Developmental Screening: A Review of Contemporary Practice

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Abstract: The early years of childhood are critical for optimal development of a variety of skills. The accurate and efficient identification of potential delays in, or issues with child development, is essential in identifying those children most in need of early intervention services. Screening procedures are designed to identify children who appear at risk for these delays or issues, with the children then more completely and comprehensively evaluated. Unfortunately, screening procedures during the preschool years remain nonsystematic, inefficient, and/or prohibitively expensive. This is especially unfortunate in that the data clearly suggest that children with developmental issues or delays who are identified early and begin receiving appropriate intervention services demonstrate a number of gains and advantages over their peers who do not participate in such programs. Specific barriers to more widespread and systematic screening procedures include the nation’s increasing cultural and linguistic diversity, increasing socio-economic status diversity, limited access to such systematic sources of screening such as medical services and child care centers, and high costs of screening procedures administered by professionals. A promising alternative to professional screening is the use of parent-completed screening questionnaires.

The critical period in child development between birth and five years has long been recognized as having disproportionately substantial and long-lasting implications for the subsequent development of a variety of skills and competencies (e.g., Grunewald & Rolnick, 2005; Shonkoff & Meisels, 2000). The brain is rapidly growing during these early years, reaching 90% of its adult size by age three (Shore, 1997). The specific environmental experiences encountered by children during these years dramatically impact later knowledge, cognitive skills, and essential social-emotional skills.

Developmental trajectories determined during the preschool years are significantly influenced by a child’s early life experiences, leading to either positive or negative outcomes (Dawson, Ashman, & Carver, 2000; Shonkoff & Phillips, 2000). Early life experiences and relationships influence both present and future cognitive and behavior development (Greenspan & Meisels, 1996; Karoly et al., 1998; Shonkoff & Phillips).

For example, children exposed to a variety of known environment and/or biological risk factors (e.g., poverty, abuse, low birth weight, low maternal education, single or teen parent, pre-existing medical conditions in either the developing fetus or in the mother-to-be) are more likely to later experience deficits and delays in cognitive, social-emotional, and physical development (Dawson et al., 2000; Greenspan & Meisels, 1996; Shields & Behrman, 2002). These gaps tend to only grow wider as the child ages. Developmental delay is a generic professional diagnostic term usually used to refer to young children at the preschool through third grade levels who are experiencing interruptions or setbacks in cognitive skills, physical status, communications skills, social or emotional development, or adaptive behavior skills (e.g., Macfarlane, 2008).

The Purpose of Screening

To prevent identified delays from becoming more significant and/or leading to more seri-

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ous disabling conditions (e.g., intellectual impairment), screening and subsequent identification of children who either are experiencing or are at risk for developmental delays is optimal when carried out as early as possible (Ackerman & Barnett, 2005; Schor, Abrams, & Shea, 2007). This early identification is predicated in part on the belief that reliable discriminations can be made between typically developing children, and those with developmental issues (Squires, Potter, & Bricker, 1999).

The preliminary process for identifying children who may be at risk of future educational or psychological challenges or special needs in learning (e.g., children with developmental delays) is screening (Gilliam, Meisels, & Mayes, 2005; McLean, 2004; Rydz, Shevell, Majnemer, & Oskoui, 2005). Preschool screening tools are not designed to provide a detailed description of developmental functioning or to design intervention strategies. Instead, they seek to indicate which children may need more comprehensive evaluation and/or support services as they approach school age. When a child who is at risk for a developmental issue is initially identified, usually he/she is then referred to a specialist for a careful, more thorough evaluation of development with special attention to the initial area(s) of concern first identified.

Research has shown that life outcomes may be positively enhanced by early identification of developmental issues and the associated provision of intervention services in the birth to five year developmental period (Barnett & Belfield, 2006). Increasingly, state and federal policy and legislation is reflecting this perspective, with growing numbers of programs designed to find, identify, track, and serve children at risk for developmental problems (Halfon, DuPlessis, & Inkelas, 2007).

Unfortunately, when compared to the common screenings of school-aged students that are routinely conducted in the nation’s public schools, the screening of children birth to five years old is inconsistent and nonsystematic (e.g., U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2005). This may be especially true for those young children who do not access medical care regularly (Schor, 2004; Schor et al., 2007).

Most children receiving early intervention services are initially identified through one or more of an assortment of professional personnel who regularly come into contact with families with children who may be at risk for developmental delays. These professionals may include social workers, preschool teachers, child care workers, therapists, public health nurses, and medical doctors. Needless to say, those children with minimal or no contact with these professionals and their services are unlikely to be screened or identified.

The 24th Annual Report to Congress reported that the average age at initial identification of a child with developmental disabilities is 5.9 years old (U.S. Department of Education, 2001). Unfortunately, by this relatively late age many irreplaceable opportunities for improving subsequent academic and life success outcomes have been lost.

Despite the lack of comprehensive screening procedures for preschool-aged children, over recent years there has been a steady increase in the number of these young children receiving early intervention (EI) and early childhood special education (ECSE) services. Both Part B and Part C of the most recently authorized version of the Individuals with Disabilities Education Act (IDEA) contain explicit requirements for states to actively identify and serve eligible children with high quality intervention services. This may help to explain the 83% increase in the total number of infants and toddlers served by Part C of IDEA nationwide from 1994 to 2005 (Danaher, Goode, & Lazara, 2007).

Rationale for Early Identification and Intervention

Early identification of possible delays or disabilities is important for a variety of reasons. First, the early extraordinary plasticity of the emerging neurological system, combined with the powerful influence of early environmental experiences, join to make the impact of environmental experiences during the early years of development especially crucial (Shonkoff, 2003). During this critical period, a variety of skills are acquired most efficiently and completely by children (Committee for Economic Development [CED], 2006; Hart & Risley, 1995; Shonkoff & Phillips, 2000; Shore, 1997).
With early identification and quality preschool services, children who evidence or are at risk for developmental issues will be more prepared for the unique academic and linguistic demands of the school environment (Schor et al., 2007; Shonkoff, 2003). In addition, children who evidence or are at risk for developmental issues who receive early intervention services are more socially and emotionally competent and successful with peers in early academic settings than are their counterparts who did not receive such services (Brophy-Herb, Lee, Nievar, & Stollak, 2007).

**Complications in Early Identification**

Unfortunately, a number of factors serve to complicate the early identification process. The nation’s population of young children is growing ethnically, culturally, and linguistically more and more diverse (Espinosa, 2005; Magnuson & Waldfogel, 2005). For example, since 2000 the Hispanic proportion of the U.S. population has substantially increased, growing from 6.9 million from 2000 to 2005 and in the process becoming the largest racial ethnic minority in 2003 (Lichter, Quain, & Crowley, 2006). During this same period, the nation’s Black population increased by 1.6 million. This growth in the nation’s racial and cultural diversity is projected to continue, if not accelerate, in the future (Lichter et al.; Shonkoff & Phillips, 2000).

The increased diversity of the nation’s young children is posing a variety of barriers for effective early intervention service providers, with implications for identification, assessment, and service provision (Espinosa, 2005; Lynch & Hanson, 2004; Shonkoff & Phillips, 2000). Culturally insensitive screening procedures may over-identify or under-identify young children of diverse backgrounds (McLean, 1999; 2004; Pavri & Fowler, 2005). Over-identification results in unwarranted diagnoses of disability, while under-identification results in failing to identify children with delays therefore failing to provide needed services in a timely fashion.

An additional and not unrelated issue is the increasing socio-economic status (SES) disparity. Separating race/ethnicity from SES remains difficult as the two are highly correlated. Ethnically and racially diverse families are disproportionately from low SES backgrounds (Braham & Bauchner, 2005). The constellation of issues negatively impacting child development that are associated with poverty includes limited parent education, poor neighborhoods, housing security, and job security (Braham & Bauchner; Shields & Behrman, 2002). These correlates individually and collectively increase the probability that poor children from racial and cultural minority groups will suffer subsequent educational barriers such as inadequate school environments and poor teachers (Ackerman & Barnett, 2005; Brooks-Gunn, 2003; CED, 2006; Espinosa, 2002).

These young children from low SES backgrounds may have only limited access to the types of professional screening that routinely are completed by family physicians and pediatricians. According to the American Academy of Pediatrics (AAP), (2006), far more young children evidence developmental issues and delays than are reported in the actual statistical prevalence data. A primary source of referrals for developmental issues are pediatricians (American Academy of Pediatrics [AAP], 2001; Pavri & Fowler, 2005); who are one of the few groups of professionals who regularly see preschool children. Regular well child visits are typically times for parents to discuss development, receive screening results, and/or follow-up on previous concerns.

However, due to low economic status and other systemic structural barriers in the present day medical care system, many children, especially those three and older, do not regularly see a physician or receive periodic health care check-ups (Halfon et al., 2007; Schor, 2004; Schor et al., 2007). Children born in inner cities, often impoverished, may not receive screening services. This is despite the fact that this group is arguably the one population of young children who are most at risk for and in need of developmental monitoring and intervention (e.g., Brinker, Frazier, Lancelot, & Norman, 1989). Specific issues encountered in programs seeking to screen low SES children for developmental issues include frequent changing of addresses, lack of medical insurance, and deficient community resources (Wertheimer, Groan, Anderson Moore, & Hair, 2003).

In addition to pediatricians, a second po-
potential source of referrals of young children with possible developmental issues is child care centers. Upon entry into these programs (and at subsequent regular intervals), children in quality child care programs are typically screened and/or monitored for developmental progress. With their experience and exposure to typically developing children, the staff in these programs may be especially well-positioned to identify early indicators of developmental issues in individual children in their care. However, many children, especially those from low SES backgrounds who may be at especially high risk for developmental issues, do not attend formal child care programs (Pavri & Fowler, 2005).

Cost is a barrier to wider access to screening for developmental issues. Professional assessments and large scale screening and monitoring procedures are expensive. In a 2001 study estimating the cost of screening preschool children, assessments administered by a doctor or health care provider ranged from $11.11 to $66.68 per child (Dobrez et al., 2001). Given the high inflation of health care costs, those costs are likely substantially higher today. Unfortunately, physicians are not usually reimbursed for screening children (AAP, 2006).

Given that most children develop typically, the costs of detecting the relatively small numbers of children who are at risk for developmental issues at risk is high for each identified child (Squires et al., 1999). For example, if 100 children are screened once a year for 5 years (birth through kindergarten) at the cost of $50 per assessment, the total cost for screening of that group of 100 children would be $25,000. Given a 10% prevalence rate for developmental issues or delay, the identification of each child with a developmental issue would have cost $2500 apiece. During these present economically challenging times, it seems unlikely that the additional resources necessary to implement more widespread developmental screening procedures for preschoolers will be identified and allocated to this purpose.

In order to most effectively track children’s development, systematic screening and monitoring procedures must be developed and implemented. However, there are only a limited number of technically adequate, low-cost screening tools. An ongoing barrier to widespread developmental screening has been the availability of a cost-effective, valid, and reliable instrument reflective of current diverse demographics.

To be effective and practical, a screening instrument must to be accurate, economical, and have current norms for use with large numbers of children (AAP, 2001; 2006; Meisels & Atkins-Burnett, 2005; Squires, Potter, Bricker, & Lamorey, 1998). The cost of screening should be significantly less than the cost of intervention if the child goes undiagnosed until symptomatic (Dworkin, 1989). If the instrument is not valid or reliable, random or inaccurate screening scores may lead to under- or over-referral for diagnostic evaluation. Current normative data that are current and reflective of the population being screened are critical for efficacious screening instruments in order to establish appropriate cutoff ranges (Meisels & Atkins-Burnett; Salvia, Ysseldyke, & Bolt, 2007).

Still other challenges in developmental screening exist. Child development changes rapidly during the birth through five year period, with this development greatly impacted by environmental factors and learning experiences (Glascoe, 2005; Shonkoff, 2003). In general, testing is often not a natural experience for young children (Bailey, 2004a; 2004b; Gilliam et al., 2005). Too often, traditional assessments do not engage children and do not incorporate play activities. In addition, traditional assessments may be often given by unfamiliar people, requiring the young child to sustain attention to adult-directed instructions and tasks (Lean & Crais, 2004). All of these factors may individually and collectively serve to inhibit the effectiveness and success of developmental screening procedures.

Effective developmental screening tests must meet psychometric standards as outlined in Table 1 (Salvia et al., 2007). The American Academy of Pediatrics (AAP) (2006) includes a listing of quality developmental preschool tests recommended for use by physicians and others involved in preschool screening. Selected developmental screening instruments are listed and compared in Table 2.
Conclusions and Implications for Future Practice

Whenever possible, any professionally generated screening data for young children should be combined with parental and teacher information, including first hand observations, to generate the most comprehensive and useful results (Gilliam et al., 2005). The use of primary caregivers assessing the child in his/her natural environment is invaluable, with the results of the total assessment battery more likely to accurately reflect the child’s true developmental status (Lean & Crais, 2004).

Given the aforementioned practical issues and constraints inherent in screening systems that rely heavily on professionally administered evaluations, a particularly promising cost-effective alternative approach to screening large groups of children is to use parent-completed questionnaires (Dobrez et al., 2001; Glascoe, Foster, & Wolraich, 1997). Parent-completed questionnaires can be used in a variety of ways, including (a) as one of several components in comprehensive child find systems, (b) as part of regular medical check-ups in physicians’ offices, and/or (c) distributed or mailed to the home in conjunction with home visits from social services agencies.

For example, parents can screen children at six-month intervals at a fraction of the cost of yearly professional assessments. In addition, parents from diverse cultures who have significant roles in screening a child for developmental issues and delays may be uniquely qualified to provide a more sensitive and accurate evaluation of the child’s authentic developmental status than a professional with a more limited understanding of the family’s unique cultural ecology and background.

High-quality tests frequently used in screening procedures include the Parents’ Evaluation of Developmental Status (PEDS) (Glascoe, 1998), the Child Development Inventories (CDIs) (Ireton, 1992), the Pediatric Symptom Checklist (PSC) (Jellinek & Murphy, 1988), and the Brigance Screens (Brigance, 2002). One particularly promising instrument used for screening children’s development and competence is the Ages and Stages Questionnaires, Third Edition (ASQ-3) (Squires, Twombly, Bricker, & Potter, 2009).

The AAP (2006) lists the ASQ as an effective and reliable screening instrument designed for frequent and ongoing monitoring of a child’s development from three months to five years. The ASQ is reported to have acceptable psychometric properties, and is economical, family-centered, and easy to administer.

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<th>Standard</th>
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<td>Specificity</td>
<td>The proportion of children correctly excluded as developing typically and performing at the expected level of a standardized assessment (Squires et al., 1999). Specificity should be in the range of 70–80% and preferably closer to 80% (AAP, 2006; Hamilton, 2006; Rydz et al., 2005).</td>
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<td>Sensitivity</td>
<td>The ability of the instrument to detect small differences across groups of children and within an individual child (Salvia et al., 2007). Sensitivity should be in the range of 70–80% or higher (AAP, 2006; Hamilton, 2006; Rydz et al., 2005).</td>
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<td>Reliability</td>
<td>The consistency of assessment scores (Salvia et al., 2007). Instruments should be selected with reliability coefficients greater than .80 and preferably greater than .90 (Bailey, 2004a).</td>
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<td>Validity</td>
<td>The degree to which the instrument measures what it is supposed to measure (Salvia et al., 2007).</td>
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<td>Representative normative sample</td>
<td>The group within a population who take a test as representatives of the larger population. When choosing an instrument, the year that testing was done should be considered, characteristics of the normative sample (stratified, proportionally representative of culture, gender, income levels, and urban-rural distribution) (Bailey, 2004a; Salvia et al., 2007).</td>
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Using the ASQ is simple and straightforward, with little specific training required. It is written at a fourth to sixth grade reading level, with illustrations included as necessary to assist with understanding. The ASQ is available in multiple languages, including Spanish, French, and Korean, and can be completed by parents in approximately 15 minutes. Trained program staff can score the questionnaire in less than 5 minutes.

An additional advantage of the ASQ is its flexibility. The ASQ can be adapted to be used in a wide variety of specific environments where young children are likely to be present, including the home, early education programs, preschools, health clinics, doctors’ offices, and teen parenting programs.

Early validation work on the latest revision of the ASQ (Pool, 2008) sought to examine concurrent validity using the Battelle Developmental Inventory, 2nd Edition (BDI-2). This work concluded that the ASQ accurately identified and classified children as being eligible or in need of further evaluation for eligibility status when the classification criterion was the BDI-2, with the ASQ accurately identifying over 90% of eligible children. Inter-observer reliabilities for this criterion were 94–96%.

### Table 2

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<td>Ages &amp; Stages Questionnaires (ASQ) (Squires et al., 1999)</td>
<td>Parent report; for ages 4–60 months; screens for risk of delays in gross and fine motor, communication, problem-solving, and personal-social skills; takes 10–15 minutes to complete; available in multiple languages; 94% test-rest reliability, 44–83% internal consistency; 76–91% concurrent validity; sensitivity: 70–90%; specificity: 76–91%</td>
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<td>Brigance Screens (Brigance, 2002)</td>
<td>Observational report; completed by professional; screens for children who are delayed as well as advanced in 6 domains; takes about 10–15 minutes to complete; available in multiple languages; 94–99% reliable; 66–94% valid; sensitivity: 70–80%; specificity: 70–80%</td>
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<td>Child Development Inventory (CDI) (Ireton, 1992)</td>
<td>Parent report; contains 3 age range screening tests (0–18 month, 18–36 month, 36–72 month); screens for delays in 5 domains; takes about 10 minutes to complete; available in English and Spanish; written at a 9th grade reading level; sensitivity: 80–100%; specificity: 94–96%</td>
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<td>Developmental Indicators for Assessment of Learning – 3rd ed. (DIAL – 3) (Mardell-Csudnowski &amp; Goldenberg, 1998)</td>
<td>Observational report; for ages 3 years to 6 years 11 months; available in English and Spanish; takes 20–30 minutes to administer; screens development in motor, concepts, language, self-help, and social skills; 87% internal reliability, 90% inter-rater reliability, 84–88% test-retest reliability; 79% concurrent validity; sensitivity: 83%; specificity: 86%</td>
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<td>Early Screening Inventory – Revised (ESI – R) (Meisels, Marsden, Wiske, &amp; Henderson, 1997)</td>
<td>Observational report; for ages 3–6 years old; screens children at risk for school failure; takes 10–15 minutes to complete; available in English and Spanish; also available online; 97–99% inter-rater reliability, 87–98% test-retest reliability; 73% valid; sensitivity: 92–93%; specificity: 80%</td>
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<td>Parents’ Evaluation of Developmental Status (PEDS) (Glascoe, 1998)</td>
<td>Parent report; for children birth to age 8; screens for risk of developmental or behavioral problems (9 domains); takes about 5 minutes to complete; available in English, Spanish, and Vietnamese; written at a 4th–5th grade reading level; 81–95% reliable; 60–86% valid; sensitivity: 74–79%; specificity: 70–80%</td>
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<td>Pediatric Symptom Checklist (PSC) (Jellinek &amp; Murphy, 1988)</td>
<td>Parent report; for children age 4–16 years; screens for mental health and behavioral problems; takes about 7 minutes to complete; available in English, Spanish, and Chinese; 84–91% reliable; 79–92% valid; sensitivity: 88–92%; specificity: 68–99%</td>
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reliability (parents and professionals) was also strong, with most correlations well over .70.

In addition to identifying children evidencing developmental delays, a related potential contribution of screening is to monitor the development of children who score slightly above some pre-determined cut-off level that would trigger more extensive investigation, but who nevertheless are close enough to that cutoff score to be of concern. In a “best practices” scenario, children with screening scores that are just above the cutoff score should receive ongoing monitoring to ensure they continue on the path of typical development, with intervention services quickly provided as indicated.

For example, typical cutoff scores would include scores that are two standard deviations below the mean in one developmental domain, or scores that are one standard deviation below the means in two or more developmental domains (e.g., language skills and motor skills). There may be legitimate concerns for those children who score slightly above identified cutoff scores (such as between one and two standard deviations below the mean), as such low scores may be indicative of limited skill repertoires. In order to identify and monitor children with low scores that are of concern but not low enough to elicit immediate further evaluation or referral, a “monitor” scoring category should be incorporated into any systematic screening systems. Children whose scores are low but do not reach typical cut-off criteria to receive special education services may be provided limited intervention services targeting specific areas of concern, even if the child’s skill levels in those areas to date have not reached the levels associated with true developmental delay.

Quality early life experiences have been repeatedly demonstrated to enhance subsequent child development in a wide variety of developmental domains. Unfortunately, not all children will have these experiences. It is imperative that social services agencies be proactive in seeking out those children most in need of more intensive, targeted early services to counteract these situations. This is perhaps most effectively done through routine developmental screenings, especially targeting those children at risk for developmental issues. The positive impact of early intervention on children’s development and subsequent school performance presents a compelling argument for screening.

References

Committee for Economic Development [CED].


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