children with delays and disabilities, it offers a means of individualizing interventions in ways that support IFSP and IEP processes and that enable children to advance skills, achieve greater function, and avoid losing function in the future. What will another 25 years bring to our knowledge of the value of this innovation? We can only act on what we know now and wait to see!

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

References

American Educational Research Association. (1999). *The standards for educational and psychological testing*. Washington, DC: Author.

Barnett, W. S., Epstein, D. J., Friedman, A. H., Sansanelli, R., & Hustedt, J. T. (2009). *The state of preschool 2009*. National Institute of Early Education Research, Rutgers. Retrieved from http://nieer.org/yearbook/pdf/yearbook.pdf

Bradfield, T., Wackerle-Hollman, A., Albano, A. D., & Rodriguez, M. C. (2011, April). *Innovations in the development of early language and literacy assessment*. Paper presented at the Annual meeting of the National Council for Measurement in Education, New Orleans, LA.

Brown, W. H. (2001). General growth outcomes or developmental and readiness domains? Naming is not knowing! *Journal of Early Intervention, 24*, 181-184.

Buzhardt, J., Greenwood, C. R., Walker, D., Anderson, R., Howard, W. J., & Carta, J. J. (2011). Effects of web-based support on Early Head Start home visitors' use of evidence-based intervention decision making and growth in children's expressive communication. *NHSA Dialog: A Research-to-Practice Journal for the Early Childhood Field, 14*, 121-146.

Buzhardt, J., Greenwood, C. R., Walker, D., Carta, J. J., Terry, B., & Garrett, M. (2010). Web-based tools to support the use of data-based early intervention decision making. *Topics in Early Childhood Special Education, 29*, 201-214.

Buzhardt, J., Walker, D., Greenwood, C. R., & Carta, J. J. (2011). A study of an online tool to support evidence-based practices with infants and toddlers. *NHSA Dialog: A Research-to-Practice Journal for the Early Childhood Field, 14*, 151-156.

Carta, J. J., Greenwood, C. R., Walker, D., & Buzhardt, J. (2010). *Using IGDIs: Monitoring progress and improving intervention results for infants and young children*. Baltimore, MD: Brookes.

Division of Early Childhood. (2007). *Promoting positive outcomes for children with disabilities: Recommendations for curriculum, assessment, and program evaluation*. Missoula, MT: Author.

Dunn, L. M., & Dunn, D. M. (2007). *Peabody picture vocabulary test* (4th ed.). Bloomington, MN: Pearson Assessments.

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.* Minneapolis, MN: Center for Early Education and Development, University of Minnesota.

Fenson, L., Marchman, V. A., Thal, D., Dale, P., Reznick, J. S., & Bates, E. (2007). *The MacArthur-Bates communicative development inventories: User's guide and technical manual* (2nd ed.). Baltimore, MD: Paul H. Brookes.

Fewell, R. (2001). A continuous measure of growth outcomes: Will it do what it proposes to do? *Journal of Early Intervention, 24*, 185-187.

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

Fuchs, L. S., Deno, S. L., & Mirkin, P. K. (1984). The effects of frequent curriculum-based measurement and evaluation on student achievement, pedagogy, and student awareness of learning. *American Educational Research Journal, 21*, 449-460.

Good, R. H., & Kaminski, R. (2000). *Dynamic indicators of basic early literacy skills* (DIBELS). Available from http://dibels.uoregon.edu

Greenwood, C. R., Bradfield, T., Kaminski, R., Linas, M., Carta, J. J., & Nylander, D. (2011). The response to intervention (RTI) approach in early childhood. *Focus on Exceptional Children, 43*, 1-22.

Greenwood, C. R., Buzhardt, J., Walker, D., Howard, W. J., & Anderson, R. (2011). Program-level influences on the measurement of early communication for infants and toddlers in early head start. *Journal of Early Intervention, 33*, 110-134.

Greenwood, C. R., Carta, J. J., Baggett, K., Buzhardt, J., Walker, D., & Terry, B. (2008). Best practices in integrating progress monitoring and response-to-intervention concepts into early childhood systems. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology V* (pp. 535-548). Washington, DC: National Association of School Psychology.

Greenwood, C. R., Carta, J. J., Walker, D., Buzhardt, J., & Baggett, K. (2006). *Individual indicators of growth and development (IGDI)*. Available from www.igdi.ku.edu (The Infant and Toddler website).

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012

Greenwood, C. R., Walker, D., & Buzhardt, J. (2010). The early communication indicator (ECI) for infants and toddlers: Early head start growth norms from two states. *Journal of Early Intervention, 32*, 310-334.

Head Start. (2010). *The Head Start child development and early learning framework promoting positive outcomes in early childhood programs serving children 3–5 years old: Revised*. Retrieved from http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/teaching/eecd/Assessment/Child%20Outcomes/HS_Revised_Child_Outcomes_Framework.pdf (Adminstration for Children and Families)

Hojnoski, R. L., Silberglitt, B., & Floyd, R. G. (2009). Sensitivity to growth over time of the Preschool Numeracy Indicators with a sample of preschoolers in Head Start. *School Psychology Review, 38*, 402-418.

Kaminski, R., Cummings, K. D., Powell-Smith, K. A., & Good, R. H. (2008). Best practices in using dynamic indicators of basic early literacy skills for formative assessment and evaluation. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology V* (Vol. 4, pp. 1181-1204). Washington, DC: National Association of School Psychologist.

Kirk, S. (2006). Using outcome measures and progress monitoring to guide language-promoting interventions in early head start programs. *Dissertation Abstracts International, A 67*(02), 519. (Publication number: AAT 3207867)

Lonigan, C. J., Wagner, D. A., & Torgesen, J. K. (2007). *Test of preschool early literacy (TOPEL)*. Austin, TX: Pro-Ed.

McConnell, S. R. (2003). *Get it, Got it, Go! Expressive language (picture naming: 3-5), cognition/early literacy (alliteration/rhyming: 3-5)*. Minneapolis: Institute on Community Integration, University of Minnesota.

McConnell, S. R., & Missall, K. N. (2008). Best practices in monitoring progress for preschool children. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology* (5th ed., pp. 561-573). Washington, DC: National Association of School Psychologists.

McEvoy, M. A., Priest, J. S., Kaminski, R., Carta, J. J., Greenwood, C. R., & McConnell, S. R., Shinn, M. (2001). General growth outcomes: Wait! There's more! *Journal of Early Intervention, 24*, 191-192.

Missall, K. N., Carta, J. J., McConnell, S. R., Walker, D., & Greenwood, C. R. (2008). Using individual growth and development indicators to measure early language and literacy. *Infants & Young Children, 21*, 241-253.

National Center on Response to Intervention. (2011). *Progress monitoring tools standards*. Washington, DC: Author. Retrieved from http://rti4success.org/progressMonitoringTools

National Research Council. (2008). *Early childhood assessment: Why, what, and how*. Washington, DC: Committee on Developmental Outcomes and Assessment for Young Children, The National Academies Press.

Odom, S. L. (2001). A worthy challenge: Assessing child developmental growth in a systematic manner. *Journal of Early Intervention, 24*, 188-190.

Phaneuf, R. L., & Silberglitt, B. (2003). Tracking preschoolers' language and pre-literacy development using a general outcome measurement system. *Topics in Early Childhood Special Education, 23*, 114-123.

Priest, J. S., McConnell, S. R., Walker, D., Carta, J. J., Kaminski, R., & McEvoy, M. A., . . . Shinn, M. R. (2001). General growth outcomes for young children: Developing a foundation for continuous progress measurement. *Journal of Early Intervention, 24*, 163-180.

Sandall, S. R., McLean, M., Smith, B., & McLean, M. (2005). *DEC recommended practices: A comprehensive guide for practical application in early intervention/early childhood special education*. Longmont, CO: Sopris West.

Shanahan, T., & Lonigan, C. J. (2008). *Developing early literacy*. Washington, DC: National Early Literacy Panel. Retrieved from http://www.nifl.gov/publications/pdf/NELPReport09.pdf

Shavelson, R. J., & Towne, L. (2002). *Scientific research in education*. Washington, DC: National Academy Press.

Tilly, W. D. (2008). The evolution of school psychology to a science-based practice: Problem solving and the three-tiered model. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology V* (Vol. 1, pp. 17-36). Washington, DC: National Association of School Psychologists.

VanDerHeyden, A. M., & Snyder, P. (2006). Integrating frameworks from early childhood intervention and school psychology to accelerate growth for all young children. *School Psychology Review, 35*, 519-534.

Downloaded from jei.sagepub.com at VANDERBILT UNIV LIBRARY on January 5, 2012