EARLY IDENTIFICATION AND INTERVENTIONS FOR CHILDREN AT RISK FOR LEARNING DISABILITIES

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We propose that a model for early screening of children aged 3-5 years for vulnerability for learning disabilities risk can result in preventive interventions, including collaborative interventions planned through parent-professional partnership. The goals of screening and preventive services would be to mitigate increased risk of learning disabilities in elementary school years. The present article describes the rationale for early screening, dimensions that should comprise brief screening tools for use from ages 3-5 years, and potential preventive interventions that have empirical support.

The diagnosis of learning disabilities is often determined when children begin to exhibit academic difficulties in school, and the average age when children receive learning disabilities assessments is 9years (Shaywitz, 1998). Delayed intervention can result in adverse and persistent consequences for academic skill acquisition. In contrast, early identification of children at risk for learning disabilities may offer the potential to mitigate the negative effects of delayed intervention by directing children to preventive services at an earlier age. This is persuasively argued by a National Institutes of Health consensus report, *Emergent Literacy Workshop: Current Status and Research Directions*, which asserted that *diagnosis at kindergarten or first grade is too late* (National Institutes of Health [NIH], 2000).

A Developmental Model of Learning Disabilities

A complicating issue in learning disabilities intervention generally, with implications for prevention, is the ongoing debate surrounding definition of learning disabilities and how – or whether -- they may be appropriately diagnosed. We assume that learning disabilities can be defined as an adverse developmental outcome (Geary, 2004; Gersten, Jordan & Flojo, 2005) resulting in *unexpected and significant* (Fletcher, Coulter, Reschley & Vaughn 2004) difficulty with basic academics. We assume that learning disabilities result from multiple vulnerabilities that arise from biological, psychological, and social systems and their complex interactions (Rueda, 2005). Specifically, children who demonstrate learning disabilities during their elementary school years demonstrate early biological vulnerabilities including a genetic liability for mild cognitive delays or low birth weight. Once biologically vulnerable children begin to lag behind peers, their interaction with their social world and with modes of instruction systematically differ from their peers'.

The interaction between an earlier vulnerability and response to intervention has been specifically studied for children who demonstrate reading disorders: Once children who have greater difficulty than peers developing reading fluency they begin to lose opportunities to practice reading connected discourse as they spend increased time learning foundation skills such as phonetic decoding. This places initially struggling readers at a continuing disadvantage as they progress through public education. Further, children who initially struggle to read passages lose access to the language experiences and content information available in print (Torgesen, 2000). Consequently, we propose a cross-theoretical, evidence-based standard for identifying vulnerabilities to target for prevention. In other words, early developmental factors that consistently predict learning disability diagnosis merit consideration as targets for preventive services, and are presumed to confer vulnerability.

Differing theoretical positions regarding the etiology of the learning disability construct may lead to preventive services that emphasize different vulnerabilities, and approaches which target different vulnerabilities are not presumed to be mutually exclusive. For example, Head Start is an example of a very comprehensive preventive intervention for academic failure that simultaneously intervenes with multiple, interacting, and dynamic systems including familial, community, economic, psychological, and biological systems. The purpose of our paper is to focus attention on the development of prevention strategies that identify young children who demonstrate a set of intrinsic, presumably organically determined vulnerabilities, particularly those that are associated with mild cognitive impairment and more specifically language delays.

The importance of developing prevention strategies that mitigate risk for learning disabilities is suggested by the consensus criteria used to determine how to invest prevention resources: Priority is assigned to disorders that have a high prevalence, and those which are associated with developmental trajectories that can result adverse behavioral, social, and psychological outcomes (Biglan, Mrazek, Carnine & Flay, 2003). Learning disabilities are indeed prevalent, and as many as 17 percent of the population may have learning disabilities (Lyon, 2005). The importance of early intervention for children at risk for learning disabilities is further illustrated by their potentially pervasive effects on development. While those with learning disabilities constitute a heterogeneous and diverse population with varied outcomes, adverse consequences of learning disabilities can persist across the lifespan and extend beyond academic skill acquisition to more complex developmental tasks (National Research Center on Learning Disabilities [NRCLD], 2002). During childhood, individuals with learning disabilities face a complicated and challenging task of integrating their disability into an emerging self-concept. Children who have difficulty with this task and employ immature strategies such as denial or disavowal can become harsh self-critics. These children thus have an increased lifetime risk for a broad range of psychiatric disorders (Esser, Schmidt, & Woerner, 1990), and particularly depressive disorders and Posttraumatic Stress Disorder (McNulty, 2003). For example, when compared to other pupils, college students with learning disabilities were found to be nearly three times more likely to have depressive illness, and have more problems with their grades and quality of their coping skills (Arnold, 2000). Even when the consequences of learning disabilities such as harsh self-appraisal do not merit psychiatric diagnoses, children and adults with learning disabilities can still experience diminished confidence in the efficacy of their own academic, cognitive, and occupational efforts, having internalized repeated exposure to frustration (Cummings, Maddux, & Casey, 2000). As members of the adult workforce, those with learning disabilities are more likely to experience unemployment, or underemployment, and to earn less than non-disabled adults (Cummings et al., 2000). Even among adults who possess college degrees, routine workplace demands can prove more difficult for employees with learning disabilities than for their coworkers, diminishing their productivity and value to employers (Dickenson & Verbeek, 2002).

During early childhood, the term *vulnerability* aptly describes risk for learning disabilities. By itself, assessment that identifies biological risk factors for learning disabilities are neither sensitive nor specific enough for learning disability *diagnosis* (Jenkins & O'Connor, 2002; O'Connor & Jenkins, 1999; Schatschneider & Torgenson, 2004). The responsibility for surveillance is shared among multiple social systems including families and the medical care, daycare and educational systems. In particular, physicians and other professionals who interact with young children and who have training in child development are encouraged to provide surveillance for early signs of language and learning disorders (AAP, 2001).

Biological Predictors Vulnerabilities for Learning Disabilities

Organic factors are indeed associated with increased risk of learning disabilities (Scarborough, 1990). These include genetic liability for mild cognitive disorders, low birth

weight, and previous evidence of comorbid mild cognitive disorders. With respect to genetic liability, studies of heritability of learning disabilities indicate that the parent-child and sibling concordance rates for learning disabilities are 25-60% and 40% respectively. Multi-gene transmission of learning disabilities is the suggested mechanism (Olsen, Wise, Conners, Rack, & Fulker, 1989; Plomin & Walker, 2003). Because genes implicated in transmission of learning disabilities may also be implicated in other cognitive disorders, siblings and children of individuals with Attention Deficit Hyperactivity Disorder (ADHD) and Autistic Spectrum Disorders need to be considered at risk as well (Faraone & Biederman, 1993; Williams, Oliver, Allard, & Sears, 2003). Low birth weight (birth weight less than 2500 grams or approximately 5 pounds- 6 ounces) predisposes children to delays in development of visuo-spatial and language skills, especially for children with socio-familial stressors such as poverty, or who need more intensive medical intervention following birth (Breslau, Johnson, & Lucia 2001; Kanzawa, Shimizu, Kamada, Tanabe, & Itoigawa, 1997; Ross, Lipper, & Auld, 1996; Stanton-Chapman, Chapman, & Scott, 2001). Finally, with respect to prior diagnosis of mild cognitive disorders, a previous ADHD diagnosis indicates learning disabilities vulnerability. ADHD has a high rate of co-morbidity with learning disabilities with as many as 66% and 27% of children with ADHD experiencing either written language or reading disabilities, respectively (Mayes, Calhoun, & Crowell, 2000). Because of the high rate of co-morbidity as well as common cognitive features of the two disorders, Mayes and her colleagues, along with others (e.g., Marshall & Hynd, 1997), propose that ADHD and learning disabilities represent *overlapping spectrum disorders*.

Language Development and Learning Disabilities

Academic achievement across the curriculum is inherently dependent on language, and from a developmental perspective, academic achievement, particularly but not exclusively reading and writing skills, represent the culmination of a process that begins early in a child's development, with the emergence of oral language (Lyon, 2004). This developmental process includes experiential exposure to concepts, cultural information, and vocabulary; development of phonemic awareness; rapid and automatic access to vocabulary; and letter-, word-, paragraph- and book-level orthographic skills. Orthographic skills subsume basic concepts of print including understanding that print conveys information, that print is read in a predictable direction; that books are used in predictable ways, and especially that written symbols correspond to speech sounds – termed the alphabetic principle (Lyon, 2004; Lindquist, 1982; Nichols, Rupley, Rickelman, & Algozzine, 2004; Scarborough, 1990; Torgesen, 2000; Torgesen & Wagner, 1994; Wolf, Bowers, & Biddle, 2000).

Reading and written language disorders are the most frequently diagnosed learning disabilities (Gonzales & Nelson, 2003; Robinson, Menchetti & Torgesen, 2002). Relatively fewer students present with math disabilities, and approximately 4 or every 10 students with a mathematics disability demonstrates a co-morbid reading disorder (Robinson et al, 2002). Students with mathematics disabilities, including those without co-morbid reading disorders, frequently display deficits in foundational language skills, including assigning semantic and phonetic meaning to numerals, semantic retrieval, and verbal fluency which contribute to poor mathematics achievement (Desoete & Roeyers, 2005; Mazzocco, 2005; Mazzocco & Thompson, 2005; Robinson et al, 2002).

Standards for Screening Tools

Screening tools that focus on early vulnerabilities for learning disabilities should quickly and unambiguously screen for both organic and language differences that confer vulnerability for learning disabilities before child attain school age. While screening tools are by definition not as comprehensive as diagnostic assessment, they can provide information about individuals' cognitive strengths and weaknesses and may be used for selecting children for further assessment or for preventive interventions (Lonigan, 2005). A screening tool should ideally incorporate interview questions for parents or other caretakers about demographic risk factors as well as tasks administered to children that screen for weaknesses in foundational language

skills including rapid access to vocabulary and phonemic awareness. The advantages of combining parental report with tasks presented to children include enlisting parents as active, respected participants (AAP, 2001). Finally, screening tools should provide a written record for each screening, conferring two advantages; first, directing the screener's attention to each domain assessed, and second, providing benchmarks for comparisons over time. While each screening tool item should be referenced to a risk factor, the tool may not necessarily produce a norm-referenced summative score as a child who has one or more risk factors should be referred for further assessment and be considered for preventive interventions.

Table 1 provides a list of dimensions that should be represented in a screening tool with examples of items.

Table 1
Sample Screening Questions and Tasks, Risk Factor Assessed

Parent Demographic Interview Questions	*Risk Factor*
Was your child's birth weight less than 5 pounds or 2500 grams?	Low Birth Weight
Does your child have a mother, father, sister, or brother with a learning Disability, ADHD, or an Autistic Spectrum Disorder, even if it was not formally diagnosed?	Heritability of Cognitive Disorders
Does your child have a diagnosis of ADHD?	Comorbidity of LD with ADHD
Was your child combining words into short sentences or phrases by the time s/he was 2 years old?	Delayed Speech
Parent Reading Observations Interview Questions	
Does your child "read" signs like "Coke" or McDonalds?"	Orthographic Skill/ Environmental Print
Does your child recognize parts of a book such as the cover, title, and end?	Print Knowledge
Does your child point to words or letters he or she knows when reading a book?	
Does you child recognize or write the letters of his or her name or other words?	
Sample Tasks Administered to Children	*Risk Factor*
Rhyme Detection	Phonemic Awareness
Segmenting Words into Phonemes	
Blending Phonemes to Form Words	
Letter Naming	Orthographic Skill
Letter-Sound Correspondence	Alphabetic Principle
Rapid Categorical Naming	Rapid Access to Vocabulary

Currently available screening tools for prediction of learning disabilities are primarily used with children age 4 years or older (e.g., National Center for Learning Disabilities [NCLD}, 2001). Two comprehensive reviews of these measures are provided by Jenkins and O'Connor (Jenkins & O'Conner, 2002; O'Conner & Jenkins, 1999). The tools they reviewed have some important limitations: Most include assessment of beginning reading skills such as alphabet knowledge, in addition to developmentally earlier language functions. Combining surveillance for demographic risk factors with direct assessment of foundational language skills appropriate for 3 year-old children would provide optimal opportunities for early prevention. According to O'Connor and Jenkins (1999), some predicative assessments take as long as one hour to administer. Because developmental screening typically needs to be repeated over time due to the dynamic nature of development, lengthier assessments have limited utility in most practical settings where screening is likely to occur.

An example of a brief (less than 10 minutes to administer) screening tool is *Get Ready to Read!* (NCLD, 2005). The 20 questions that comprise *Get Ready to Read!* do not require oral responses, and children are asked to choose one of four pictures to answer each item. This tool was designed so that it can be administered by individuals without specialized assessment training. In a review of the tool by Lonigan (2005), its purpose is described as providing a *snapshot* of foundational language skills that can become targets for preventive intervention. Lonigan differentiates between this purpose and diagnostic evaluation which would provide more detailed information about cognitive strengths and weaknesses. Domains assessed include letter, word, and book level orthographic skills and phonemic awareness. Concurrent and predictive validity for *Get Ready to Read!* screening at age 4 years have been demonstrated through correlation with other preschool measures and with reading measures (word recognition and phonetic decoding skills) at age 7 years. *Get Ready to Read!* provides norm-referenced scores. Cut-off scores for decision making are not provided. Spanish and English versions of the tool are available (Lonigan, 2005).

Preventive Services for Children Identified as Vulnerable

Logically, to have any value screening needs to lead to effective preventative services. While empirically validated preventive interventions are preferable, consensus standards for evaluating prevention programs have not emerged (Biglan et al, 2003). Proposed standards for evaluating intervention effectiveness consider an intervention to be *well-established* when two or more well-conducted and well-described group-design studies demonstrate the intervention's superior effectiveness to placebo treatment, or equivalent effectiveness to an already established treatment. Additionally, an intervention can be deemed well-established when its effectiveness is supported by a large number of single-case design studies by multiple researchers at multiple sites. *Probably efficacious* interventions are supported by more limited evidence, such as two or more studies that do not provide comparison to placebo or already established treatment, or a small number of single-case design studies (Shepard & Carlson, 2003). Further, Justice and Kaderavek (2004) propose that interventions likely to confer benefit to children include combinations of *direct intervention* by professionals, and *indirect interventions* which are collaboratively planned by professionals and parents to occur in naturalistic settings. Justice and Kadervek argue that combining direct and collaborative interventions increases the amount of children's time devoted to intervention as well the ecological validity of interventions. Further, Shepard & Carlson (2003) propose that effective early-childhood preventive interventions are collaboratively planned with parents, view parents as important resources, respect cultural differences, and flexibly accommodate parent's schedules. A set of proposed preventive interventions that may have utility for children identified as at risk for learning disabilities is briefly described below. The selection of preventive interventions is influenced by the perspective that language deficits that contribute to learning disabilities are observable in early childhood and further that these early language deficits place children on a developmental trajectory associated with later learning disabilities. Consequently, remediation of early language deficits represents the most appropriate target for intervention for children at increased learning disabilities risk. The interventions described target language development during early childhood using an ecological view of language development as occurring in natural contexts such as home, preschool, and community. These proposed interventions incorporate the recommendations offered by Justice and Kadverek (2004) and Shepard and Carlson (2003) that programs emphasize parent-professional partnership, and are supported by group-design effectiveness studies. However, a limitation associated with empirical support for these interventions is the selection of outcome variables in their effectiveness studies. Typically, these interventions demonstrate benefit in terms of language skill development. This does not directly imply that preventive interventions would change either the subsequent incidence of learning disabilities or the severity of disability among those who receive the interventions. Intervention outcome studies that directly assess the relationship between language intervention in early childhood

and learning disabilities rate and severity would represent a gold standard for intervention effectiveness.

Indirect Interventions: Parent Education and Consultation

Improving Parental Language Models. Language development is mediated by experience with language models, and parents provide *apprenticeship experiences* for language complexity. Critical parent skills for improving children's language include responsiveness and sensitivity to the social and affective intention of children's communication. Parents facilitate children's language growth when they imbue communication with positive affective tone, and provide affirmation for children's communicative intent, and by modeling rich, complex use of language (Dodici, Draper, & Peterson, 2003). Parent behaviors that improve language development are teachable skills and professional-parent consultation can improve parents' length of utterances, responsiveness to children's communication, contingent use of praise for children's communication, use of language expansion, modeling of language pragmatics such as attentive listening and turn-taking in conversation, and understanding of the differences between children's and adults' language development. Developmental awareness includes, for example, the need for parents to pause before responding or interrupting during conversation to accommodate their children's slower processing speed. Systematic intervention through parent-professional partnership can increase children's spontaneity of language, length of utterances, and variety of language forms, while decreasing yelling and oppositional behavior (Hancock, Kaiser, & Delaney, 2002).

Improving Children's Creative and Narrative Play. Interventions designed to improve the complexity and maturity of vulnerable children's play also confers substantial and measurable benefit in terms of their vocabulary development, length of utterances, and language complexity and diversity. Teaching adults, including parents and other caretakers, to systematically guide complex, imaginative, and social play with peers through introduction of ideas and themes for play, providing ideas for roles and narratives, unobtrusively moderating play through modeling, prompting, and providing feedback, and by aiding in recall and discussion of play experiences when play is over, facilitates children's practice of language pragmatics, sustained social interaction, problem solving through negotiation, and exposes children to language models provided by peers during play. As well, facilitating mature, imaginative, and social play can increase the likelihood that children will derive satisfaction from play and social interaction, reinforcing communication attempts (Craig-Unkefer & Kaiser, 2002). Parent-child word games can also play an important role in facilitating language development (Hornby & Jensen-Proctor, 1984), including old games such as *I spy*, or *20 Questions*.

Improving Orthographic and Phonemic Skills through Shared Reading. Shared reading provides children, even at very young ages, with models of reading, exposure to the phonological system of language, and information about how books and print are organized to convey information. As well, parents who read with their children provide them with important opportunities for interaction using language and encourage competence and active engagement in both communication and literacy (Woude & Barton, 2003). Thus, shared reading confers a double benefit of increased opportunities to practice listening and speaking with an adult model as well as opportunities to learn about written language through books. Unfortunately, several studies that assessed the frequency of shared reading in homes revealed that a minority of parents read to their children (Celano et al., 1998; Heubner, 2000), perhaps as few as one in four (Klass et al., 2003). Hypothesized obstacles to shared reading include role strain experienced by parents who cope with financial stressors and increased work demands in a turbulent economy (Huebner, 2000). This has a disproportional affect on shared reading in families who are at risk due to poverty, limited parental education, or membership in ethnic or language minorities (Celano et al., 1998; Huebner, 2000; Klass et al., 2003; Washington, 2001). As well, the frequency and quality of shared reading varies

between families and depends on parents' own literacy skills, beliefs about literacy, and their children's enthusiasm for reading (Celano et al., 1998).

Despite the obstacles parents and children face, collaborative interventions that teach parents to enhance shared-reading experiences can increase both the frequency of shared reading and the quality of shared reading. Demonstrations of effective interventions based upon parent education have been as brief as three one-hour sessions (Hockenberger, Goldstein, & Haas, 1999). The common elements of effective intervention across studies include increasing frequency and duration of shared reading, and teaching parents to intentionally and reflectively use specific questions and prompts. Enriched adult questioning and prompting can focus on expanding the complexity of children's use of language for communication and concept formation, as in Dialogic Reading created by Whitehurst and his colleagues (Zevenbergen, Whitehurst, & Zevenbergen, 2003), and on focusing children's attention on orthographic and phonemic information conveyed by literature including book-level, paragraph-level, word-level, and alphabetic information. Prompts aimed at developing pre-literacy skills typically instruct children to locate, identify, or name characteristics of book organization, such as left to right and top to bottom organization of text, recognition of words in context, and letters and their sounds (Celano et al., 1998; 2002; Hokenberger et al., 1999; Huebner, 2000; Justice, Weber, Ezell, & Bakerman, 2002). Shared reading can be encouraged through use of books with strong rhyming patterns and repetition of sounds, celebration of reading through activities linked to books (Allor & McCathren, 2003), and building on families' existing communication and literacy patterns and strengths (Justice & Kaderavek, 2003). Importantly, both parent and professional readers can enrich their shared reading skills during shared reading, with measurable benefits for children, especially when interventions are implemented both at home and by professionals (Crain-Thoresen & Dale, 1999; Whitehurst & Lonigan, 1998).

Reach Out and Read provides an example of shared reading intervention provided within a primary health care context (Klass et al., 2003). Assessment of children's print knowledge by handing books to preschool children during well visits is an essential element of Reach Out and Read. In-office assessment offers direct observation of how children handle books as well as the quality of their verbal, motor, and affective responses to print. Reach Out and Read intervention additionally provides volunteer readers who model shared reading in pediatric waiting rooms; guidance for parents and other caretakers that provide specific information about child development, literacy development and shared reading; and a gift of a developmentally appropriate book at each visit. Program evaluations demonstrated increased frequency of shared reading, particularly among families at lower income levels and families who are members of language minorities. In addition to increasing frequency of shared reading, the Reach Out and Read program enhanced the emotional valance of shared reading, with parents reporting greater satisfaction with shared reading as an activity and greater responsiveness to shared reading among their children. Most importantly, Reach out and Read children experienced significantly greater receptive and expressive language gains compared to age-matched controls (Klass et al., 2003).

Direct Interventions Provided by Professionals

Direct intervention for young children at risk for learning disabilities or other poor reading outcomes from pre-school through first grade is considered a promising approach to *catch them before they fail* (Hus, 2001). However, preventive interventions typically demonstrate effectiveness for groups of children while individual children experience widely disparate outcomes (Gonzales & Nelson, 2003). This variation may result from differences in severity of deficits evident among children identified as at-risk, with children having the most severe impairments experiencing the smallest gains from prevention programs (Torgesen, 2000). Although the elements required for successful preventive services are not well understood, Torgesen (2000) advises that preschool prevention provide instruction that is explicitly related to literacy as opposed to language development more generally. Because acquisition of

phonemic and orthographic skills appear to represent mutually dependent processes (Castles & Coltheart, 2004; Christensen, 1997; Korkman & Peltoma, 1993), typical interventions focus on explicit instruction in phonemic skills, including rhyming, segmenting, and blending sounds; letter recognition; and letter-sound correspondences, mirroring Torgesen's recommendation. Evaluations of preventive interventions which included control or comparison groups that received no or nonspecific intervention indicate that intervention is associated with improvements in precursor language skills (Allor & McCathren, 2004; Rvachew, Nowak & Cloutier, 2004), as well as later improvement in reading and spelling outcomes up to two years following intervention (Allor & McCathren, 2004; Hus, 2001; Korkman & Peltoma 1993; Schneider, Ennemoser, Roth, & Kuspert, 1999; Vadasy, Jenkins, & Pool, 2000). Effective preventive practices have been demonstrated in diverse settings using a variety staff to provide intervention. Examples include adding explicit reading prevention instruction to speech and language therapy provided by speech and language pathologists (Pokorni, Worthington, & Jamison, 2004; Rvachew, Nowak, & Cloutier, 2004), small-group intervention carried out by psychologists, educators, and speech and language pathologists in mental health, medical, and school settings (Korkman & Peltoma, 1993) and by college students with several hours of training (Allor & McCathren, 2004), as well as by volunteers with similarly minimal training (Vadasy et al., 2000) . As well, the duration of intervention programs vary, with successful programs lasting as few as 9 weeks (Hus, 2001) and as long as one school year (Allor & McCathren, 2004), with session lengths as brief as 15 minutes (Schneider et al., 1999). Vulnerable children are best served by programs which ensure fidelity of intervention practices by providing staff training prior to and during intervention, as well as those that use structured and packaged formats that explicitly guide intervention (Allor & McCathren, 2004; Korkman & Peltoma 1993).

Discussion

Academic skills represent the culmination of a continuous process of language development beginning in early childhood. Genetic liability for learning disabilities, low birth weight, and delayed development of early language skills can predispose children to learning disabilities thus mediating the language development process. Viewed from a developmental perspective, professionals working with vulnerable children and their families can provide early intervention that offers opportunities to facilitate the language development of children with increased risk for learning disabilities, possibly mitigating their risk for later developing learning disabilities. Specifically, professionals who have daily interaction with children can help parents and other caretakers identify children's vulnerabilities through use of screening tools, and promote through education and collaboration development of home literacy environments (Payne, Whitehurst & Angell, 1994) that offer enriched opportunities to develop foundational language skills associated with literacy. In addition to collaborative, indirect interventions, screening to identify vulnerable children can lead to appropriate referral for direct services including diagnostic assessment, an educational, speech and language, and related programs.

While empirical support provides evidence for the efficacy of preventive services in enhancing foundational language skills, this evidence does not establish that rates of learning disabilities diagnosis would decline as a result of preventive services. Approaches to demonstrating the benefits of prevention on disability frequency or severity are suggested in the broader prevention literature and are relevant to learning disabilities prevention efforts. These include establishing registries of prevention trials to collect and aggregate longitudinal and outcome data for children who receive preventive services, with emphasis on documenting the relationship between prevention and disability, on collecting long-term follow-up data , and on establishing local monitoring systems to describe both how research-based interventions are carried out locally in practice settings and the effectiveness of the programs (Biglan et al, 2003; Shepard & Carlosn, 2003).

References

Allor, J. H., & McCathren, R. B. (2003). Developing emergent literacy skills through storybook reading. *Intervention in School and Clinic, 39*(2), 72-79.

Allor J.H. & McCathren, R.B. (2004). Learning disabilities practice: The efficacy of an early literacy tutoring program implemented by college students. *Learning Disabilities Research and Practice, 19*(2), 116-130.

American Academy of Pediatrics [AAP]. (2001). Policy statement: Developmental surveillance and screening of infants and young children. *Pediatrics, 108*(1), 192-195.

Arnold, N. G. (2000). The increased risk of depression in learning disabled college students. *Dissertation Abstracts International, 61*(2-B), 1069.

Atkinson, P.M., Parks, D.K., Cooley, S.M. & Sarkis, S.L. (2002). Reach Out and Read: A pediatric clinic-based approach to early literacy promotion. *Journal of Pediatric Health Care, 16*(1), 10-15.

Biglan A., Mrazek, P.J., Carnine, D. & Flay, B.R. (2003). The integration of research and practice in the prevention of youth problem behaviors. *American Psychologist, 58(6/7),* 443-440.

Breslau, N., Johnson, E.O., & Lucia, V.C. (2001). Academic achievement of low birthweight children at age 11: The role of cognitive abilities at school entry. *Journal of Abnormal Child Psychology, 29*(4), 273-281.

Castles, A. & Coltheart, M. (2004). Is there a causal link from phonological awareness to success in learning to read? *Cognition*, *91*, 77-111.

Celano, M., Hazzard, A., McFadden-Garden, T., & Swaby-Ellis, D. (1998). Promoting emergent literacy in a pediatric clinic: Predictors of parent-child reading. *Children's Health Care*, *27*(3), 171-183.

Christensen, C. A. (1997). Onset, rhymes, and phonemes in learning to read. *Scientific Studies of Reading*, *1*(4), 341-358.

Craig-Unkefer, L. A. & Kaiser, A. P. (2002). Improving the social communication skills of at-risk preschool children in a play context. *Topics in Early Childhood Special Education*, *22*(1), 3-14.

Crain-Thoreson, C. & Dale, P.S. (1999). Enhancing linguistic performance: Parents and teachers as book reading partners for children with language delays. *Topics in Early Childhood Special Education, 19*(1), 28-40.

Cummings, R., Maddux, C.D, & Casey, J. (2000). Individualized transition planning for students with learning disabilities. *Career Development Quarterly. 49*(1), 60-73.

Dickenson, D. L. & Verbeek, R. L. (2002). Wage differentials between college graduates with and without learning disabilities. *Journal of Learning Disabilities, 35*(2), 175-185.

Dodici, B. J., Draper, D. C., & Peterson, C. A. (2003). Early parent-child communication and early literacy development. *Topics in Early Childhood Education, 23*(3), 124-137.

Esser, G., Schmidt, M.H., & Woerner, W. (1990). Epidemiology and course of psychiatric disorders in school-age children--Results of a longitudinal study. *Journal of Child Psychology & Psychiatry & Allied Disciplines, 31*(2), 243-264.

Faraone, S.V. & Biederman, J. (1993). Intellectual performance and school failure in children with attention deficit hyperactivity disorder and in their siblings. *Journal of Abnormal Psychology, 102*(4), 616-624.

Farmer, T. W., & Farmer, E. Z. (2001). Developmental science, systems of care, and prevention of emotional and behavioral problems in youth. *American Journal of Orthopsychiatry, 71,* 171-181.

Fletcher, J.M., Coulter, W.A., Reschly, D.J. & Vaughn, S. (2004). Alternative approaches to the definition and identification of learning disabilities: Some questions and answers. *Annals of Dyslexia, 54,* 304-331.

Geary, D.C. (2004). Mathematics and learning disabilities, *Journal of Learning Disabilities, 37,* 4-15.

Gersten, R., Jordan, N.C., Flojo, J.R. (2005). Early identification and interventions for students with mathematics difficulties. *Journal of Learning Disabilities, 34,* 293-304.

Gonzales, J.E. & Nelson, R. (2003). Stepping stones to literacy: A prevention-oriented

phonological training program. *Reading and Writing Quarterly, 19,* 393-398.
Hancock, T. B., Kaiser, A. P., & Delaney, E. M. (2002). Teaching parents of preschoolers at high risk. *Topics in Early Childhood Education, 22*(4), 191-213.
Heubner, C. E. (2000). Community-based support fro preschool readiness among children in poverty. *Journal of Education for Students Placed At Risk*, *5*(3), 291-314.
Hockenberger, E.H., Goldstein H. & Haas, L.S. (1999). Effects of commenting during joint book reading by mothers with low SES. *Topics In Early Childhood Special Education, 19*(1), 15-28.
Hornby, G. & Jensen-Proctor, G. (1984). Parental speech to language delayed children: A home intervention study. *British Journal of Disorders of Communication, 19*(1), 97-103.
Hus, Y. (2001). Early reading for low-SES minority language children: An attempt to 'catch them before they fall'. *Folia Phoniatrica et Logopaedica*, *53*(3), 173-182.
Jenkins, J.R. & O'Conner, R.E. (2002). Early identification and intervention for young children with reading/learning disabilities. In: Bradley, R., Danielson, L., & Hallahan, D.P. (eds.). *Identification of Learning Disabilities: Research to Practice*. Mahwah, NJ: Lawrence Earlbaum Associates.
Johnson E. O. & Breslau, N. (2000). Increased risk of learning disabilities in low birth weight boys at age 11 years. *Biological Psychiatry* 47(6)
Justice, L.M. & Kaderavek, J.M. (2003). Topic control during shared storybook reading: Mothers and their children with language impairments. *Topics in Early Childhood Special Education, 23*(3), 137-151.
Justice, L.M. & Kaderavek, J.M. (2004). Embedded-explicit emergent literacy intervention I: Background and description of approach. *Language, Speech, and Hearing Services in Schools, 35*(3), 201-222.
Justice, L.M., Weber, S.E., Ezell H.K., & Bakerman, R. (2002). A sequential analysis of children's responsiveness to parental print references during shared book-reading interactions. *American Journal of Speech-Language Pathology, 11*(1), 30-41.
Kanzawa, T., Shimizu, S. Kamada, J. Tanabe, H., & Itoigawa, N. (1997). Intelligence and learning disabilities in 6- to 8-year-old children weighing under 1000 grams at birth. *International Journal of Behavioral Development, 20*(1) 179-188.
Klass, P.E., Needlman, R., & Zuckerman, B. (2003). The developing brain and early learning. *Archives of Disease in Childhood, 88*(8), 651-655.
Korkman, M. & Peltoma, A. K. (1993). Preventive treatment for dyslexia by a preschool training program for children with language impairments. *Journal of Clinical Child Psychology*, *22*(2), 277-287.
Larney, R. (2002). The relationship between early language delay and later difficulties in literacy. *Early Child Development & Care*, *172*(2), 183-193.
Lindquist, G. T. (1982). Preschool Screening as a Means of Predicting Later Reading Achievement. *Journal of Learning Disabilities, 15*(6), 331-332.
Lonigan, C. (2005). Development and promotion of early literacy skills: using data to help children succeed. Retrieved August 25, 2005, from National Center for Learning Disabilities: http://www.ld.org/earlyliteracyscreeningforum/pdf/Loniganforumpaper.pdf
Lyon, G. R. (2004). The NICHD Research Program in Reading development, Reading disorders and Reading Instruction. In *National Center for Learning Disabilities* (chap.) Retrieved October 10, 2004, from National Center for Learning Disabilities: http://www.ncld.org/research/keys99_nichd.cfm
Lyon, G.R. (2005). The NICHD Research program in reading development, reading disorders and reading instruction. http://www.ld.org/Research/keys99_nichd.cfm
Lyon, G.R., Shawitz, S.E., & Shawitz, B.E. (2003). A definition of dyslexia. *Annals of Dyslexia, 53,* 1-15.
Marshall, R. M., & Hynd, G. W. (1997). Academic underachievement in ADD subtypes. *Journal of Learning Disabilities, 30*(6), 635-643
Mayes, S. D., Calhoun, S. L., & Crowell, E. W. (2000). Learning disabilities and ADHD-overlapping spectrum disorders. *Journal of Learning Disabilities, 33*(5), 417-425.
McNulty, M. A. (2003). Dyslexia and the life course. *Journal of Learning Disabilities, 36*(4),

363-381.
National Center for Learning Disabilities. (2001). *Get Ready to Read! Screening Tool.* New York: Author.
National Institutes of Health [NIH]. (2000). *Emergent literacy workshop: Current status and research directions.* Author.
National Research Center on Learning Disabilities [NRCLD]. (2002). *Researcher Consensus Statement: NRCLD Information Digest #3.* Author.
Nichols, W.D., Rupley, W.H., Rickelman, R.J., & Algozzine, B. (2004). Examining phonemic awareness and concepts of print patterns of kindergarten students. *Reading Research & Instruction 43*(3), 56-81.
O'Connor, R.E. & Jenkins, J.R. (1999). Prediction of reading disabilities in kindergarten and first grade. *Scientific Studies of Reading*, *3*(2), 159-198.
Olson, R., Wise, B., Conners, F., Rack, J., & Fulker, D. (1989). Specific deficits in component reading and language skills: genetic and environmental influences. *Journal of Learning Disabilities, 22*(6), 339-348.
Payne, A.C., Whitehurst G.J., & Angell, A.L. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly, 9*(3-4), 427-440.
Plomin, R. & Walker, S. O. (2003). Genetics and educational psychology. *British Journal of Educational Psychology, 73,* 3-14.
Pokorni, J.L., Worthington, C.K. & Jamison, P. J. (2004). Phonological Awareness Intervention: Comparison of Fast ForWord, Earobics, and LiPS. *Journal of Educational Research, 97*(3), 147-157.
Rescorla, L. (2002). Language and reading outcomes to age 9 in late-talking toddlers. *Journal of Speech, Language, and Hearing Research, 45*, 360-371.
Robinson, C.S., Menchetti, B.M. & Torgesen, J.K. (2002). Toward a two-factor theory of one type of mathematics disabilities. *Learning Disabilities Research & Practice*, 17(2), 81-89
Ross, G., Lipper, E., & Auld, A.M. (1996). Cognitive abilities and early precursors of learning disabilities in very-low-birthweight children with normal intelligence and normal neurological status. *International Journal of Behavioral Development, 19*(3), 563-580.
Rourke, B.P. & Del Dotto, J. (1994). *Learning Disabilities: A Neuropsychological Perspective.* New York: Sage Publications
Rvachew, S., Nowak, M., & Cloutier, G. (2004). Effect of phonemic perception training on the speech production and phonological awareness skills of children with expressive phonological delay. *American Journal of Speech-Language Pathology*, *13*(3), 250-263.
Scarborough, H. S. (1990). Very early language deficits in dyslexic children. *Child Development, 61,* 1728-1743.
Scarborough, H.S. & Dobrich, W. (1990). Development of children with early language delay. *Journal of Speech & Hearing Research, 33*(1), 70-83. http://ecrp.uiuc.edu
Schatschneider, C. & Torgeson, J.K. (2004). Using Our Current Understanding of Dyslexia to Support Early Identification and Intervention. *Journal of Child Neurology, 19*(10), 759-765.
Schneider, W., Ennemoser, M., Roth, E., & Kuspert, P. (1999). Kindergarten prevention of dyslexia: Does training in phonological awareness work for everybody? Journal of Learning Disabilities, 32(5), 429-437.
Shaywitz, S.E. (1998). Current concepts: Dyslexia. *New England Journal of Medicine, 338*(5), 307-312.
Shepard, J. & Carlson, J.S. (2003). An empirical evaluation of school-based prevention programs that involve parents. *Psychology in the Schools, 40(6),* 641-656.
Stanton-Chapman, T.L., Chapman, D.A. & Scott, K.G. (2001). Identification of early risk factors for learning disabilities. *Journal of Early Intervention, 24*(3), 193-206.
Stormont, M., Espinosa, L., Knipping, N. & McCathren, R. (2003). Supporting Vulnerable Learners in the Primary Grades: Strategies To Prevent Early School Failure. *Early Childhood Research and Practice: An Internet Journal on the Development, Care, and Education of Young Children, 5*(2). http://ecrp.uiuc.edu.

Torgesen, J. K. & Wagner, R. K. (1994). Longitudinal studies of phonological processing and reading. *Journal of Learning Disabilities*, *27*(5), 276-287.
Torgesen, J. K. (2000). Individual differences in response to early interventions in reading. *Learning Disabilities Research and Practice, 15*(1), 55-65.
Vadesy, P.F., Jenkins, J.R. & Pool, K. (2000). Effects of tutoring in phonological and early reading skills on students at risk for reading disabilities. *Journal of Learning Disabilities, 33*(6), 579-591.
Washington, J. A. (2001). Early literacy skills in African-American children: Research considerations. *Learning Disabilities Research & Practice*, *16*(4), 213-221.
Whitehurst, G.J. & Lonigan, C.J. (1998). Child development and emergent literacy. *Child Development, 69*(3) 848-873.
Whitehurst, G.J., Zevenbergen, A.A , Crone, D.A., Schultz, M.D., Velting, O.N., & Fischel, J.E. (1999). Outcomes of an emergent literacy intervention from Head Start through second grade. *Journal of Educational Psychology, 91*(2), 261-272.
Williams, G., Oliver, J.M., Allard, A. & Sears, L. (2003). Autism and associated medical and familial factors: A case control study. *Journal of Developmental & Physical Disabilities, 15*(4), 335-349.
Wolf, M., Bowers, P. G., & Biddle, K. (2000). Naming speed processes, timing, and reading: A conceptual review. *Journal of Learning Disabilities, 33*(4), 387-408.
Woude, J.V. & Barton, E. (2003). Interactional sequences in shared book-reading between parents and children with histories of language delay. *Journal of Early Childhood Literacy, 3*(3), 249-273.
Wood, C. & Terrell, C. (1998). Pre-school phonological awareness and subsequent literacy development. *Educational Psychology, 18*(3), 253-275.
Zevenbergen, A.A., Whitehurst G.J., & Zevenbergen, J.A. (2003). Effects of a shared-reading intervention on the inclusion of evaluative devices in narratives of children from low-income families. *Journal of Applied Developmental Psychology, 24*(1), 1-15.