READING DISABILITY

CONCEPTUALIZATION, IDENTIFICATION AND INTERVENTION

A REVIEW OF THE LITERATURE

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A REVIEW OF THE LITERATURE

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Abstract

This paper folio provides a review of the current literature on reading disability in an effort to bring together relevant information for parents and practitioners who work with reading disabled children. The first section, Reading and Reading Disability, will begin with a definition and analysis of normal reading development and then use this as a point of reference to conceptualize reading disability, its development as well as its distinction from garden variety poor reading. The second section of this folio, Definition and Identification of Reading Disability, will discuss the emergence of reading disability from the field of learning disabilities, the identification and measurement of reading disability as well as problems with current definitions and identification procedures. The final section of this folio, Early Identification, Intervention and Remediation, will focus on prevention, early intervention and/or remediation of reading disability in young children. Additionally, it will make suggestion for parents and professionals who work with reading disabled children.

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Section II: Definition and Identification of Reading Disability

Section III: Early Intervention and Remediation

Section I

Reading and Reading Disability

The first segment of this paper folio is an examination of the development of normal reading skills. The individual components of reading are delineated and an analysis of reading disability, its components and development, is considered. This section concludes with a discussion of the distinction between reading disabled and generally backward readers and determines that the child with a reading disability is substantially, though not completely, different from other poor readers.

Normal Reading

While listening and speaking are natural, biological processes, reading, writing and spelling are not (Brady & Moats, 1997; Fletcher, 1994; Lyon, 1998; Shaywitz, 1999; Stanovich & Siegel, 1994; Vellutino & Scanlon, 1998). For reading to develop, there must be systematic, explicit instruction. Reading begins very early in life, long before a child enters school. Research has demonstrated a strong positive relationship between the amount and quality of early language and literacy interactions and experiences and the acquisition of the linguistic skills necessary for reading. For reading to develop the child must possess phonemic awareness and other phonological processing skills. This is not an easy task because the separate speech sounds are not easily distinguishable due to a process called co-articulation. When uttering a word such as "cat", only one sound is heard. However, this word contains three phonemes. The English language requires the reader to connect print to speech, linking the 26 letters of the alphabet with the 44 phonemes which comprise our language. This linkage between written spellings and the phonemes of spoken words is known as the alphabetic principle and its development is crucial to the acquisition of reading skills. Once acquired, this alphabetic principle must be practiced to the

point of automaticity so that most of a child's attention and memory can be allocated to the understanding of what is read, instead of focusing intently on the sound/symbol relationships which comprise each word (Lyon, 1998).

According to Adams (1990), reading is a process of getting meaning from print which involves a complex system of skills, strategies and knowledge interacting simultaneously to produce this meaning. Accurate and effortless word identification, the central component of skilled reading, is useless in and of itself (Vellutino, Scanlon & Tanzman, 1994). It becomes meaningful only when it is combined with a system of complementary knowledge and activities which results in comprehension, the end product of reading (Adams, 1990). This comprehension is facilitated when spurred on by a child's interest, motivation and active attention, in combination with adequate background knowledge. Vellutino et al. further argue that ease of word identification must also be combined with adequate language comprehension in order to produce comprehension of printed material.

In describing reading as a circular activity, Adams (1990) states that "if we want children to learn to read well, we must find a way to induce them to read lots." She further asserts that "if we want to induce children to read lots, we must teach them to read well" (p. 5). If we want children to acquire the ability and disposition to read freely and frequently, and to ensure that they have ready access to the information and pleasures of print, not only as children but also as adults, we must initially teach them to read effectively, and then induce them to read copiously to hone these skills. The most effective way to ensure that reading develops as a utilitarian as well as a pleasurable activity is to expose children, in the early stages of reading development, to a productive system of acquiring the subskills required for fluent reading and to be alert to any

deviations in this acquisition process (Snow, Burns & Griffin, 1988). Once these skills begin to develop, encouraging and refining them throughout the elementary school years will ensure that children enter adulthood with the prerequisites necessary to productively contend with the world via the print mode.

Components of Reading

Reading is not a single skill. Rather, it comprises a number of parts which are not discrete, but which, according to Adams (1990), "grow to and from one another" in a reciprocal relationship, with each specific skill area alternately facilitating and benefitting from the growth of another area. As such, skilled reading involves the simultaneous coordination of orthographic, semantic, syntactic and phonological knowledge and processes, and entails the relatively complete processing of each individual letter of print (Adams, 1990; Siegel, 1993b). Skilled reading has two primary components, word recognition and comprehension, both of which depend on sophisticated syntactic ability, working memory (Berninger & Abbott, 1994; Siegel, 1993b; Stanovich, Siegel & Gottardo, 1997; Vellutino et al., 1994) and fluency (Levy & Hinchley, 1990). It is the interactive combination of these components and subskills which produces the behaviour we call reading.

Rapid, context-free word recognition which Badian (1993) sees as characteristic of skilled reading, is the identification of individual words in the text and can be arrived at via two routes, the grapheme/phoneme conversion route and the whole word identification route. The grapheme phoneme conversion route enables the reader to draw on his/her knowledge of sound symbol relationships to sound out the parts of each new word and then synthesize these separate parts into a recognizable word. This is a much slower process than the whole word

identification route which enables the reader to access his mental store of previously encountered words to instantly identify a word on sight alone (Adams, 1990; Siegel & Ryan, 1988).

Syntactic awareness, or sensitivity to the grammatical structures of the language, enables the reader to use context by sensitizing him/her to the predictability of the text, thus facilitating comprehension. Working memory allows the child to simultaneously decode individual spelling/sound combinations into new words, identify words previously encountered, remember what has just been read, draw on background knowledge, and predict the upcoming text to derive meaning from what is being read. Fluency, which enables the rapid decoding of new words and the almost instantaneous recognition of previously seen words, enhances a reader's working memory, thus allowing him/her to process more text, make more connections and derive meaning more quickly from print.

The Development of Reading

Fluent reading skills develop quickly in the average child over the 7-9 year age range (Siegel, 1993a; Siegel & Ryan, 1988), but the foundations of reading actually begin much earlier in life as the child listens to nursery rhymes, stories and songs and engages in other language-based activities, thus becoming familiar with the rhythm and sound patterns of the language in his/her environment (Vandervelden & Siegel, 1995). These researchers have determined that there is a strong relationship between the acquisition of the sound patterns of the language and early reading ability. This initial oral language development sets the stage for the attainment of reading skills in the early primary years. As the child continues to expand his/her language abilities s/he begins to develop phonological awareness which is the realization that language can be segmented first into words, then into syllables and finally into phonemes. This leads to the

development of phonemic awareness which, according to Torgesen (1997) and Wagner and Torgesen (1987) is one's sensitivity to or explicit awareness of the phonological structures of the words in one's language and involves the ability to notice, think about and manipulate the individual sounds in words. They further assert that phonemic awareness comprises two things: (a) learning that words can be divided into segments of sounds smaller than a syllable (phonemes), and (b) learning about individual phonemes themselves. Put simply, phonemic awareness enables the child to recognize that segments of spoken words can be manipulated, as in nursery rhymes.

These prereading skills continue to evolve throughout the preschool years and into the early primary grades with a corresponding growth in phonological awareness. This phonological awareness leads to the acquisition of the more formal learning of the alphabetic principle which enables the child to recognize that spoken words can be represented by print. This piece of knowledge readily sets the stage for the acquisition of grapheme/phoneme conversion rules; that is the development of sound/symbol relationships which is the basis for decoding skills. This gives the child the ability to crack the code so that s/he can figure out unknown words by enabling him/her to sound out the various parts of that word. Because the English language is complex and does not involve simply a one-to-one correspondence between letters and sounds, the acquisition of rules is a complex process and occurs most efficiently following systematic instruction and repeated encounters with print (Adams, 1990; Chall, 1967, 1983, 1997; Siegel, 1993b). This knowledge, coupled with increases in sight vocabulary and the child's store of background knowledge, results in the activity known as reading (Vandervelden & Siegel, 1995).

Dependence on the various reading strategies changes as the child develops more fluent

reading skills. The beginning reader depends primarily on grapheme/phoneme conversion skills to facilitate the rapid decoding of individual words. As reading ability develops, s/he switches to the use of sight vocabulary as the predominant method of word recognition. However, the skilled reader reverts to the use of phonics, his/her explicit knowledge of grapheme/conversion rules, whenever new words are encountered (Bruck, 1988; Siegel & Ryan, 1988). This two-pronged approach to reading continues into adulthood, with the skilled reader making use of the specific strategy which best suits his/her needs at any particular time (Bruck, 1993b).

Reading Disability

Reading problems range from a mild delay to a severe inability to acquire the cognitive and psychological processes necessary for reading. However, it is only when the acquisition of these processes is significantly interrupted that we use the term reading disability. In its simplest terms, reading disability is a failure to learn to read or to read fluently and is conceptualized as a disorder in word recognition or single word decoding and not a problem of comprehension (Brady & Moats, 1997; Shaywitz & Shaywitz, 1994; Spear-Swerling & Sternberg, 1995). The literature on severe reading problems uses the terms "reading disability" and "dyslexia" interchangeably to denote a condition of severe impairment or complete inability to acquire fluent reading skills (Badian, 1994; Vellutino & Scanlon, 1998). In keeping with this practice, these two terms will be used synonymously in this paper.

Components of Reading Disability

Bruck (1988) suggested that the major definitive feature of dyslexia was the atypical rate of acquisition of specific, reading-related cognitive processes, namely phonological and syntactic awareness and working memory. During the past ten to fifteen years, research has confirmed this

finding and further delineated the various components of reading failure. Countless studies have found that it is primarily a phonological core deficit which lies at the heart of reading disability (Badian, 1994; Bruck, 1993a; Elbro, 1999; Lennox & Siegel, 1993; Pratt & Brady, 1988; Rack & Olson, 1993; Shafrir & Siegel, 1994b; Siegel, 1993a; Siegel & Ryan, 1988, 1989; Stanovich, 1986a, 1988, 1989b, 1993; Wagner & Torgesen, 1987). This deficit in phonological processes is part of a larger inability to handle various aspects of language, both receptive and expressive (Elbro, 1999; Grossen, 1997; Siegel, 1993a; Siegel & Ryan, 1988), and emerges concurrently with specific deficits in syntactic awareness, also referred to as grammatical sensitivity (Elbro, 1999; Siegel, 1993b; Siegel & Ryan, 1988), and to a lesser degree in orthographic processing (Badian, 1994; Bruck, 1993a; Stanovich & Siegel, 1994). More recent research has also implicated rapid serial naming speed in reading disability (Badian, 1997; Bowers & Wolf, 1993; Elbro, 1999; Lovett, 1995; Meyer, Wood, Hart & Felton, 1998; Scarborough, 1998). According to Elbro and Badian, rapid serial naming speed is a cognitive-linguistic skill which gauges speed of access to the sounds of words in the mental lexicon and allows for the rapid retrieval of the spoken referent for a visual stimulus. Tasks to measure this skill usually consist of the presentation of a series of pictures of everyday objects which the child is required to name in the shortest time possible. Semantics, which pertains to the meaning inherent in a language, poses problems for a small group of dyslexics with severely impaired phonological awareness ability and a complete inability to read pseudowords (phonologically correct nonwords). However, it appears that semantic skills remain fairly intact in all other reading disabled children (Siegel, 1993b). These language difficulties, in combination with deficits in working memory (Elbro, 1999; Pratt & Brady, 1988; Siegel & Ryan, 1989; Stanovich, 1986a), constitute the cluster of

symptoms which characterize reading disability.

Phonological processes. Although there is general consensus among researchers that phonological processes are critical to the development of fluent reading ability, alternate views exist regarding the exact nature and timing of the relationship between the development of phonological processes and the acquisition of reading skills. Most researchers, including Badian (1994), Bruck (1993b), Lennox and Siegel (1993b), Pratt and Brady (1988), and Stanovich (1986b), believe that while the development of reading ability fosters the growth of phonological processes, there is a reciprocal and largely causal relationship between phonological processes and the development of reading skills. They further contend that phonological awareness, specifically phonemic awareness, is an essential, but insufficient (Brady & Moats, 1997) prerequisite to the growth of reading skills. This relationship, which fosters the young child's ability to learn spelling/sound relationships, forms the basis of our alphabetic reading system (Bruck, 1993b). It thus appears there is a bidirectional as well as an interactional relationship between the development of phonological processes and learning to read. Pratt and Brady describe this relationship as a circular one. They argue that a degree of phonological awareness must exist before sound/symbol relationships can be acquired. Knowledge of these relationships leads to early reading acquisition which further augments the development of phonological processes.

Bruck (1993b) states that an inability to develop spelling/sound relationships, stemming from inadequate phonological awareness leads to a meager knowledge of grapheme/phoneme relationships, which she describes as the primary deficit in dyslexia. Liberman (1998), Rack and Olson (1993), Shafrir and Siegel (1994b), Siegel (1993a), Torgesen (1997) and Vellutino and

Scanlon (1998) concur with Bruck's assessment of the primary deficit in dyslexia and state that phonological skill deficiencies associated with phonological coding deficits, which result in problems in connecting the spoken and written word forms, underlie reading disability. This, in turn, leads to inadequate word recognition which comprises the core of reading disability. Siegel further asserts that phonemic awareness, or the ability to recognize the basic phonemic segments of the language, is a critical component of phonological processing, and that difficulties with phonemic awareness lead to reading problems. Badian (1994) concurs with this analysis and further states that explicit awareness of the phonemic units in language is a prerequisite to understanding that letters correspond to phonemes. Without this knowledge, the child is unable to acquire the sound/symbol relationships which are the basis of our alphabetic reading system and a necessary precursor of fluent reading. The result is dyslexia.

Language deficits. Phonological processing deficits, which are generally recognized in the literature as the core of reading disability, stem from underlying language deficiencies which usually precede and are often causally related to reading problems (Brady & Moats, 1997; Catts & Kahmi, 1999; Shafrir & Siegel, 1994a; Siegel, 1993a, b). Siegel and Ryan (1989) conceptualize reading disability as the culmination of deficits in a variety of language skills including phonics and syntax. Pratt and Brady (1988) contend that the difficulties of poor readers are specific to the language requirements of various tasks demanded by the reading situation and that these language abilities are unrelated to performance on intelligence tests but positively correlated with a person's skill level in reading. Vellutino et al. (1994) concur with other researchers in determining that adequate facility in word identification is a prerequisite to adequate facility in reading comprehension, and that one's ability to read is dependent on

adequate language comprehension. Other than phonological awareness, the language skill which is most critical to the development of fluent reading is syntactic awareness.

Syntactic awareness. Syntactic awareness is defined as the ability to understand basic grammatical structures of language (Siegel, 1993b). Siegel and Ryan (1989) contend that during reading the brain's executive function retrieves information about syntax, word meanings and/or phonological rules and uses this information to derive meaning from what is being read. Syntactic awareness then, makes its own unique contribution to reading, and, when deficiencies exist in this skill area, to reading disability as well.

Most researchers agree that skills in this area are important to reading acquisition, with deficiencies positively correlated with reading problems. Shafrir and Siegel (1994b) found that children with phonics skills deficits and word recognition problems scored significantly lower than normally achieving children on syntactic as well as phonological processes. Vellutino et al. (1994) and Vellutino and Scanlon (1998) also determined that phonological, syntactic and semantic abilities are crucial determinants of facility in word recognition, but that each carry different weights at different stages of reading development. They explain that phonemic awareness assumes a more significant role in the initial stages of reading than syntactic awareness; however, the relative contribution of each is reversed in later reading acquisition. Thus, it appears that although the contribution of syntactic skill deficiencies to reading disability up to the end of the elementary school years is significant, such deficiencies appear to play a much greater role in more advanced readers. It also appears that while syntactic awareness problems are easily remediated in many beginning readers, leading to the question of whether such deficiencies are causal or correlational, resulting from long standing problems in reading.

they continue to pose significant problems for those who cannot be readily remediated with early intervention measures (Vellutino & Scanlon, 1998). It is also not known at this time whether such problems persist into adulthood and contribute to reading disability beyond the intermediate school years (Siegel, 1993b).

Orthographic processes. Orthographic processing appears to make its own particular contribution to efficient word recognition (Siegel, 1993b; Vellutino et al., 1994) and subsequently, to fluent reading. According to the latter researchers, orthographic coding remains an ill-defined construct which is difficult to operationalize and thus measure. Nevertheless Siegel defines this linguistic skill as "the understanding of the written conventions of the language and the correct and incorrect spellings of words." (p. 46)

Regardless of the difficulty in defining this concept, it is generally recognized among researchers that orthographic processing difficulties are evident in most reading disabled children. Stanovich (1988) found indications of extreme difficulty in acquiring a sight word vocabulary on a visual/orthographic basis among a number of dyslexic children. More recent research conducted by Badian (1994, 1997) found that all dyslexic/discrepant poor readers (defined as children with an IQ which is equal to or greater than 80 and a word reading standard score which is greater than 15 standard score points below the expected reading level), regardless of verbal IQ level (low average to superior), consistently displayed a severe weakness on simple orthographic processing tasks. Badian also advocates placing much greater emphasis on the role of orthographic processes in reading disability. This is evidenced by her inclination to take Bowers' and Wolf's (1993) double deficit hypothesis (which proposed phonological and naming speed deficits as central to dyslexia) one step further by adding an orthographic processing deficit

to the core combination of deficits already outlined by these researchers.

Badian (1994, 1997) also determined that the degree of weakness in orthography among reading disabled children was not found in those labeled garden variety poor readers by Gough and Tunmer (1986) and described as children who are generally developmentally delayed in many areas including reading and other cognitive skills and functioning in the below average range of ability. Badian also identified a subgroup of reading disabled children who display deficiencies in orthographic processing only. This contrasts sharply with most reading disabled children whose primary deficit is in the area of phonological processing with deficiencies in other skill areas, including orthographic processing.

Furthermore, Rack and Olson (1993) contend that orthographic processing abilities are not heritable and appear to be more related to environmental factors than genetics. Shafrir and Siegel (1994a) agree with this position and state that print exposure may be a critical factor in developing sensitivity to orthographic cues, perhaps explaining why garden variety poor readers do not evidence the same problems in this area as those with a reading disability. Siegel (1993b) further confirms the contribution of environmental factors to orthography in a recent study which compared the use of orthographic cues in dyslexic poor readers to that of younger children who are reading at the same level. When compared with this group, dyslexic children show superior ability in their use of orthographic cues. This suggests that the increased level of ability relative to younger children reading at the same level is due primarily to the amount of print exposure dyslexic children have had in comparison to these younger children. This superiority in orthographic processing does not exist, however, when dyslexic readers are compared with their chronological age mates. This finding, which strongly suggests that this cognitive ability is

susceptible to environmental factors. has implications for remediation with reading disabled children.

Semantic processes. Unlike phonological and syntactic processing abilities. semantic processes appear to remain relatively intact in most reading disabled children. Siegel (1993b) makes this determination as the result of analyses of errors made by dyslexic children on two types of tasks: (a) reading of words in isolation and (b) reading of complex sentences with semantic errors. When reading words in isolation. Siegel found that most dyslexics substituted phonetically similar words. as did normally achieving children. but with a lesser degree of accuracy than the latter group. On the second task. dyslexic children performed as well as normally achieving children. This contrasts sharply with tasks where correction of syntax is required and strongly suggests that the difficulties experienced by dyslexics in processing syntactic information does not extend into the area of semantic processing.

While semantic processing appears to be intact in most reading disabled children. Siegel (1993b) determined that a small group of dyslexic children does make semantic errors when reading words out of context. Such children substitute words which are similar in meaning but not phonology to the target word when reading words in isolation. They were characterized as being extremely deficient in phonological processing skills and unable to read even one pseudoword. This is in contrast to many dyslexic as well as normally achieving children who are more likely to substitute phonetically similar words for unidentifiable ones. It appears that only dyslexic children make such errors. and further that only a small proportion of all dyslexics make errors such as these. This indicates that the grapheme/phoneme conversion rules are not utilized and likely that phonological processing abilities are virtually nonexistent (Stanovich & Siegel.

1994).

Memory processes: working and short term. While there is little disagreement among researchers regarding the primary role of phonological processing deficiencies in reading disability, they acknowledge that other deficiencies exist which hamper the development of fluent reading in children with dyslexia. Specifically, deficiencies in memory processes, both short-term and working memory, further complicate the process of reading acquisition for dyslexic children. Siegel and Ryan (1989) defined working memory as the momentary storage of information while other cognitive tasks are being carried out. It involves the holding in short-term memory of several pieces of information while simultaneously retrieving additional information from long-term memory, with the pieces in temporary storage extremely subject to decay. Reading is a highly cognitive function which requires an individual to retrieve grapheme phoneme information and orthographic representations, and simultaneously combine this with his/her background knowledge while remaining cognizant of the context of what is being read. It is thus not difficult to see the impact that faulty memory can have on the development of fluent reading skills.

When investigating the memory process of reading disabled children, Siegel and Ryan (1989) found that children with a reading disability demonstrated a generalized deficit in working memory. This was evident not only in language but also in counting. These researchers also found that reading disabled children, when compared to normally achieving children as well as children with an arithmetic disability or attention deficit disorder, showed deficits or slower performance on short-term memory tasks as well. Pratt and Brady (1988) determined that these deficits in memory processes hamper the ability of the reading disabled child to manipulate

phonemes likely because such tasks place a burden on the verbal short-term memory processes. another recognized area of impairment for reading disabled children. This faulty memory-phonology interaction further hampers the acquisition of fluent reading skills in reading disabled children. More recent research conducted by Zeffiro and Eden (2000) bears out the role of memory processes in dyslexia. including problems with verbal and short-term memory (Brady & Moats. 1997: Liberman. 1998: Scarborough. 1998).

Rapid serial naming speed. Recent research has implicated an additional factor. rapid serial naming speed. in reading disability (Bowers & Wolf. 1993: Liberman. Shankweiler & Liberman. 1989: O'Connor & Jenkins. 1997). Bowers and Wolf found that the reading ability of children with a rapid serial naming speed deficit was more compromised than that of children without this deficit. Badian's 1997 research into this area has borne out the presence of a naming speed deficit among the poorest readers. More recently Scarborough (1998). in his longitudinal study of second-and eighth-grade children with reading disabilities. determined that several deficits in phonemic awareness. verbal memory and rapid serial naming speed as well as IQ were stable over the six year span. This research also determined that a child at grade two who evidenced deficits in rapid serial naming speed would later be identified as reading disabled. Meyer et al. (1998) arrived at similar findings in their study of two different longitudinal samples. each evaluated at grades three. five. and eight. They found that for the poor readers. rapid serial naming speed was highly correlated with future word identification. They also found that for these poor readers phonemic awareness and IQ were not effective predictors. A study by Lovett (1995) of children ages seven to thirteen years diagnosed as having severe reading disability. examined how children with rapid serial naming speed deficits. as opposed to children

with phonological awareness deficits or children with both deficits, responded to remedial efforts. She determined that both groups of children with rapid serial naming speed deficits responded similarly and more poorly than the group with the phonological awareness deficits. These findings were similar to those of Korhonen (1991) who concluded from his study of third grade students with deficits in rapid serial naming speed that this group, when compared to other children with reading difficulties, had made the least progress by grade six.

Despite the converging evidence supporting the use of rapid serial naming speed deficits in identifying those who will continue to experiences reading difficulties, several questions remain as highlighted by the 1997 study of Torgesen, Wagner, Rashotte, Burgess and Hecht which provided evidence to the contrary. These researchers conducted predictive analyses from second to fourth grade and from third to fifth grade in a sample of 43 poor readers which formed the bottom 20 percent of a group of 215 children who were followed from kindergarten to grade five. These analyses found that, with IQ controlled, rapid serial naming speed predicted reading ability, but that phonemic awareness was a much stronger predictor. Torgesen et al. speculated that this may be due to the fact that the temporal stability of reading scores over the two-year period was much higher than that of other samples of poor readers in that none of this group showed much improvement relative to norms, and might explain why rapid serial naming speed had little impact on the outcome. However, all these findings suggest that children who demonstrate rapid serial naming speed deficits show the least improvement over time, and this information, alone, may prove useful in helping to identify those children who require greater assistance than others with reading disabilities who do not have this deficit.

Bowers and Wolf (1993) concur with this analysis in their proposal of the double deficit

hypothesis in which they state that children with both phonological and rapid serial naming speed deficits will be poorer readers than children with only one of these deficits. At the present time, the exact nature of the relationship between rapid serial naming speed and reading ability is unclear. It is also unclear what types of intervention may be effective in remediating this difficulty and improving reading skills in these children. The findings cited above address one of the problems identified by Keough (1994) regarding a lack of sufficient longitudinal validation of reading disability predictors and screening devices in ascertaining who will develop significant reading delays. This knowledge would have value in the long term in identifying those who will continue to exhibit deficits in reading ability and will not go on to acquire fluent reading skills. As well, continued research into this area will undoubtably have important implications for early identification and remediation of children with such deficits (Butler, 1999).

Dyslexia - A Life Long Disability

There is evidence to suggest that the phonological deficits and word recognition problems of dyslexic children are never totally overcome. In her work with reading disabled adults, Bruck (1990, 1992, 1993a) found that despite relatively high levels of reading comprehension, the word recognition and phonological processing deficits of reading disabled children last throughout the lifespan. She determined that the dyslexic's over reliance on inadequate sound/symbol correspondence rules and poor phonological skills inhibits the development of reliable orthographic representations of words. Thus, word recognition does not become automated, and while the adult dyslexic does read, s/he does so much more slowly and with much greater difficulty than normal readers. Liberman, Rubin, Duques and Carlisle (1985), as well as Read and Ruyter (1985) drew the same conclusion as Bruck and suggest that phonological awareness

ability continues to exert a strong influence on the reading skills of adults as well as children. Deficits in these processes lead to the persistence of sound/symbol correspondence problems as well as phonemic segmentation problems which persist into adulthood. As a result, these adults never acquire the automatic decoding and word recognition which distinguishes fluent readers from those with dyslexia (Elbro, 1999). Reading, for them, is always a much slower and more laborious process than for normal readers. However, current longitudinal studies employing early identification and intervention may, in the future, prove this to be true no longer.

Acquisition of Reading Processes: Dyslexics Versus Normally Achieving Children

Children who learn to read without encountering difficulties build on phonological processes and, subsequently, phonemic awareness to facilitate learning of the alphabetic principle which leads to decoding and a rapidly expanding sight word vocabulary. This process, which enables most children to become fluent readers by the end of their primary school years, allows normal readers to access words primarily on a visual basis after four years of formal reading instruction (Adams, 1990). However, this process is interrupted in the reading disabled child. She does not quickly acquire phonological awareness in the early years and consequently does not develop facility with phonemic awareness which leads, in skilled readers, to the development and application of the alphabetic principle, the basis of our language system. Whereas normal reading is characterized by increases in grapheme/phoneme decoding as well as sight vocabulary, with reversion to the use of decoding when unknown words are encountered, reading ability in reading disabled children is characterized primarily by increases in sight vocabulary with very modest gains in grapheme/phoneme rules (Adams, 1990). This is not to imply that reading disabled children do not acquire phonological processes and the alphabetic principle. They do,

but at a much slower rate and to a lesser degree than other children (Bruck, 1993a). This delayed acquisition of phonological processes impedes the development of rapid decoding and efficient word recognition skills and subsequently, fluent reading in dyslexic children.

The reading profiles that distinguish dyslexic readers in childhood also characterize this population into adulthood. Current evidence strongly suggests that the word recognition deficits of dyslexic children persist into adulthood with slow word recognition skills characteristic of young adults with a childhood diagnosis of dyslexia. Even though adult dyslexics recognize a range of words which is roughly equivalent to that of an average grade six student, they do not use age-appropriate word recognition processes. They continue to rely heavily on inadequate spelling sound information, and supplement this with syllable and context information for word recognition (Bruck, 1990). In this regard, their pattern of performance is similar to that of beginning skilled readers and suggests that arrest, rather than delay or deviance, characterizes the word recognition skills of adult dyslexics.

Conceptualization of a Reading Disability

At this point in the evolution of research on reading in general and reading disability in particular, there is clear evidence to suggest that reading ability is part of a graded continuum of skills which extends at the lower range from those who have few or no functional reading skills to the upper range where the skills of fluent readers are found (Elbro, 1999; Shaywitz & Shaywitz, 1994; Siegel, 1989; Stanovich, 1988). Within these extremes lie many variations in reading ability and disability including those referred to as reading disabled. It follows, then, that reading disability also is not a discrete entity or distinctive syndrome (Spear-Swerling & Sternberg, 1995). As Brady and Moats (1997) and Elbro note, there is no clear cut point on this

continuum of reading skills which explicitly delineates where efficient reading ends and reading disability begins. As such, the cutoff point is arbitrary and not defined by nature but by educational policies and operational definitions based upon specific criteria deemed critical to this concept. It is a universally accepted principle that dyslexia constitutes the lower end of this graded continuum of reading skills and is characterized primarily by phonological processing deficits which significantly impede the work of the word recognition module (Stanovich & Siegel, 1994). These researchers further suggest that the core of dyslexia lies at the word recognition level with the locus of flaw in the word recognition module. Vellutino and Scanlon (1998) concur with this assessment and state that reading disability is primarily a word recognition deficit which arises from lack of phonological and phoneme awareness.

Lovett (1984) distinguished between two groups on this continuum in the reading disabled range: rate disabled and accuracy disabled readers. The accuracy disabled students were those who were unable to accurately identify a word either through use of sight vocabulary or phonic strategies, while the rate disabled students could identify most words but did so much more slowly and with significantly more difficulty than their age-matched peers. She speculated that the rate disabled group is merely the accuracy disabled at a further point on the continuum or perhaps at a later period in their development. MacDonald (1993) agrees with this analysis and states that rate disabled readers are formerly accuracy disabled readers who have acquired phonological awareness skills that have not yet become automatized.

Bruck (1990) maintains that the term arrest, rather than deviance or delay, best characterizes the word recognition skills of dyslexic children. This is in sharp contrast to the garden variety poor reader whose skills are better encompassed within the Developmental Lag

Theory (Gough & Tunmer, 1986). This theory postulates that garden variety poor readers will acquire reading processes but will do so at a much slower rate than fluent readers.

Reading Disability or Garden Variety Poor Reader

There has been significant controversy for a long period of time in the literature concerning whether a person with a reading disability is distinct from a person with a developmental lag in reading, referred to by Gough and Tunmer (1986) as the garden variety poor reader. For a number of years researchers were unable to find substantial differences between these groups, and determined that all these children with reading problems were largely homogeneous. Specifically, Siegel (1989a, 1992) concluded that the dyslexic poor reader and the garden variety poor reader did not differ in their cognitive performance, while Bruck (1988) advanced the theory that dyslexic and other children with reading difficulties did not use qualitatively different processes to read and spell than did other children.

Today we recognize that these two groups of children with reading problems are identifiable according to the unique characteristics exhibited by children with each type of reading abnormality (Badian, 1994; Stanovich, 1993; Stanovich & Siegel, 1994; Tal & Siegel, 1996). Their major similarity lies in the phonological processing deficits which hinder rapid, automatic word recognition and pseudoword reading. This conclusion is verified by Tal and Siegel as these researchers found no differences between garden variety poor readers and dyslexics in their analysis of the phonological processing and multisyllabic word recognition skills of these two groups. Stanovich and Siegel found, however, that while garden variety poor readers have phonological processing problems in relation to proficient readers, they have fewer deficits in this area than reading disabled students.

The parallel stops there. Researchers have identified critical differences between these two groups of poor readers and acknowledge that the garden variety poor reader, in contrast to the reading disabled student, has deficits in a wider range of processes including reading comprehension. Whereas the reading disabled student has deficits primarily in phonological processing which leads to subsequent deficits in word recognition, the garden variety poor reader has deficits in the phonological processes as well as in other areas involved in the comprehension of language, both written and spoken. Although the deficits of garden variety poor readers are more pervasive than those of reading disabled children, Badian (1994) has identified another critical difference between the two groups which works to the advantage of the former group. The distinction lies in their mastery of orthographic processes. Specifically, Badian determined that garden variety poor readers do not display the same degree of weakness in orthographic processes as reading disabled students. Shafrir and Siegel (1994a) agree with this position and state that the greater amount of print exposure which makes the orthographic processes of reading disabled students superior to those of younger children who are functioning at the same reading level, does not bring it on par with these processes in other poor readers.

As further evidence of the distinctiveness of these two groups of children with reading delays, Francis, Shaywitz, Stuebing and Shaywitz (1996) analyzed individual growth curves to determine whether the development of children with reading disabilities is similar to that of garden variety poor readers. In essence, they sought to determine whether children with a reading disability were best characterized by a developmental lag or deficit. Their research, which used nine yearly longitudinal assessments of a sample of 403 children classified as reading disabled, with and without a discrepancy from IQ, as well as a normally achieving group, found that the

developmental course of reading skills in children with reading disability is best characterized by deficits. They were not merely lagging behind as were the garden variety poor readers.

In addition to defining critical differences between the two groups of children with reading difficulties, research has also taught us that, over time, reading disabled students become garden variety poor readers as they fail to learn to read fluently and to use this skill to acquire the knowledge which would enable them to achieve higher IQ scores (Siegel, 1989a, 1992). This occurs largely as a result of the aptitude/achievement discrepancy definitions employed to identify those students who are reading disabled. Because they fail to acquire age-appropriate reading skills, the IQ scores of reading disabled children decrease as they fall behind their age mates in the verbal fluency which characterizes many tasks on IQ tests, thus lowering their IQ and, in effect, creating garden variety poor readers from these earlier reading disabled students.

Summary

Reading is a process which usually develops during the primary school years, with prereading strategies and skills beginning to develop much earlier in a child's life as s/he internalizes the language spoken around him/her. This enables the preschool child to extract the information which will facilitate his/her becoming a reader at the age of seven to nine years. However, in a significant number of children, fluent reading skills are never acquired. These children often exhibit difficulties with spoken language and do not seem to readily develop phonological awareness as do most other young children. Subsequently, they do not acquire phonemic awareness nor discover the alphabetic principle, which explicitly and/or implicitly leads to knowledge of and facility with the grapheme/phoneme conversion rules and the resulting decoding skills which underpin fluent reading ability. These children are reading disabled.

Reading processes are also interrupted in other slow readers. However, these readers exhibit deficits in a much wider variety of cognitive processes than those who are deemed to be reading disabled. Their specific cluster of symptoms, while similar in some respects, is sufficiently distinctive to make them distinguishable from those children identified as reading disabled.

Section II

Definition and Identification of Reading Disability

If we are to appropriately serve the population of reading disabled students, we must first define specifically what a reading disability is, and then determine how to identify students with these characteristics. A review of the literature suggests this is no easy task as multiple definitions have been proposed, most of which have a number of problems associated with them. In 1988, Stanovich summed up the state of affairs at that time in regard to defining reading disabilities when he stated that the field was in disarray because definitional issues were not resolved. In the decade or so since Stanovich's summation, little has changed as issues relating to the definition and identification of specific reading disability remain largely unresolved.

This paper will examine the field of learning disabilities and place specific reading disability within this context. It will briefly discuss the history of reading disabilities with its reliance on intelligence test scores as a major delineating feature, and examine how this use of IQ scores in defining learning disabilities came to be an integral part of defining reading disability. It will proceed to examine discrepancy definitions of reading disability and then take a closer look at the accepted practice of using IQ scores in identifying specific reading disability. Following this examination, the paper will discuss various operational definitions of reading disability and propose several alternate definitions which more accurately reflect the contemporary literature than currently used definitions. Having clarified definitional issues, this paper will review relevant issues in the identification of specific reading disability and then conclude with a discussion of prevalence rates and measurement of this disability.

Dyslexia - A Specific Learning Disability

According to Lyon (1996) and Lyon and Moats (1988), the learning disability label applies to a remarkably heterogeneous group of individuals, approximately five percent of the population, whose primary defining characteristic is unaccountable underachievement. Learning disability is not a single disorder. Rather, this underachievement can occur in any number of areas associated with reading, language, arithmetic or memory and can co-occur with one another or with social skill deficits, as well as emotional or behavioural disorders. The definition of a learning disability also has exclusionary criteria in that the primary presenting problem cannot be the result of mental retardation, emotional disturbance or cultural deprivation. The majority of children with a learning disability have basic reading skill deficits as their primary area of deficiency.

This definition, which focuses on an achievement/potential discrepancy, appears to serve the learning disabled population well as a whole. It therefore evolved that since a reading disability is classified as a specific learning disability, the defining features of a learning disability have been transferred holistically to the reading disabilities body of information without regard for its suitability in this domain. Research has demonstrated, however, that this usage is somewhat limited and misleading. Indeed, the practice of using IQ scores in the reading disabilities definition, and hence identification, actually hampers this field in that it does not permit a number of reading disabled children to be so identified and thus served in a way most conducive to meeting their needs. This conclusion emerges from research over the past decade or so, which indicates that reading disability is primarily the result of phonological and other language deficits and is independent of an achievement/potential discrepancy (Lyon, 1994). This

finding is in stark contrast to other subgroups of the general learning disabled population who appear to be well defined by an achievement capacity discrepancy (Gnys, Willis & Faust, 1995; Lyon, 1996, 1998; Siegel, 1988a, b, 1993a, b; Stanovich 1988, 1989a, d).

A Brief History of Reading Disability

Reading disability as a specific learning disability has a long history characterized by periodic shifts in perspective. The earliest investigations into dyslexia emerged from the medical literature during the last part of the nineteenth century and studied individuals who had failed to learn to read, a condition then referred to as congenital word blindness. These early researchers, working from a medical model, assumed neurological dysfunction, including developmental abnormalities, was the basis of reading disability. Around the turn of the century, Hinshelwood (1917) initiated studies to examine the role of the brain in reading failure or dyslexia (Lipson & Wixson, 1986). A quarter of a century later, Orton (1925) expounded on a theory of hemispheric imbalance to account for dyslexia. He noted that students with dyslexia made an inordinate number of letter and word reversals and speculated that some form of visual information processing problem existed. This theory, which gave prominence to such tenets as letter and word reversals, perceptual deficits and eye movements as causal factors in dyslexia (Catts, 1989; Green, 1996; Stanovich, 1986a, 1988) and influenced research and remediation up to the 1970s, has now been conclusively repudiated by neuroscientists (MacDonald, 1993; Vellutino & Scanlon, 1998). Despite this repudiation, the notion of reversals as central to reading disability continues today as many people, including educators of young children with reading problems, continue to identify reversals, even in the mid-to-late primary years, as symptomatic of dyslexia.

The next major shift in perspective on reading disability occurred with the advent of

instruments to measure educational achievement. A number of reading tests including the first norm-referenced, group test of reading ability developed by Thorndike in 1914, the 1916 Kansas Silent Reading Test, and a test of oral reading developed by Gray in 1915 (as cited in Lipson & Wixson, 1986), led directly to a diagnostic movement which emphasized remediation of deficits rather than discovery of neurological impairments (Pelosi, 1977). This movement took dyslexia out of its medical context and placed it within an educational one where it remains to this day (Lipson & Wixson, 1986). This shift in attention to educational achievement and practices led to a movement to attribute reading problems to deficits in pedagogical practices. The focus on educational factors thus presumed that reading problems reside outside the reader and that improved educational practices would remediate most existing cases of dyslexia and prevent others from occurring. This school of thought was short-lived, however, and has not been regarded as a major model of reading disability.

Around the mid-1920s the perspective shifted again from neurological and pedagogical factors to focus on specific nonmedical factors within the reader. This view did not assume that neurological dysfunction, or organic problems within the brain itself, was the source of the problem but did concede that neurology may play a role in some aspects of dyslexia. This view presumed that factors within the reader were the cause of reading disability. The search for intrinsic factors led, over the period from 1941 to 1984, to a series of studies by W. S. Gray and his colleagues (as cited in Guthrie, 1984) which concluded that reading difficulties could not be attributed to any one factor but could be directly linked to a combination of factors within the reader. These investigations proved to be a crucial turning point in the search for the origins of reading disability which redirected attention from medical and "outside the reader" factors to

those which reside within the reader.

Within the reader models of reading disability have been prominent since the 1920s and continue today as we recognize that while neurological dysfunction plays a role in some cases of dyslexia, specific deficits within the individual are more apt to cause this reading delay. In this regard a number of researchers have recently focused on the language processes of reading disabled children in their attempts to understand the precise nature of reading disability (Catts, 1989; Kahmi, Catts, Mauer, Apel & Gentry, 1988; Murphy, Pollastek & Wells, 1988; Shaywitz & Shaywitz, 1994; Siegel, 1988c; Stanovich, 1986a). This research has determined that language deficits, and more specifically, phonological, (Badian, 1994; Bruck, 1993b; Lennox & Siegel, 1993b; Pratt & Brady, 1988; Rack & Olson, 1993; Shafrir & Siegel, 1994b; Siegel, 1993a, b; Siegel & Ryan, 1988, 1989; Stanovich, 1988, 1989b, d, 1993; Wagner & Torgesen, 1987), syntactic and grammatical processing deficits (Siegel, 1993a, b; Siegel & Ryan, 1988), occurring concurrently with deficiencies in orthographic processing (Badian, 1994; Bruck, 1993a; Stanovich & Siegel, 1994), coupled with memory deficits (Pratt & Brady, 1988; Siegel & Ryan, 1989; Stanovich, 1986a) as well as deficiencies in rapid serial naming speed (Bowers & Wolf, 1993; O'Connor & Jenkins, 1997; Liberman et al., 1989), underlie most cases of dyslexia. This research has also pointed out the redundancy of tying reading disability to IQ scores, as average ability is not a necessary prerequisite of reading disability when this condition is viewed in terms of its symptom cluster of language and associated deficits. However, reading disability, itself, often results in a lowered IQ, as the reading disabled person is unable to fluently use the processes which will enable his/her IQ scores to increase commensurate with his/her age, thus resulting in a lower measured IQ using current standardized instruments (Siegel, 1989a, b). A

similar conclusion was drawn by Adams (1990) in her statement that IQ is not related to the development of early reading skills, but that inability to read later is related to a lowered IQ and, in essence, turns a reading disabled person into a garden variety poor reader.

Discrepancy Definitions of Reading Disability

Since the beginning of research into reading disability, various definitions have been proposed. Most prevalent in the literature has been the traditional discrepancy definitions which posit a variance between a person's potential and his/her actual achievement. The discrepancy most often cited is between intellectual functioning and reading achievement (Berninger & Abbott, 1994; Murphy et al., 1988). This discrepancy is usually operationally defined as: (a) a Full Scale score which is equal to or greater than 80 on an instrument such as the Wechsler Intelligence Scale for Children - Revised (WISC-R) or, more recently, the Wechsler Intelligence Scale for Children - Third Edition (WISC-III) and (b) significantly below average performance on reading tests, frequently defined operationally as achievement which is equal to or less than the 25th percentile on the Word Recognition or Word Attack subtests of a standardized reading measure. The following definition, proposed by Murphy et al. is typical:

> children who are of at least average intelligence, who have normal sensory abilities, who are not primarily emotionally handicapped, who have had normal opportunities to learn to read, but who are deficient in reading, achieving on standardized tests at least two years below expected level according to their chronological and grade placement. (p. 2)

This practice of defining a reading disability on the basis of an IQ-achievement discrepancy derived from static measures served the field well in its early development because it acknowledged that a child who struggled with reading skills acquisition was not necessarily a

slow learner - that factors other than below average mental ability could negatively affect a child's ability to learn to read (Berninger, Hart, Abbott & Karovsky, 1992). Currently, many definitions designed to identify those eligible for services under the reading disabilities classification, continue to use this questionable criteria.

Stanovich (1991) suggests that a discrepancy between a child's actual reading and listening comprehension is a more educationally relevant definition of reading disability than those which focus on a person's measured intellectual ability in defining dyslexia. This discrepancy highlights the difference between the level at which a person can understand orally presented material and the level at which s/he can comprehend what is read. Stanovich contends that the level of listening ability is the child's inherent language level, and that a reading level which is significantly lower than this represents a level of attainment in a specific language skill which is not congruous with the child's overall level of language development and thus constitutes a specific reading disability.

Research has also claimed that reading disability can be determined by the presence of various defining features. Gnys et al. (1995) refer to suggestions in the literature which seem to indicate that a person's performance on the WISC-R has been one of the factors used to determine whether or not an individual is reading disabled. The suggestion is that a significant discrepancy between the Verbal and Performance scales, or significant scatter among the various subtests which comprise these instruments, can be used as a distinguishing characteristic of reading disability. Gnys et al. and Siegel (1989a) dispute this claim with the determination that a child with below average IQ scores and a learning disabled child can have similar performance patterns on the WISC-R. As a result, such patterns of performance cannot be reliably used to

differentiate children with and without reading disabilities. Siegel is not clear at this time whether these patterns hold true for the WISC-III as this is the most recent revision of the Wechsler Scales and more research will have to be carried out to determine if patterns discovered on the WISC-R. also hold true for the WISC-III. Other defining features of dyslexia. including the ability of measures of nonword repetition tasks to distinguish between reading disabled and nondisabled children independent of IQ (Taylor. Lean & Schwartz. 1989). and problems in both automatic visual recognition and phonological recoding of graphic stimuli (Badian. 1994). suggest that discrepancies other than deviation from IQ warrant investigation if we want to arrive at a definition which accurately describes and identifies the reading disabled child. Ongoing research supports this position and acknowledges that reading is a modular skill which is independent of a person's IQ score (Shafrir & Siegel. 1994b: Stanovich. 1988). Essentially. phonological and other language deficits in combination with memory deficits can and do occur in people with a range of IQ scores. It has further been determined that people with a reading disability display similar patterns of functioning. regardless of the IQ level (Siegel. 1993a). It is thus time to move beyond the simplistic IQ-achievement criteria which was used in the infancy of reading disability to more objective and clearly identifiable criteria for reading disability.

Identification of those who are reading disabled follows directly from definitional practices. Using IQ/achievement discrepancy criteria. a reading disabled person is someone who has an unaccountable discrepancy often quantified as average or above average intelligence and reading ability which is significantly below that of his/her age mates with similar intellectual ability. This significant underachievement is often defined as a delay of two or more years in reading ability. For a person to be identified as reading disabled. an emotional or behavioural

disturbance as well as a cultural, environmental or sensory disadvantage must be excluded as the primary area of difficulty. The requirement of average or above average intelligence effectively eliminates individuals who are considered to be slow learners as well as those with mental retardation who display significantly delayed reading abilities characterized by phonological and other language processing deficits in combination with memory deficits - the same characteristics as those labeled reading disabled, but without the average or above average IQ score as determined by standardized intelligence tests.

Origin of IQ Scores in Identifying Reading Disability

An IQ score has been a major part of the process to identify a reading disability as far back as the early 1930s. Using IQ scores in classifying people as reading disabled emerged from the learning disabilities literature with its all-encompassing definition of a learning disabled person as someone with at least adequate intelligence combined with an unaccountable deficit in one or more of the basic psychological processes, one of which is reading (Gnys et al., 1995; Lyon, 1996, 1998). Recent research, however, has determined that an IQ score is no longer relevant to the definition of a reading disability (Joshi, Williams & Wood, 1998; Kirby, Booth & Das, 1996; Lyon, 1998; Siegel, 1988b, c, 1993; Spear-Swerling & Sternberg, 1995; Stanovich, 1986a, 1988; Vellutino & Scanlon, 1998).

This definition has been holistically extended to the reading disabilities field without regard for its suitability in this domain. Research strongly suggests that while this definition may serve the learning disabilities field well, it is not applicable in the area of reading disability

(Siegel. 1988b. 1993: Stanovich. 1988. 1989c. d). as students in this group are thought to be distinct and separable from children with other learning disabilities. They are not. however. as the definition suggests. distinct and separable on the basis of an IQ score from other children experiencing similar reading problems. Indeed the use of an IQ score may be counterproductive in this field in that it may under identify or misidentify many students. in each case failing to provide them with the program which is most conducive to their specific needs.

Validity of IQ Scores in Reading Disability

The relationship between a person's performance on an intelligence test and specific deficiencies in various areas of learning. including reading. is a longstanding issue which affects not only research and identification but also treatment of students with learning disabilities. Despite the many questions regarding the use of such tests for determining who will be designated as learning disabled. these instruments have become firmly entrenched in the classification and remediation of such students (Kaufman. 1979: Sattler 1988). However. the widespread use of the resulting IQ scores for these purposes has led to objections by a number of researchers. particularly in determining who is reading disabled (Aaron. 1997: Kirby et al.. 1996: Lyon. 1998: Siegel. 1988c. 1993: Spear-Swerling & Sternberg. 1995: Stanovich. 1988. 1989a. d. 1994: Stanovich. Siegel & Gottardo. 1997: Vellutino & Scanlon. 1998). These objections arise from several sources and reflect various misconceptions regarding the nature of intelligence tests themselves as well as the processes they purport to measure. The IQ scores which are derived from such measures are also suspect. as is their applicability to the area of reading disability.

particularly when used as a measuring rod for this domain.

Siegel (1988c, 1993b) and Stanovich and Siegel (1994) insist that there is a dearth of evidence for the use of aptitude/achievement discrepancy criteria in determining who is dyslexic. They contend that IQ scores do not predict differences in the reading-related cognitive abilities of reading disabled children. This contention is further supported by their research of 1989 and 1993 in which they determined that deficits in the cognitive processes of reading disabled children interfere with their overall performance on IQ tests, resulting in lower IQ scores. These researchers have determined that poor readers at all intellectual levels demonstrate problems with reading, spelling, phonological processing, short-term memory and syntax. It follows logically, that a child who has phonological or other processing deficits or memory problems will respond more slowly and usually more inaccurately to items on the various subtests of intelligence tests, and thus will be more handicapped than the child with all cognitive processes intact. This is especially true for timed tasks and will result in a lower demonstrated IQ score in comparison to a child without such cognitive processing deficits. Continuing with this line of reasoning, which strongly suggests the relative independence of intelligence and reading disability, Vellutino et al. (1996) argue we must inevitably question the utility and widespread use of IQ/achievement discrepancies to identify who is reading disabled. They refer to the work of Siegel (1988c), Fletcher et al. (1994) and Stanovich and Siegel (1994) in their contention that the strong linear relationship between reading ability and intelligence presumed by IQ/achievement discrepancy definitions of reading disability correlating average IQ with average reading ability, low IQ with

low reading ability and high IQ with superior reading ability, does not exist.

Siegel (1988c) further contends that existing intelligence tests have large components of expressive language and memory, both of which are deficient in the reading disabled child. This leads to an underestimate of ability levels when existing tests are used. It could thus be argued that it is not intrinsic, cognitive ability which is being measured, but the language processes in which reading disabled children are recognized to be deficient. Brady and Moats (1997) agree that the measurement of IQ is not relevant to identifying a reading disability. They insist that reading disability occurs at all levels of intelligence - high, average and low, and that performance on some measures included on intelligence batteries (e.g. vocabulary, general knowledge, similarities, comprehension) are likely affected by a child's language deficits and the resulting lack of exposure to material learned through reading that are concomitant with reading disability. They further assert that all people with reading problems have difficulties with the phonological demands of reading (e.g. phoneme awareness, decoding and spelling), and that people with lower intelligence often have additional problems with reading and language comprehension. This core of phonologically based reading problems raises serious doubts about the feasibility of using IQ/achievement discrepancy formulas to identify reading disability.

Siegel (1989b, 1992) perceives problems with intelligence tests themselves and contends that much of what is measured by intelligence tests is actually knowledge acquired through reading. She explains that since IQ and reading achievement are not independent of one another, and since reading is very problematic for a child with a reading disability, s/he is unlikely to

acquire much of the knowledge measured by IQ tests. As a result, the lower IQ scores demonstrated by reading disabled students may not accurately reflect their intrinsic intellectual ability and will cause these students to be considered less intelligent than their age mates who likely have the same intrinsic ability levels but are reading normally. Taylor, Fletcher and Satz (1982) agree with this position and state that the IQ score is a summary of several aspects of cognitive functioning, a number of which correlate with reading ability. They further contend that the IQ score reflects the severity of the child's reading problem. Consequently it becomes a vicious cycle where reduced acquisition of knowledge results from reading problems which, in turn, leads to lowered scores on intelligence tests. These below average scores make the child appear to be a slow learner or a person with a cognitive delay which subsequently makes him/her ineligible for the reading disabilities label. This effectively denies a reading disabled student the service that would improve his/her reading skills and prevents the acquisition, through reading, of knowledge and information which will result in the higher scores on intelligence tests the student requires to be classified as reading disabled. S/he is, instead, inaccurately categorized as a garden variety poor reader, rather than the reading disabled person s/he actually is.

The use of aptitude/ achievement discrepancy definitions identifies only a portion of those who are truly reading disabled - those with average or above average IQ scores who display at least a two year delay on measures of reading. Berninger and Abbott (1994) argue that such definitions will misidentify those students with above average or superior intelligence who are reading at grade level but not to the potential predicted by their IQ scores. Despite their

aptitude/achievement discrepancy, most agencies would have difficulty labeling these students as reading disabled and even greater difficulties allocating scarce resources to bringing their reading on par with their measured potential. Furthermore, this use of IQ scores will under identify those students with significant phonological and other language processing difficulties but low IQ scores, who are truly reading disabled (Siegel, 1988c, 1993). This misidentification of both groups of children would happen within the context of the use of special education resources and would deny service to those with the symptom cluster associated with reading disability. Children with demonstrated phonological and other language deficits, who are reading two or more years below their current grade/age placement but in keeping with their measured ability, would not be provided with service from the special education unit. Alternately, service would be provided to those who are reading at grade level but not to their measured potential, as determined by IQ tests. This provision of service only to those with delayed reading who demonstrate average or above average IQ scores, denies service to those who demonstrate the phonological and other language processing problems of the reading disabled person.

Siegel (1993b) and Stanovich (1989a) explain that intelligence does not produce reading achievement. Instead, skilled reading is a multifaceted entity arising from a number of factors, including motivation, interest, availability of materials, home environment and parental expectations, perhaps the least relevant of which may be intellectual ability. Siegel (1992) goes one step further when she poses the question, if intelligence produces reading achievement, how can we explain those students with low IQ scores who read at grade level? The acquisition of

fluent reading skills by such children aptly demonstrates that reading is a modular function which develops largely without reference to IQ scores. These children, if such discrepancy definitions were valid, should exhibit various degrees of delay in acquiring reading skills, depending upon their ability level. Since this is not so, we must question how these children can develop reading skills without the stated requisite of ability which is applied to other children with reading delays.

Lyon (1998) supports this view, and in his review of instruction states that, in the beginning stages of reading, the use of an IQ/ achievement discrepancy is not relevant. He further states that children with and without a discrepancy do not differ significantly in the information processing skills (phonological and orthographic coding) which underlie the accurate and rapid recognition of single words. Moreover, Vellutino and Scanlon (1998), in their review of the literature regarding the use of IQ scores in identifying who is reading disabled, agree with these researchers and state that deficits in general intellectual ability are not causes of reading disability. It thus appears that reading disability is a specific cluster of deficits which varies among individuals and is not significantly associated with IQ as measured by intelligence tests.

The use of such IQ/achievement discrepancy definitions leads to a delay in identification of preschool and primary school children who demonstrate significant interruptions in phonological and other language processes coupled with memory deficits. These children who display the deficits identified by researchers as being central to reading disability will, after a number of years of failure, achieve the discrepancy necessary to be classified as a reading disabled student and become eligible for service. In most school districts this discrepancy does

not occur until the child is in grade three and has experienced significant difficulty with learning to read. This leads to other problems which compound the reading failure, not the least of which is the child's perception of him/herself as being not quite as intelligent as his/her peers who are rapidly acquiring normal reading skills. It also has the added disadvantage of denying this child access to services at the most crucial time for remediation, a time when remediation is much more likely to yield positive, long term results.

Badian (1994), in her comparison of garden-variety poor readers and those with a moderate ability/achievement discrepancy between actual and expected reading levels who were matched for age and word reading ability, determined that phonological and visual processing differences may be more important in distinguishing reading disabled children than a discrepancy from IQ. This finding suggests the need to move towards identifying, in children with reading difficulties, the actual skill areas which are deficient and to focus on remediating these deficits as soon as they can reasonably be determined. In developing a workable identification procedure we need to recognize the irrelevance of IQ scores and move away from the use of all-inclusive ability/achievement discrepancy criteria in determining who is reading disabled. Once this is done, the focus should be placed, as Badian suggests, on the salient features of reading disability as defined by various researchers over the past decade. Much of the research suggests that, especially in the early stages of reading acquisition, phonological skills such as phoneme segmentation, phonetic decoding and name encoding and retrieval are much more important than a child's measured IQ. This focus on phonological awareness as well as other language and

memory deficits would then point the way to the most productive procedure for identifying and remediating the reading problems of students with dyslexia. The current use of aptitude/achievement discrepancy definitions does not permit us to focus on the identified deficits in many children and remediate these. A child who has memory problems or phonological processing deficits would be better served by a program designed to recognize and remediate weaknesses in the child's repertoire of reading related skills, than a procedure which identifies his/her ability level as determined by current intelligence tests and bases access to remediation on the presence of average or above average IQ scores. The practice currently in use appears to take a global rather than a specific approach to helping reading delayed children overcome identified deficits and may not represent the best use of either available remedial resources or the child's time.

Tal and Siegel (1996) found that no phonological processing differences exist between IQ discrepant (those whose reading was significantly lower than their measured cognitive ability) and nondiscrepant (those whose reading was compatible with their measured cognitive ability) poor readers. This leads us to hypothesize that, if phonological processing deficits form the primary core of reading disability, then IQ should not be factored into this equation. Instead, we need to focus, as Badian (1994) suggests, on identified deficits as they cluster together in children with notable reading delays. Having done this, we must then provide these children, as early as possible and without waiting the years it takes for an ability/achievement discrepancy to develop, with intensive programs designed to overcome identified deficits.

Spear-Swerling and Sternberg (1995) agree with other researchers about the lack of utility of intelligence test scores in identifying who is reading disabled. They further assert that children with reading disabilities are not qualitatively different from other poor readers either in their remedial needs or in cognitive areas related to word recognition. As such, reading disabled children do not seem to possess a unique biological deficit that distinguishes them from other poor readers. Continuing with this line of reasoning, Kirby et al. (1996) contend that children with reading disabilities are not qualitatively different from other nondisabled children reading at the same level. Hence, remedial efforts should have a similar focus for both groups. Despite the differing perspectives on this issue, too much remains unknown. It is undetermined at this time whether neurological differences or abnormalities exist, which may be the root cause of reading disability and, if so, whether these produce children who are qualitatively different in the area of reading, from other children with reading delays. Further research is needed to clarify this issue.

Additional research has confirmed earlier findings on the irrelevance of IQ scores in the identification of reading disability. Francis et al. (1996) used individual growth curves to determine whether the development of children with reading disabilities is best characterized by a developmental lag or deficit. Their research used nine yearly longitudinal assessments of a sample of 403 children classified as reading disabled, with and without a discrepancy, as well as a group of normally achieving readers and found no support for the use of a discrepancy between IQ and achievement in identifying who is reading disabled.

Siegel (1989a) asserts that the use of IQ scores in the identification of reading disability

penalizes children from different cultural and minority backgrounds and leads to misidentification because of lower IQ scores. These children do not necessarily have lower ability levels than other children who are experiencing reading difficulties. The fault lies with the cultural bias inherent in existing intelligence tests which does not render an accurate IQ score for these children. The inability of such children to achieve an IQ score in the average or above average range leads erroneously to a designation of garden variety poor reader and, subsequently, to denial of access to high quality programs designed to upgrade reading skills in reading disabled children. Following their identification as slow learners, expectations for these children are also reduced which results in reduced reading ability, particularly among lower socioeconomic status children (O'Sullivan, 1992).

It appears the only redeeming feature of using IQ scores as part of the process of identifying who is reading disabled may be related to remediation, and even this relationship is tenuous at best. The suggestion has been put forward that children with various IQ scores may derive differential benefits from remediation. Some research tentatively indicates that the reading and spelling patterns of children with different IQ levels vary. If such a pattern exists, this information may be useful and provide justification for doing IQ tests, although direct assessment, analysis and remediation of reading and spelling errors may be more useful in remediation of the reading disabled child (Siegel, 1989a). In a review of research on this point, Siegel determined that no clear correlation between IQ levels and remediation benefits has been identified and suggests that there is no validity in using IQ scores to predict the effects of

remediation. This position has been strengthened more recently by Aaron (1997) who carried out a review of the research on this issue in which he examined studies conducted from 1975 to 1997. He concluded that the literature does not offer empirical support for the position that reading disabled children with an IQ/achievement discrepancy derive a differential remedial benefit compared to other children with reading difficulties who do not have this discrepancy. Gillet and Temple (2000) confirm the findings of Siegel and Aaron with their determination that there is no value in discriminating between reading disabled and other children with reading difficulties in regards to remediation. They contend that all poor readers, whether learning disabled or not, need instruction that is tailored to their individual strengths, needs, age and interests, regardless of IQ level. It may be more practical and cost efficient to spend the time which would have been spent administering and analyzing intelligence tests, on delineating each child's reading strengths and deficiencies. A program could then be designed and implemented to address these specific aspects of a child's reading functioning, as Badian (1994) and Siegel (1993a) suggest. Aaron also proposes such an approach in his Reading Component Model. He advocates that the proximal cause of each child's reading disability be determined and remedial strategies designed to address this specific cause be initiated. He bases this approach upon the well validated assumption that reading is a complex process made up of identifiable components and that a weak component can hinder the development of skilled reading. Using this approach, no identification of reading disability is necessary other than significant delay in acquiring reading skills. As well, this procedure has potential for use in developing an unbiased definition

of reading disability, one which has no reference to the concept of intelligence.

Vague operational definitions of reading disability have plagued the field since its inception and continue to the present day. Such practices have sparked a deluge of controversy regarding the utility and applicability of using IQ/achievement discrepancy definitions in determining who is reading disabled. If the basis of our definitions is flawed, as a number of researchers including Badian (1994), Berninger and Abbott (1994), Brady and Moats (1997), Francis et al. (1996), Lyon (1998), Siegel (1989a, b, 1992, 1993b), Spear-Swerling and Sternberg (1995), Stanovich (1989a, d, 1993) Stanovich and Siegel (1994) and Vellutino et al. (1996) have indicated, then the definitions themselves cannot accurately reflect the essential components of, nor lead to an accurate identification procedure for dyslexic individuals. It is proposed that, in the absence of an empirically supported operational definition, we abandon the effort to identify a distinct group of readers who demonstrate specific psychometric attributes or are perceived to have underlying biological deficits and identify, instead, all children who exhibit reading differences and provide intervention designed to remediate their specific deficits. With continuing research we may locate, as Kirby et al. (1996) and Spear-Swerling and Sternberg suggest, a biological deficiency which clearly distinguishes reading disabled children from the general population of poor readers. That has not been done to date.

Definition - Newfoundland Department of Education

The Department of Education which develops and directs policy on all matters pertaining to education in Newfoundland and Labrador, including the determination of who qualifies for

service under the category of reading disability, continues to employ ability/achievement discrepancy criteria in its definition of reading disability and makes identification of reading disabled children conditional on the presence of an average or above average IQ score (Department of Education, Division of Student Support Services, Transitional Policy and Guidelines, 1998). This clearly contradicts current research which strongly suggests that IQ scores are irrelevant to the definition and identification of a reading disability (Fletcher et al., 1994; Lyon, 1998; Siegel, 1988b, c, 1989, 1992, 1993; Stanovich, 1986a, 1989a, b, 1993; Stanovich & Siegel, 1994; Tal & Siegel, 1996; Vellutino & Scanlon, 1998; Vellutino et al., 1996). It follows then that the Department of Education must revise its policies in light of current research findings and develop an updated definition which will lead, in turn, to revised identification policies, and ultimately to appropriate identification and service for all students with a reading disability.

The Newfoundland Department of Education has recently made one concession in the provision of service to reading delayed students which recognizes two basic tenets of reading disability: (a) students with significant reading problems need to be identified and provided with remedial service as early as possible, without having to wait the years required for a specific aptitude/achievement discrepancy to develop and (b) IQ scores are not necessary to identify and provide service to young children suspected of having a reading disability. To this end, they have made special education services available to children, up to the end of the primary school years, who are suspected of having a reading disability or other unidentified exceptionality, but who

have not been in school long enough to demonstrate the ability/achievement discrepancy upon which the provision of special education services for reading disabled students, nine years of age and older, currently hinges. Using this Developmental Category (0-8 years) of service provision under the Special Education guidelines, the Department of Education is acknowledging the need to identify and attempt to overcome reading delays as early as possible, without relying on an IQ/achievement discrepancy to determine who is entitled to this service. This is a major step forward in enabling reading delayed students to receive appropriate service when it is most likely to be beneficial.

Proposed Operational Definitions of Reading Disability

A plethora of research has shown that using IQ scores to define a reading disability is not valid. However, no other clear definition has emerged. Fletcher and Foorman (1994) summarize this predicament by stating that definition and classification issues regarding reading disability are still under debate. Based upon the research of the past decade, however, it seems the time has come to shift our focus from ability/achievement definitions to those which more accurately reflect what the literature is saying. This step would conceivably build consensus for one, generally accepted definition of reading disability in the years to come.

A large body of current research suggests that the field of reading disabilities would be best served by replacing ability/achievement discrepancy definitions with one which focuses on a delay in word recognition, and more specifically in pseudoword reading (Siegel, 1989a; Stanovich, 1989a, b), with concurrent deficits in phonological awareness and orthographic

processing. This combination appears to provide the most promise in developing a new and more accurate definition of reading disability. one which precisely identifies the essential correlates of this condition and. in so doing. identifies the problem at its earliest possible stages and points the way to remediation. The research carried out by Badian (1994) lends support to this definition of reading disability as she proposes that "dyslexia be defined as a significant weakness in word recognition and nonword reading accompanied by deficits in both orthographic and phonological processing. manifested by failure in automatic visual recognition and phonological recoding of graphic stimuli." (p. 61)

Another avenue which seems to have merit for researchers who are trying to find a more accurate and educationally relevant definition of reading disability focuses on identified discrepancies. but without reference to IQ scores. Carlisle (1989). Siegel (1993b) and Spring and French (1990) have suggested that measuring the discrepancy between reading and listening comprehension or between reading and oral language comprehension has more validity than using IQ achievement discrepancy criteria in defining who is reading disabled. Using this framework. researchers speculate that children who have age-appropriate listening comprehension and/or oral language development. but with significantly delayed reading skills have a genuine interruption in their development of reading ability and would be considered reading disabled. This model would have to be carefully delineated to determine the specific values of oral language. listening and reading comprehension and. their discrepancy from demonstrated reading skills. to indicate the presence of reading disability as opposed to garden

variety poor reading.

As an alternate definition, one which takes into account the fact that most people seem unwilling to abandon the use of IQ scores in the identification of reading disability, Siegel (1988c) suggests a compromise. She proposes that standard scores on a cognitive measure such as the WISC-R (WISC-III) which are equal to or greater than 80 coupled with word recognition or spelling scores equal to or less than the 25th percentile on an instrument such as the WRAT be used as a means of identifying who is reading disabled. This criteria would then define a reading disabled person as one who achieves an IQ score which is equal to or greater than 80, coinciding with a word recognition or spelling score on a standardized subtest of reading achievement which is equal to or less than the 25th percentile. This definition and identifying criteria would permit the widest possible range of students who exhibit significant reading delay and still fall within the normal range of intelligence to benefit from the services allocated for those with identified reading disabilities. Stanovich (1993) would add one caveat to any definition which gives prominence to the concept of measured intelligence. In his phonological-core, variable-difference model of reading disability, he suggests that the existence of phonological processing difficulties be used to determine whether one has a reading disability. Badian (1994) concurs with Stanovich's emphasis on phonological processing difficulties as the basis for determining who is dyslexic. However, she would add visual processing difficulties as a further criterion for identification of dyslexia. A composite of all three, with each supplementing the other, may hold the most promise in arriving at a comprehensive, accurate and educationally valid definition of

dyslexia.

Miles. Haslum and Wheeler (1998) advocate the retention of the concept of general intelligence in defining dyslexia (or specific developmental dyslexia. SDD. to use their terminology). in order to distinguish this disorder from specific reading retardation. SRR. which factors only reading ability and general intelligence into the definition equation. They would take the definition of dyslexia one step further. however. and propose the inclusion of such clinical evidence as left-right confusion and difficulty in the recall of auditorily presented digits. Such indicators would form a much more robust means of differentiating specific developmental dyslexia from specific reading retardation (defined solely by lowered intelligence and commensurate reading achievement). and hold promise for an operational definition of dyslexia as well as the beginnings of a taxonomy for the classification of various reading disorders. Joshi et al. (1998) suggest that listening comprehension could be used instead of IQ in identifying reading disability. as this ability is highly correlated with reading (dis)ability with both being mediated by the same cognitive mechanism. This possibility is worthy of further study.

Perhaps the definition which holds the most promise for the future emerges from the work of Berninger and Abbott (1994). They shift the focus entirely from its traditional stance and recommend that dynamic assessment via validated treatment protocols with resulting failure to respond on the part of the student be used to determine who is reading disabled. They conjecture that we cannot assume a child has a reading disability just because s/he is having difficulty acquiring the skills involved in the reading process. Many factors including the developmental

readiness of the child's brain structures as well as access to appropriate instruction impinge upon this ability. The requirement of appropriate instruction included in the current definition cannot be overlooked. The assumption is usually made that if a child has been sitting in a regular classroom and exposed to reading instruction s/he has had adequate opportunity to learn, and that children who do not learn to read under these conditions likely have a reading disability. There are many reasons, other than reading disability, which can explain why children fail to acquire reading skills. Berninger et al. (1992) assert that many teachers are not grounded in current research and theory on reading instruction and thus not aware of, nor ready to deal with the normal variation of experience which children bring to the reading environment. Lyon, Vaasen and Toomey (1989), in their survey of more than 400 teachers, found that 93 percent had not received undergraduate training and 82 percent had not received graduate training in dealing with diversity among children. Further, Nolen, McCuttchen, and Berninger (1990) found that less than half the American state Departments of Education required teachers to take course work in reading and writing instruction. When it was required, less than six semester hours, or the equivalent of two semester courses, was devoted to this instruction. A perusal of the current curricula of several teacher education programs indicates that not much has changed in this regard. Is it any surprise that many beginning teachers feel inadequately trained not only to teach reading to students who are ready and able to learn, but to provide appropriate instruction and opportunity to learn to those who, for various reasons, are not ready to benefit from traditional instruction? The result for this latter group is reading delay and often the reading disability

designation after failure to read has occurred when, in reality, what we have is a child who does not necessarily have a reading disability but has not been provided with appropriate instruction and opportunity to learn.

Recognizing this fact Berninger and Abbott (1994) suggest that we do not presume a child has had adequate instruction upon failure to learn. They propose instead that we expose these children to intensive remediation which addresses their identified deficits. Based upon the results of these efforts at remediation, children would be categorized in one of two ways: (a) treatment responders - those who benefitted from the remedial attempts and exhibited gains in reading skill development, and (b) treatment nonresponders - those who did not show appreciable gains following intensive efforts to remediate their deficits. Berninger and Abbot feel that only after these efforts have proven insufficient in helping the child learn to read should we identify him her as reading disabled. One disadvantage of this course of action is that it presupposes we have clearly defined intervention strategies which have been proven to help reading delayed children overcome specific deficits. However, this is not the case at the present time. At best, this procedure might prove fruitful once we have clearly defined remediation procedures for the early identification and remediation of specific deficits such as phonological or orthographic processing problems. To this end, the time and money spent on training people to administer intelligence tests might be put to better use if it were redirected to the administration of measures which clearly identify a child's specific deficits and to research into the treatment protocols which will prove, over time, to remediate these deficits (Siegel, 1989a).

Current State of Practice

Despite years of research essentially disproving the legitimacy of using IQ scores as a defining feature of a reading disability, an examination of identification policies clearly indicates that we continue to cling to outdated definitions and measurement procedures to identify those who are reading disabled and thus eligible for services under this classification. Aptitude/achievement discrepancies continue to be the major identifying feature of reading disability. Unquestionably, what is needed is a definition of reading disability reflecting current research which disassociates it from other learning disabilities and identifies phonological deficits as the primary core of reading disability, occurring simultaneously with deficits in other language and memory processes, without reference to the obsolete concept of IQ scores. Currently, many definitions designed to identify those eligible for services under the reading disabilities category continue to use the largely disproven criteria of IQ scores combined with discrepancies in reading performance. Although there have been many definitions of dyslexia suggested to replace the IQ/achievement discrepancy definitions of the past, a large body of current research suggests that a delay in word recognition and, more specifically, in pseudoword reading equal to or greater than two years, in combination with phonological and other language and memory deficits, should replace these nonfunctional definitions.

Identification of Reading Disability

The identification of those who are reading disabled is currently tied to traditional definitional practices. This needs to change. The use of obsolete IQ/achievement discrepancy

criteria to identify the reading disabled will leave unidentified many truly reading disabled children who can benefit from remediation. This practice denies these children appropriate remediation while possibly lowering reading expectations for IQ/achievement nondiscrepant children, which has the effect of decreasing their reading achievement even further. It follows then that children without an IQ/achievement discrepancy in reading should be provided with the same opportunities for remediation as children with this discrepancy. It is only through proper identification and remediation that these misidentified children, as well as those currently identified as reading disabled, will reach their full potential.

Green (1996) says that family history and genetic factors are crucial in identifying those who are reading disabled and a review of these must be included in the assessment and identification process since it has long been recognized that dyslexia has a strong familial component. This is particularly true in the area of phonemic awareness (Lyon, 1998). Between 23 and 65 percent of children who have a parent with a reading disability also have a reading disability themselves. Additionally, if there are siblings with a reading disability, the likelihood is 40 percent that the child evidencing significant reading problems is also dyslexic. This knowledge provides opportunities for early identification of those who are reading disabled. Green further asserts that one of the problems in identifying a person with dyslexia is that it is done by a special educator or school psychologist, someone who has no formal, advanced training in assessment of language structures. A reading disability may involve any or all of the major language systems including, phonology, morphology, syntax and semantic organization,

from words through discourse, and all of these language systems must be assessed if relationships among language, cognition and academic achievement are to be observed. This is the domain of speech language therapists. Berninger and Abbott (1994) and Vellutino et al. (1996) would add remedial efforts to the identification of reading disability. They assert that such interventions must be early and intensive and precede any diagnosis of reading disability. If these appropriate interventions are largely unsuccessful, a diagnosis of reading disability becomes a much stronger possibility and the reading disability designation can be applied with a much greater degree of certainty than one made without the benefit of such remediation.

Appropriate and complete identification of all students with a reading disability will become a reality only after a clear and unambiguous definition reflecting current research is developed and implemented and early intensive efforts at remediation are put in place preceding a reading disability diagnosis. Such a definition would likely include measures of single word reading and spelling, measures of phonological sensitivity such as phoneme counting, segmentation, blending, deletion and manipulation, as well as measures of nonsense word reading in conjunction with other language and memory measures (Lyon, 1994). Remedial efforts would center around identifying each child's core deficits and providing instruction to remedy such deficiencies (Berninger & Abbott, 1994; Vellutino et al., 1996). Unresolved reading delays would then acquire the reading disabilities designation and entitlement to further, long term service necessary to enable the child to develop to his/her fullest potential.

Measurement of Reading Disability

In order to identify those who are reading disabled two things are necessary: (a) a definition reflecting current research which focuses primarily on phonological and other skill deficits as the core of reading disability while ignoring IQ levels, and (b) the means to quantify the type and degree of skill deficiencies being assessed. Morris (1994), however, asserts that since there is no universally accepted definition of the reading disabilities construct, any measurement of this construct is as open to criticism as is the definition. Like a house on an unstable foundation which renders everything else above questionable, the foundation of reading disability rests on its definition. Everything else stems from this foundation, and since this is unstable, little stemming from this definition can be said unequivocally.

Having said this, the need exists to recognize certain undisputed axioms related to reading disability. Since it is well recognized that phonological deficits combined with other language deficits form the core of reading disability, a means to measure the level of achievement as well as the deficiencies in these areas is needed. With an effective definition comprising these elements in place, there would remain only the selection of instruments to measure the level of achievement and identify the existing deficiencies in the various skills. Measures of word recognition and/or pseudoword reading and phonological and orthographic development, combined with semantic and syntactic processing, are the most appropriate tasks to assess these abilities, quantify the amount of delay in a child's reading achievement and identify the specific deficiencies in his/her reading-related processes. The various memory processes, short-term,

working and long-term, can be measured using various instruments currently deemed valid to assess these processes. The criteria, as outlined by a Department of Education, school district or specific program, would then be used to determine whether or not a particular person met the requirements for a reading disability.

To measure reading disability several things are necessary. The initial requirement is a clear, unambiguous definition which will lead to precise identification criteria. This explicit identification criteria should ideally determine the level of reading delay necessary for consideration as a reading disability. It should then quantify a specific degree of interruption in the phonological, syntactic and semantic processes which characterize reading disability. These delays, coupled with deficits in short-term memory, rapid serial naming speed and orthographic processing should lead to accurate measurement of reading disability. Measures of word recognition and pseudoword reading, coupled with measures of phonological awareness, orthographic processing and other language processes, as well as rapid serial naming speed and short-term memory are the appropriate tasks to determine achievement levels and to isolate specific deficiencies in a child's phonological and other processes relevant to reading (Morris, 1994). Depending on the specific definition adopted, measures of listening or oral language comprehension could also be completed (Carlisle, 1989; Siegel, 1993a; Spring & French, 1990).

Age is also a factor in determining the abilities which need to be measured to determine whether or not a reading disability exists. A very young child who is suspected of or who seems to have the potential for a reading delay will need different reading/readiness skills assessed than

an older child who has already failed at reading. Additionally, a smaller delay in skill acquisition between that of a child with suspected reading disability and his/her peers will need to be present to alert educators to the potential for reading disability in a very young child.

Instruments to Measure Reading Disability

Even though most psychologists, guidance counselors and other people who carry out assessments with students suspected of having reading disabilities have their particular favourites, any reliable and valid instrument designed to measure word recognition and pseudoword reading ability could be used in the assessment of reading disability. As well, any number of standardized instruments with demonstrated reliability and validity, could be used to measure the other skill areas in question. The literature is replete with examples of assessment devices used by various researchers in their quest for knowledge on this topic. Several instruments appear repeatedly and are even referred to by some as the Holy Trinity of reading disability (Lyon, 1994). Such instruments include the Woodcock Johnson Psychoeducational Battery - Revised (WJ-R), (Woodcock & Johnson, 1990), the Wide Range Reading Test - Revised (WRAT-R), Word Recognition subtest (Jastak & Wilkinson, 1984), and the Woodcock Reading Mastery Tests (WRM), Word Attack subtest (Woodcock, 1987). Any of these measures, as well as many others, can be used to determine whether or not a reading disability exists. Once a reading disability is identified, analysis of the results of these instruments will specify the skills as well as the deficits in the student's current repertoire of reading abilities (Fletcher & Foorman, 1994; Shaywitz & Shaywitz, 1994). Then, the operational definition of a reading disability as

outlined by a Department of Education/school district/specific program would, upon completion of the assessment, be applied to determine whether or not the person in question met the criteria for a reading disability designation.

Of particular interest in the identification of dyslexia would be measures which could identify, at the very earliest stages of literacy development, those children who are not acquiring language skills at the expected developmental rate. The use of such instruments to detect dyslexia would facilitate early intervention in the reading disability spiral and offset much of the psychological trauma associated with difficulties in learning to read. Two such instruments which have been developed in the United Kingdom are The Dyslexia Early Screening Test (DEST) (Nicolson & Fawcett, 1996) and the Cognitive Profiling System (CoPS) (British Dyslexia Association, 1997). Both of these screening devices have been normed and designed for administration by regular classroom teachers to children four years of age and older, to identify children at-risk for learning difficulties including dyslexia, before these children actually fail at reading (Fawcett, Singleton & Peer, 1998). While these instruments should not replace traditional assessment, they can, very early in the child's literacy development, identify those who are at-risk so that interventions can be provided. The results of these early interventions will determine whether further assessment is warranted. If, as various researchers contend, early intervention will reduce later reading difficulties, a number of these children will exit the reading difficulties route and go on to acquire reading skills in, or very close to, a developmentally appropriate manner. This would result in only those children with the most severe reading

disabilities requiring service within the special education system. In turn, this would allow researchers to focus their efforts on developing programs to address the most severe reading disabilities.

Prevalence

Having examined identification and measurement procedures for reading disabled children, the next step is to determine how many reading disabled children there are in or about to enter the school system. Accurate prevalence rates follow directly from appropriate and complete identification of all reading disabled children. As a result, it is difficult at the present time, to determine the prevalence of dyslexia because of the different identification criteria employed by various agencies which offer services to reading disabled children. One researcher likened it to the definition of obesity in that the prevalence of this condition depends on where you draw the line between being overweight and being obese (Shafrir & Siegel, 1994b). Reading disabilities' researchers have a similar problem in that it is difficult to know where, on the continuum of reading skills, to draw the line between people who have reading problems and those who are genuinely reading disabled. The lack of clarity in definition and identification procedures further compounds this difficulty, as various provinces, agencies and boards of education employ different criteria to achieve this end.

Even though we do not have a clearly delineated definition of reading disability, a look at prevalence rates resulting from traditional definitions used to suggest that males were much more heavily represented than females in the reading disabled population, often by as much as four to

one: however. this may not be accurate. More recent figures suggest that reading disabilities occur at similar rates in both genders (Shafrir & Siegel. 1994b). Clearly. an operational definition which specifically identifies and quantifies the deficiencies would provide a more accurate picture of prevalence rates than we currently have. Even though accurate prevalence rates are difficult to determine. a recent estimate by Lyon (1996) identifies approximately five percent of the public school population as learning disabled. He further states that the vast majority of those with identified disabilities have deficits in basic reading skills. Moats (1994) arrived at a similar statistic regarding the composition of the learning disabled population several years earlier with his determination that 80 percent of this specific school population is reading disabled.

More recently. Miles et al. (1998) in their study of 11.804 British ten-year-olds. identified slightly more than two percent of their population as dyslexic. Those identified included 223 boys and 46 girls which yielded a gender ratio of almost five to one. These findings are at odds with other studies which report almost identical gender ratios (Lubs et al.. 1993: Shaywitz. Shaywitz. Fletcher & Escobar. 1990: Wadsworth. DeFries. Stevenson. Gilger & Pennington. 1992). These researchers examined the definition of dyslexia used in those studies and found that it used the criteria of "poor reading in relation to intelligence". When Miles et al. examined their data in light of this definition they found that approximately four percent of their population was identified as dyslexic. This analysis yielded a gender ratio of less than two to one. a ratio which more closely approximates the findings of other studies. They have suggested that gender ratio differences which exist in the literature have arisen out of the different criteria

used to identify who is dyslexic. This determination clearly points out the critical need for consensus on an unambiguous operational definition for dyslexia. However, when clinically based definitions for dyslexia are used which include not only poor spelling and reading in relation to general intelligence but other clinical indices such as left-right confusion or difficulty in the recall of auditorily presented digits, the resulting gender ratios are much closer to the Miles et al. findings of more than four to one in favour of males. If instead, dyslexia is diagnosed based solely on a discrepancy between reading ability and intelligence, the gender ratio findings will be closer to the traditional one to one ratios previously reported in the literature. This research has important implications for an operational definition of dyslexia and hence, identification procedures.

Lyon (1998) reviews converging evidence from longitudinal studies indicating that 17 to 20 percent of the population of school age children have a reading disability. A disproportionate number of these are poor children and racial minorities. Bock (1998), in his review of research on reading impairments undertaken at the National Institute of Child Health and Human Development (NICHD), stated that reading disability affects boys and girls at the same rate; however, more boys are identified because they come to teachers' attention more readily and are referred more often. Green (1996) puts prevalence rates at 15 percent. Vellutino et al. (1996) estimate that if young children evidencing reading difficulties were provided with early and appropriate intervention, we could reduce our prevalence rates from a conservative nine percent to approximately one to three percent.

Summary

From its early history as a learning disability, specific delays in reading have been identified and studied. Various perspectives have been used to examine this phenomena during the past century, with current practice focusing primarily on language and reading readiness deficits. Definitional issues have always hampered the field of reading disability and continue to do so to this day, as the generally accepted discrepancy definitions, particularly those associated with intelligence test scores, have a number of inherent problems. Several researchers in the field of reading disability have proposed alternate operational definitions which, if adopted, would lead more readily to comprehensive identification of all those who display the level of delay and specific deficits which characterize reading disability. Appropriate identification of the reading disabled population would, in turn, lead to more effective and timely intervention which, research has shown, would result in improved remediation and often prevention of this specific learning disability.

It is clear that the greatest challenge in the field of reading disabiliy is the development of a definition which reflects current research into the basic tenets of this disability and the application of such criteria to the identification, very early in the preschool and beginning primary school years, of those children who are exhibiting aberrant literacy acquisition skills. Such a process would facilitate intervention at a time when we can best determine whether a child is experiencing literacy development abnormalities which will, with effective remedial efforts, be overcome, so the child can go on to acquire age-appropriate reading processes. This

course of action would also tell us whether the reading delay is likely of constitutional origin and will require a more intensive and sustained effort to allow this child to achieve to his maximum potential. This child, and not the former one, would be identified as having a reading disability and be provided with the

amount and type of intervention to allow him/her to achieve to his/her maximum potential in all areas of endeavour, and not just reading.

Section III

Early Intervention and Remediation

A Rationale for Early Intervention

In the development of a child's reading skills two elements are of the utmost importance if we are to capitalize on the abundance of research done over the past several decades in the field of reading (dis)ability. The first element we must be aware of is the existence and nature of the reciprocal relationship between the development of phonological awareness skills and early reading acquisition. The second one is the role of phonological processing and other deficits in reading disability. Explicit knowledge of these factors gives us the tools to help a child overcome his/her deficits, thus enabling him/her to acquire reading skills earlier and in a more efficient and productive manner.

A profusion of research indicates that the sooner we begin this process, the more amenable the child is to remediation, the less s/he will fall behind, the more progress s/he will make and the less psychological trauma the child will endure (Fawcett, 1998; Green, 1996). Spear-Swerling and Sternberg (1995) agree that early identification is important because of the cognitive and motivational consequences of long standing reading failure. In the face of this research it is detrimental to the child's overall development, but most particularly to his/her advancement in reading, to wait until s/he has a significant IQ/reading achievement discrepancy to identify this individual as reading disabled and then provide appropriate service. This process usually takes several years and can be delayed until close to the end of the child's primary school

years. the years when s/he should be acquiring basic reading skills and developing fluency with the reading process. the years when s/he can benefit most from remediation.

Because of the reciprocal relationship between the development of phonological awareness skills. particularly phonemic awareness. and early reading acquisition (Badian. 1994: Brady & Moats. 1997: Elbro. 1999: Lyon. 1998: Schneider. Kuspert. Roth. Vise & Marx. 1997: Stanovich & Siegel. 1994: Vandervelden & Siegel. 1995) and the role of phonological awareness deficits in reading disability and our ability to measure these deficits (Kahmi. Catts & Mauer. 1990: Lenchner. Gerber & Routh. 1990: Lundberg. Frost & Petersen. 1988: Yopp. 1988) early identification and intervention is possible. desirable and productive (Miles et al.. 1998: Satz & Fletcher. 1988). In their 1997 study of German kindergarten children exposed to a six-month metalinguistic training program. Schneider et al. found that children can develop phonological skills separate from and before reading ability develops and that these. in turn. facilitate the acquisition of subsequent reading and spelling skills. This confirmed earlier studies carried out by Lundberg et al. which showed a strong. positive relationship between phonological processing skills and early literacy. The research of Vandervelden and Siegel supports the causal link between the development of phonological processing skills and the acquisition of early reading and concludes that the use of phonological information. which these researchers refer to as "the sounds of one's language" in using written and oral language. is of vital importance in learning to read and write. The consequences of ignoring this research will have detrimental effects on all children. but most particularly on those who are at-risk for reading difficulties. This latter group

may experience lifelong repercussions due to a lack of exposure to appropriate learning experiences during the most crucial phase of literacy development. the preschool and early primary school years (Butt. 1998).

Early identification is a viable undertaking according to Miles et al. (1998) and Satz and Fletcher (1988). More recent research has uncovered relevant information which has the potential to enhance the predictive power of early screening devices and assist early intervention. Despite the importance of and need for such devices. previous attempts to validate preschool screening instruments were fraught with problems. The most frequent concerns according to Satz and Fletcher and Keough (1994) included insufficient longitudinal validation. the confounding of screening and outcome assessments. and inadequate assessment of the predictive value of the screening devices. However. recent research into reading theory has identified new variables which can reliably predict reading difficulties before children actually fail at reading. This knowledge will then lead to early intervention and ultimately. more effective remediation.

Statistics strongly suggest that the earlier reading difficulties are detected and appropriate intervention put in place. the better the long term results will be (Green. 1996; Satz & Fletcher. 1988). When dyslexia is detected in grades one and two. 82 percent of the children identified attain normal achievement levels. When it is detected in Grade three. only 46 percent are successfully remediated. The success rate is even worse for those children whose dyslexia is not detected until grades five through seven. with the rate of remediation dropping to between 10 and 15 percent. These statistics provide overwhelming evidence of the need for a shift in focus from

trying to overcome reading difficulties when reading disability is identified according to traditional IQ/achievement discrepancy definitions (usually around the end of the primary school years), to a focus on prevention and early intervention with children experiencing or otherwise determined to be at-risk for reading difficulties.

Early Detection of Reading Disability

If early intervention and remediation is most conducive to ameliorating a reading disability, the next issue to be addressed is the age at which we can reliably identify this condition. Are there precursors in the child's early development which are consistently correlated with reading disability prior to and into the primary school years? The answer to this question is a resounding "yes". Research has determined that we can reliably identify a potential reading disability long before a child enters kindergarten, and sometimes as early as infancy, when specific at-risk factors are identified (Berninger & Abbott, 1994; Bruck, 1988; MacLean, Bryant & Bradley, 1987; Pratt & Brady, 1988; Siegel, 1988a, 1993; Stanovich, 1986b; Yopp, 1988). As far back as 1987, MacLean et al. concluded from their research that the early detection of reading (dis)ability is possible by age three in children who experience difficulty in acquiring early rhyme and alliteration skills, as such skills are related to the identification of sounds and the beginning reading of words. Elbro (1999) states that three out of four children with severe reading difficulties are identifiable at the beginning of kindergarten. Thus, there appears to be little justification for waiting until an aptitude/achievement discrepancy develops, as is currently the practice, before identifying a reading disability. On the question of precursors to normal reading

ability or markers for specific reading difficulties. research has also determined that the vast majority of these precursors and markers comprise the phonological awareness skills children need to acquire normal reading skills. In the event that reading difficulties have gone undetected until the mid primary school years. it is essential. once the problem is uncovered. to intervene immediately. Elbro has determined that most of the variation in reading ability is present after only one or two years of formal reading instruction. Even though some children are late bloomers (i.e. those who are slow to develop reading skills initially but who catch up readily with little negative impact on their overall reading development) and others get stuck at some point. the vast majority of those who are not reading after several years of reading instruction will. without appropriate intervention. continue to exhibit below average reading skills. relative to their peers. for their entire school careers.

With our ability to identify specific reading precursors and our knowledge of other means of early detection of future reading disability. it is essential that people responsible for the education of young children make use of this knowledge early in the child's language development. to ensure that s/he will develop reading skills to his/her full potential. To wait until school entry to detect potential reading problems is detrimental to the child's overall language development. However. when reading difficulties have gone undetected prior to school entry. it is better to recognize such problems in kindergarten than to wait until the end of grade one or two when the child has a demonstrated delay in reading. A number of researchers have identified specific skill deficiencies in early primary school children which likely predict future reading

failure. Satz and Fletcher (1988) have determined that deficiencies in the visuo-spatial skills of kindergarten children are frequently correlated with reading difficulties in grades two and five. Deficiencies in other areas including phonological segmentation skills and in the repetition of ordered series of words (Mann, 1984), short-term memory tasks (Mann & Liberman, 1984) and explicit awareness of phoneme units in language as a precursor to the development of sound/symbol relationships (Pratt & Brady, 1988) are accurate predictors of future reading disability. Delays in acquiring any of these prereading skills should immediately alert parents and educators to the possibility of a reading disability and suggest intervention to remediate at the earliest possible opportunity.

Children acquire phonological awareness long before beginning to read, through experiences which seem to have little to do with the actual task of reading itself. Poor readers have a fundamental problem in acquiring awareness of the phonemic structure of the language, an aspect of phonological awareness which correlates highly with success at learning to read (Byrne & Liberman, 1999; Siegel, 1988c; Stanovich, 1986a, b; Yopp, 1988). This relationship exists not only in early reading acquisition, but throughout the school years and into adulthood. The inability to readily acquire phonological awareness skills is not due to a developmental delay or lack of exposure to reading, but to intrinsic factors within the child. This is the core of dyslexia and cannot be attributed to differences in IQ levels, but seems directly attributable to problems in language processing (Badian, 1994; Siegel, 1988c, 1989a, 1993; Stanovich, 1986a, b, 1988; Tal & Siegel, 1996).

Lack of development of such specific precursors to reading can be reliably used to detect, prior to school entry, children who will experience difficulty acquiring normal reading processes in the early primary years and subsequently be labeled reading disabled. Lenchner et al. (1990) have determined that phoneme blending, manipulation and segmentation skills are the best predictors of future decoding ability and that a delay in their development should be a red flag for parents and professionals who work with young children. MacLean et al. (1987), in their research on the early detection of reading (dis)ability, determined that children who will go on to experience reading disability evidence difficulty in acquiring early rhyming and alliteration skills. They have shown that these skills are related to the identification of sounds and the beginning reading of words, but not to the recognition of letters of the alphabet. This builds on the earlier work of Stanovich (1986a) who concluded that the discrimination of letters of the alphabet is not a problem for children with reading disability, but that mapping letters onto phonemic segments is.

Muter (1998) determined that the following precursors to reading exist and their presence or absence can be reliably identified in the early primary grades: (a) syllable and phoneme segmentation, (b) sound blending, (c) rhyme detection and (d) phoneme manipulation skills. Muter confirms that phoneme awareness and grapheme/phoneme knowledge are both prerequisite to learning the alphabetic principle. This knowledge is attained after children have had sufficient exposure to the written form of letters and after their level of phonological awareness permits them to break words into their component sounds (Ehri, 1992). Muter further

asserts that while some phonological awareness skills develop prior to formal reading instruction. if they are to be fully developed. these skills must be taught. not in isolation. but within the context of reading. Lyon (1998) also places a high value on early exposure to good oral and printed language and asserts that children most at-risk for reading failure are those who arrive at school with limited exposure to such linguistic concepts as phonemic sensitivity. letter knowledge. print awareness. vocabulary development and knowledge of the purposes and pleasures of reading. who demonstrate. as well. inadequate oral language and verbal skills.

As well. family history. particularly in the area of phonemic awareness. can be used as a reliable indicator of reading disability. Between 23 and 65 percent of children who have a parent with a reading disability also have a reading disability. Additionally. if there are siblings with a reading disability. the likelihood is 40 percent that the child evidencing significant reading problems is also dyslexic (Green 1996; Lyon. 1998). This knowledge can be used to screen children to determine who is at-risk for reading disability. Following this initial screening. more timely and appropriate identification and remediation of those who are reading disabled can occur.

In 1989. Liberman et al. determined that the child's degree of skill in phonological awareness and in rapid serial naming speed tasks were the best predictors of future success in learning to read. These findings were confirmed several years later with the research carried out by Fletcher and Foorman (1994) and Stanovich and Siegel (1994) who found that the best predictor of reading difficulty in grade three was a child's performance on a variety of phonemic

awareness measures, level of print awareness and the rapid naming of letters, numbers and objects. Research continued in this vein until O'Connor and Jenkins in 1997, Meyer et al. in 1998 and Byrne and Liberman in 1999 verified these research findings and asserted that a child's level of awareness of phonemic-size segments of the spoken language is predictive of success or failure in the early stages of reading, as are letter knowledge and speed of access to the sounds of words in the mental lexicon as measured by rapid serial naming tasks. All of these can be used as markers for reading disability. O'Connor and Jenkins (1997) also found that these tasks are better predictors of reading ability when measured in early grade one than in late kindergarten and more reliable in late kindergarten than early kindergarten.

Such deficits in rapid serial naming speed tasks have generated much study recently. In his longitudinal study of second and eighth grade children with reading disabilities, Scarborough (1998) determined that deficits in several areas including phonemic awareness, verbal memory, rapid serial naming speed and IQ were stable over the six year span. This research also determined that a child at grade two who evidenced deficits in rapid serial naming speed would later be identified as reading disabled. Meyer et al. (1998) arrived at similar findings in their study of two different longitudinal samples, each evaluated at grades three, five, and eight. They found that for the poor readers, rapid serial naming speed was highly correlated with future word identification. They also found that while phonemic awareness was an accurate predictor for these poor readers, it was not nearly as accurate a predictor as rapid serial naming speed and that IQ was not at all, indicative of future reading problems. A study by Lovett (1995) of children

ages seven to thirteen diagnosed as having severe reading disability, examined how children with rapid serial naming speed deficits, as opposed to children with phonological awareness deficits or both, responded to remedial efforts. She determined that both groups of children with the rapid serial naming speed deficit responded similarly but more poorly than the group with the phonological awareness deficits. These findings were similar to those of Korhonen (1991) who concluded from his study of third grade students with deficits in rapid serial naming speed, that this group, when compared to other children with reading difficulties, had made the least progress by grade six.

Despite the converging evidence in favour of using rapid serial naming speed in identifying those who will continue to experience reading difficulties, several problems remain as highlighted by the 1997 study of Torgesen et al. which provided evidence to the contrary. These researchers conducted predictive analyses from second to fourth grade and from third to fifth grade in a sample of 43 poor readers which formed the bottom 20 percent of a group of 215 children who were followed from kindergarten to grade five. These analyses indicated that, with IQ controlled, rapid serial naming speed predicted reading, but that phonemic awareness was an even stronger predictor. Torgesen et al. speculate that since the temporal stability of reading scores over the two-year period was much higher than that of other samples of poor readers, this might explain why rapid serial naming speed had no impact on the outcome. As well, none of this group showed much improvement in their reading abilities over time, relative to norms, which likely resulted from lack of effective instruction. However, the weight of these findings

suggests that individuals who demonstrate rapid serial naming speed deficits show the least improvement over time and this piece of knowledge may prove useful in identifying those children who require greater assistance than other reading disabled children who do not have this deficit. Bowers and Wolf (1993) arrived at a conclusion similar to this analysis in their proposal of the double deficit hypothesis in which they determined that children with phonological and rapid serial naming speed deficits will be poorer readers than children with only one of these deficits. Building on this study, Badian (1997) proposed the addition of a third factor, orthographic processing, to try to understand why some children have such severe reading difficulties, essentially extending this double deficit hypothesis into a triple deficit hypothesis. At the present time, the exact nature of the relationship between rapid serial naming speed and reading ability is unclear. It is also unclear what types of intervention may remediate this difficulty and result in greater reading skill achievement for these children.

Successive processing is another area of concern for researchers into reading disability as it has been determined that deficits in this skill are characteristic of many children with reading problems. Findings suggest that successive processing may be a prerequisite or at least a co-requisite to the acquisition of phonological processing skills (Kirby et al. 1996). As such, it may prove to be a fruitful area for further research into the various precursors of reading disability.

Some of the findings cited above, including those of Scarborough (1998), Korhonen (1991), Lovett (1995) and Meyer et al. (1998), address one of the concerns raised by Keough (1994) and Satz and Fletcher (1988). These researchers determined that there is a lack of

sufficient longitudinal validation of reading disability predictors and screening devices in determining which predictors have value in the long term in identifying those who will continue to exhibit deficits in reading ability and will not go on to acquire fluent reading skills. This knowledge may, with continued research, lead to additional early identification and intervention techniques which will improve remediation of the reading skills of children with such debilitating deficits.

Using a different approach, Siegel (1988a) devised a system to detect future learning disabilities while a child is still in infancy. This relatively simple and easy to use system, which makes use of readily available information on a number of variables including reproductive, perinatal and demographic factors, has been shown to be a very reliable and accurate predictor of future learning problems including reading, spelling and arithmetic disabilities. When this system is used, children of parents from lower socioeconomic backgrounds have been identified as having more learning difficulties than children born into more affluent families. Severity of illness in the perinatal period for the preterm group, also led to poorer outcomes than for children who experienced healthy development throughout this period. This system has also been used to reliably predict aspects of cognition and language development in preschool children as well as specific reading disability and other learning disabilities during the primary school years. Since premature babies are at much greater risk for language difficulties than the general population, screening of such children would substantially reduce the incidence of dyslexia (Green, 1996).

Siegel (1988a) contends that the use of this system results in very few false negatives and

can detect, in infancy, almost all children who will exhibit learning disabilities six to eight years later. It does, though, result in many false positives which erroneously predict future learning disabilities in children who do not go on to demonstrate learning problems. However, this determination, and the subsequent referral to an infant stimulation or development program, has not been shown to be detrimental to any child, including those who would not have, even without intervention, gone on to experience learning or developmental problems. It may also be possible that this early identification prevented a learning disability in a child who was at-risk originally, but who overcame initial difficulties because of the timely and appropriate intervention.

Another means of detecting the potential for failure at reading early in the child's school life has been developed by Berninger and Abbott (1994). These researchers concluded that children can be designated as at-risk for reading difficulties in the very early primary school years and prior to actual failure at the reading task. This is done by analyzing the individual growth curves of children who have been exposed to specific interventions with demonstrated effectiveness for this population. Children who do not make the expected gains, referred to as treatment nonresponders, are red-flagged as at-risk for learning problems including reading disability.

With the number of identifiable reading precursors and their relationship with early, efficient reading development, as well as several reliable systems to predict future reading disability, coupled with the number of children in our school systems who subsequently go on to experience varying degrees of difficulty in acquiring basic reading skills, the onus is on parents

and early childhood professionals to detect, as early in the child's life as possible, potential reading and other learning problems. Failing this early detection, the school system must be ready to identify, immediately upon school entry, each child's developmental level, and be prepared to provide immediate, appropriate intervention to those children designated as at-risk for reading and other learning problems. The knowledge necessary to make this determination exists. It is thus essential for the school system to put this knowledge to immediate use for the maximum remediation of learning difficulties in early primary children.

For those who argue that preschool intervention is too costly, evidence to the contrary exists. Research shows that intervention with at-risk children who show phonological awareness deficits would not increase overall costs to the education delivery system and may actually reduce the total monetary costs of educating such students, notwithstanding the psychological cost to the student of struggling through an education system and later, life as a person with a reading disability. The cost of not doing so, however, is enormous. Dyslexic children fall behind more and more without appropriate and timely intervention and cost the entire system significantly more in terms of long term support in special education classes (Lyon, 1998).

In our quest for precursors, after school entry and before formal reading instruction begins, educators can analyze the strategies children use to decode unknown words. This knowledge is particularly important in light of the fact that phonetic decoders are better readers than those who do not use this strategy and that decoding strategies used in the first grade predict much of the variance in reading at the third grade. Inclusion of this variable would enhance the

predictive ability of any early screening device designed to detect early reading difficulties (Badian, 1997). This study also has important ramifications for instruction in beginning reading if we wish to prevent reading difficulties. Explicit instruction must be provided in using a phonetic strategy in beginning reading. Many children do not acquire a comprehensive knowledge of the alphabetic system and how it works and go on to develop maladaptive strategies which often harden into habits that prove very resistant to correction. They subsequently fall behind their peers in word identification and begin the downward spiral of reading difficulty and, often, disability.

Components of an Early Reading Intervention Program

Research over the past ten to fifteen years has identified several components which would ideally comprise an early reading intervention program designed to offset potential reading deficits. Intervention would initially focus on developing phonemic awareness in the very young child. This training would provide toddlers and preschool children with explicit knowledge of the phonemic structure of spoken words (Perfetti, Bell, Beck & Hughes, 1987). These researchers have determined that some phonemic awareness is necessary for learning to read. However, once this awareness begins to develop, the relationship becomes reciprocal with the development of phonemic awareness initially spurring beginning reading skills and then, beginning reading skills supporting and enhancing phonemic and other phonological awareness skills (Byrne & Liberman, 1999). This training would continue during the early school years and expand into a complete phonological awareness training program (Badian, 1997; Byrne & Liberman, 1999;

Clark, 1992; Elbro, 1999; Lyon, 1998; MacLean et al., 1987; Perfetti, 1987; Schneider et al., 1997; Vellutino & Scanlon, 1987).

A very strong, highly specific relationship has been found between knowledge of nursery rhymes and the development of phonological skills, a relationship which is significant even when socioeconomic status and IQ are controlled (MacLean, et al., 1987). Further to this, measures of nursery rhyme skills and of the detection and production of rhyme and alliteration are strongly related to the development of early reading. To this end the reciting of nursery rhymes, a very enjoyable activity for most young children, leads to development of phonological skills and ultimately to the more efficient acquisition of prereading and reading skills. This reading of nursery rhymes is one which can be carried out with infants and very young children within the context of a loving, parent-child relationship, and lays the foundation for developing proficient reading skills prior to or upon formal school entry several years later (Butt, 1998).

In addition to phonological awareness components, Vellutino and Scanlon (1987) have determined that other prereading skills need to be present prior to the child's introduction to formal reading if s/he is to learn to read normally. They contend that word recognition abilities comprise semantic and syntactic as well as phonological coding elements, and that deficiencies in the first two areas constitute a major source of reading differences in many beginning readers. Therefore, young children should be screened to determine whether semantic and syntactic awareness skills, and not just phonological awareness skills, are developing normally and remedial intervention provided where needed.

Another area recently determined to be deficient in children with reading difficulties is rapid serial naming speed (Badian. 1997: Bowers & Wolf. 1993; Korhonen. 1991; Lovett. 1995; Meyer et al.. 1998; Scarborough. 1998). Deficits in this area do not seem to be primary ones but co-occur with and compound deficits in phonological awareness. letter knowledge. and verbal memory. Evidence to this point seems to suggest that children who have a deficit in this area appear to have very severe reading disabilities which are more resistant to intervention than those who are of average proficiency in this area (Korhonen. 1991; Lovett. 1995; Torgesen. 1997). This may enable us to identify children who are in much greater need of assistance. particularly early assistance. than others with reading disabilities. These are children whose reading abilities will never reach their full potential without such critical. timely intervention. At the present time. it is unclear what intervention methods may best be used to ameliorate this deficit area.

All of these prereading skills would ideally be developed within a nurturing family setting with the emphasis being placed on enjoyable activities and rich. shared language experiences (Butt. 1998). Lyon (1998) states that early language experiences should begin in the very first days of life and continue throughout the child's preschool and primary school years and include the enjoyment of rhyming activities. listening to and sharing picture books and picture storybooks. early writing opportunities. activities in word identification to develop accurate. fluent word recognition skills and direct. systematic teaching of phoneme awareness and phonics skills within a literature and language rich environment. Recognizing that not all homes foster such fruitful early learning experiences. a concerted effort on the part of institutions which

monitor the development of young children to put together activity-oriented programs designed to develop the prereading skills researchers have determined will foster early reading development. should be a priority for society. In addition to developing necessary skills in very young children. parents could be educated to recognize the necessity of such early learning experiences and encouraged to continue these activities long after formal, institution-based programs have concluded (Butt. 1998). Early intervention in those areas identified as crucial to the development of normal reading skills would produce better readers. not only among those at-risk for reading disability but among all children. thus helping every person reach his/her potential.

If we cannot or do not wish to identify specific prereading deficits in a particular population of preschool children. an alternate route would be to offer phonemic and phonological awareness training to all primary school children as early as possible. This could be accomplished through the inclusion of training in these components in standard reading programs. This preventive and remedial measure would have benefits for both normally achieving children and those who would be identified later as reading disabled. in that it would alleviate or lessen problems and deficits associated with reading disability while providing richer language experiences for all children.

Intervention During the Early Primary Years

Effective programs at the early primary school level must consider the deficiencies identified during preschool and/or early kindergarten years and continue to emphasize prevention

and early intervention, before a child fails at the actual reading task. Such comprehensive programs would be complete, systematic, carefully planned alternatives to be used in conjunction with or, in more severe situations, to replace traditional methods and would include intensive, daily one-on-one tutoring adapted to meet the child's needs. These programs would emphasize frequent assessment of the child's skill level and adapt instruction to reflect this current level of knowledge (Fletcher & Foorman, 1994). Direct, early and appropriate instruction emphasizing phonological awareness appears to be the most beneficial route to follow as research shows that most children with reading difficulties do not catch up. Seventy-four percent of students who are identified as reading disabled at grade three remain reading disabled in grade nine (Fletcher, 1994; Stanovich & Siegel, 1994). Explicit early instruction must be provided in the use of phonetic strategies and the way in which the alphabetic system works (Badian, 1997). Liberman et al. (1989) found that phonological awareness deficits (the core deficit in reading disability) are usually responsive to remediation and O'Connor and Jenkins (1997) determined that children with phonological awareness weaknesses can learn to read with appropriate instruction. These findings were confirmed by Blachman (1994), Felton (1993) and Spear-Swerling and Sternberg (1995).

Adams (1990) advocates the systematic teaching of phonics, built upon a sound phonemic and phonological awareness foundation as the single, most successful method of teaching not just young or disabled readers, but all children to read. Vellutino and Scanlon (1987) found that children who received training specifically in phoneme segmentation did better in the long term

than those using a whole word approach. This suggests the need for training in this particular skill area, as well as other phonemic and phonological awareness areas, as an adjunct to traditional methods of teaching reading in the early primary grades. The inclusion of specific phonological awareness training activities in standard reading programs could make a significant difference for all children, especially those who exhibit reading difficulties upon school entry (Adams, 1990). As with the preschool group, this preventive measure would benefit all beginning readers, not just those who begin formal schooling with recognized prereading deficits. With the focus on developing prerequisite reading skills in early intervention, fewer children would go on to be identified as reading disabled, and those who would be so identified would likely achieve a reading skill level which more closely approximates the norm than would children whose identification and remediation are delayed.

Training studies (Ball & Blachman, 1988; Cunningham, 1990; Hatcher, Hulme & Ellis, 1994) have shown that children make the most progress when phonological awareness training is done in combination with the meaningful teaching of letter/sound relationships. In this way explicit links are formed between the child's underlying phonological awareness and his/her experiences in learning to read. The Easy Steps to Reading Independence (ESTRI) developed by Biggins and Sainz (1997) is a support program designed to be used in conjunction with either a whole language or basal reader program which allows both nonreaders and readers with limited ability to begin reading immediately. It can be used with reading disabled students at various age and grade levels without requiring a sight word vocabulary before beginning the program. This

approach employs a simplified method for decoding unknown words and builds on the child's listening and speaking abilities to develop skills in reading and writing. ESTRI takes a "cumulative and spiral approach" to developing phoneme/grapheme correspondence relationships, using the specific rule that each syllable of a word contains a vowel sound and this vowel sound appears in five ways in the English language. The developers suggest this program, which is currently in use in a number of schools run by the New York State Department of Education, may be particularly effective with older students who have not been identified early enough to maximally benefit from early intervention.

Programs developed by Bradley and Bryant (1983) and Lundberg et al. (1988) provided a test of the potential causal connections between phonemic awareness and written language through longitudinal intervention programs. These programs direct the child's attention towards the form of spoken language, rather than its content, through listening and whole word activities and exercises with rhyme that focus attention onto individual phonemes. Such activities have demonstrated considerable positive impact not only on children's phonemic awareness but also on their subsequent reading and spelling development. Other programs have shown that the effects of phonemic awareness training are greatly enhanced when training is combined with letter knowledge (Elbro, 1999). Phoneme awareness training has preventive effects in at-risk children; however, effects are smaller in groups of poor readers than in groups of preschool children. It may be that poor phoneme awareness is an indication of a more pervasive language problem; alternately, only minor problems in this area may be amenable to phoneme awareness

training, or perhaps no current phoneme awareness program is capable of training all phonological segments of importance to reading. This area requires more research for such issues to be clarified (Elbro, 1999).

Brady and Moats (1997) propose an "informed approach" which incorporates two principles: (a) systematic, explicit, activity-oriented reading instruction which leads to discovery and learning and (b) frequent practice of writing, spelling and reading skills in meaningful contexts. Children need to discover that words are made up of meaningless sounds and to identify those sounds, learning first the beginning, then the ending and finally the medial sounds, thus developing awareness of the phonemes in all positions in spoken words. Emphasis must be placed on decoding, comprehension and writing, as well as augmentation of early reading instruction with successive processing and phonological coding (Kirby et al., 1996).

Efficient reading is not just word recognition. It must also lead to an understanding of the material read. To address this need, the early primary school program must include elements to instruct the child in ways to derive meaning from this material. Vellutino and Scanlon (1987) found that children who received instruction in deriving meaning in beginning reading as well as in phonology, were more likely to succeed than children who received either one alone. Spear-Swerling and Sternberg (1995) and Adams (1997) concur with this assessment that all children benefit from code-oriented as well as meaning-oriented instruction, especially those at-risk for reading disability.

Kindergarten and first grade prevention programs and classroom change models have also

proven to be effective. An example of such a program with a documented effectiveness record is the Reading Recovery Program (Clay, 1979, 1985) which includes extensive diagnoses of children who are experiencing reading difficulties relative to their peers, at the end of one year of schooling. This program provides intensive one-on-one instruction which focuses on the essential skills of reading - self-monitoring, word analysis, phrasing and fluency and aims to have children attain a median level of reading ability relative to their classmates after 15 to 18 weeks and not require further intervention. This intensive instruction is provided by trained Reading Recovery specialists to at-risk students for 30 to 45 minutes daily and includes many components which have been determined to be critical to successful primary level reading, including explicit instruction to develop phonemic awareness and remediate other identified deficits and practice doing actual reading. Each day's lesson typically contains a number of elements essential to teaching beginning reading including rereading of familiar books as well as new books, letter identification and writing. Such lessons provide a number of elements deemed critical to the development of early literacy including: (a) individualized instruction which builds on the child's assessed strengths and needs, (b) practice in letter recognition, concept of a word, phonemic segmentation and other print concepts, (c) repeated reading of real text at the child's independent/instructional level and (d) frequent writing practice.

Despite initial reports of success, Reading Recovery has not proven to be the panacea for reading problems that its developers hoped it would be, as gains made in this intervention do not endure unless classroom practices offer appropriate challenges at ascending levels of difficulty

and home support continues (Snow et al., 1998). Additionally, Reading Recovery does not explicitly teach phoneme-to-grapheme correspondences as Juel (1999) suggests many children need. Instead, it is left to the child to infer these correspondences indirectly and this likely reduces the efficacy of this intervention for a number of students who require such explicit instruction as determined by Snow et al. in their review of the literature into preventing reading difficulties in young children. However, it is not necessary to abandon this approach. Instead, these findings suggest that we should supplement with such practices as including instruction in the code (Iversen & Tunmer, 1993) which is in keeping with the recent information regarding how young children best learn to read.

Classroom change models were also successful in ameliorating later reading difficulties (Fletcher & Foorman, 1994). Such models are based on the premise that the best way to minimize the need for later remedial help is to provide the best possible classroom instruction immediately upon school entry and to highlight individual pacing of students through a sequence of well-defined instructional objectives. In such situations children are taught in small groups based on skill levels, and are continuously assessed and regrouped based on these assessments.

Hultquist (1997) contends that orthographic processing is another area in need of remediation in reading disabled children. By focusing only on their phonological awareness skills, we run the risk of helping them become better decoders without remediating their reading rate problems. Since orthographic processes account for more of the variance in spelling and reading rate than in reading accuracy (Barker, Torgesen & Wagner, 1992), we may be teaching

them only to be fluent decoders while allowing them to remain poor spellers and dysfluent readers. This, in turn, is likely to make them more susceptible to reading comprehension problems. Research has made great strides in uncovering and remediating the deficient phonological processes underlying dyslexia. Our attention must also turn to the visual aspects of reading and spelling with remedial efforts focused on helping reading disabled children overcome their orthographic weaknesses, thus improving their fluency as well as their accuracy. Despite these findings, a different point of view was suggested by Stanovich, West and Cunningham (1991) who argue that explicit remediation of orthographic processes may not be necessary as these skills emerges in large part as a direct result of print exposure. Because of this, exposing reading disabled children to print by requiring them to read for a specified amount of time each day may be all that is necessary to improve their orthographic processing skills. Again, more research is needed to clarify the role of orthographic issues, particularly in the area of remediation of such deficits in reading disability.

One very successful remediation program carried out by university student athletes (many who were poor readers themselves) with at-risk first grade children was analyzed by Juel (1991) to determine which components were critical to its success. Careful scrutiny of this program uncovered both qualitative and quantitative elements which contributed to the success of this program. The qualitative issues are: (a) the development of a positive relationship between the tutor and tutee coupled with lots of verbal and nonverbal reinforcement of the child's achievements, (b) tutoring sessions characterized by ample scaffolding (i.e. a process of

providing the tutee with just enough assistance on each task to ensure success) of reading and writing experiences and (c) sufficient cognitive modeling of the reading and writing process by the tutor so that the tutee was led explicitly through the tasks of word recognition, spelling and writing, thus making each one clearer to the learner. One of the most effective techniques in this cognitive modeling process involved the reversal of roles between the tutor and tutee such that the tutee became the teacher and the tutor became the student, which enabled the child to take a more active part in understanding how the teaching/learning interaction worked Quantitative results clearly demonstrated that the more successful tutors spent significantly more time on two specific activities: (a) explicit instruction in sound/symbol correspondences and (b) more use of the build-up readers which each tutor/tutee dyad had authored. These build-up readers introduce high frequency vocabulary as well as new words which contain common phonogram patterns. This use of one-on-one tutoring is recommended by Quatroche (1999) as the most effective intervention for struggling readers. She suggests the following components should also be included in an intervention program: (a) explicit teaching of phonological awareness, letter/sound relationships and word patterns, (b) repeated exposure to enhance word recognition and to increase sight word vocabulary, (c) ongoing teaching of comprehension strategies via such monitoring skills as self-questioning, visual imagery, retelling and question-answer relationships and (d) repeated reading of connected text to develop fluency, accuracy and increased word recognition.

Repeated reading of short sections of text has demonstrated efficacy in developing

fluency in beginning readers during the past decade (Dowhower, 1994; Samuels, 1997). Wheldall (2000) conducted an experimental evaluation of this strategy to develop reading fluency using the Rainbow Reading Program and found that, not only did it build fluency, it also developed accuracy and some comprehension skills as well. The use of this program to build reading skills and self confidence, as well as direct instruction in sight word vocabulary via flash cards, can be added to the remedial specialist's repertoire of techniques for remediating the deficits of reading disabled students (Frantantoni, 1999).

In attempting to maximize crucial remediation time it is just as important to recognize what does not work as it is to determine what actually does help the young child overcome reading difficulties. Fletcher and Foorman (1994) state that diagnostic-prescriptive pullout programs show little evidence of effectiveness unless they involve one-on-one tutoring. Such tutoring has substantially improved the effectiveness of these programs, particularly in the long term, with children who have identified learning disabilities. As well, mainstream programs where a special education assistant works right in the regular classroom have been no more effective than pullout programs unless the assistant is specifically assigned to a particular student to carry out an intervention program based on the child's identified strengths and needs.

The use of context as a primary strategy for figuring out unknown words also needs to be rethought in light of recent information. Despite the fact that its use has always been a staple in beginning reading instruction, particularly among whole language proponents, researchers have determined that it is not a useful nor productive strategy (Liberman, 1998; Lyon, 1998). Most of

the words which children miss are content words and these can be predicted from context only between 10 and 40 percent of the time. The remaining 60 to 90 percent results in many errors and causes children to misread and misunderstand the meaning the author wishes to convey. A study by Tunmer and Chapman (1998) confirms these figures. They determined that the average predictability of content words in running text is about 10 percent compared to 40 percent for function words which are usually the short, high frequency words that beginning readers can already recognize. Deriving meaning from the text depends disproportionately on the recognition of the least familiar and predictable words. As a result, unless children are reading very low level material with repeated sentence structures, high predictability and an extreme amount of picture support, they have a 10 percent chance of guessing the correct word. This is neither a strategy to build skill in word recognition nor promote comprehension. These findings strongly suggest that we need to rethink the balance between the use of letter/sound relationships and context cues. While whole language proponents advocate the use of context cues as a primary strategy for recognizing unfamiliar words in context, it appears that the use of this strategy is not very productive and we would do well to use graphophonic cues (the mapping of letters to sounds) as a first strategy and to use context cues sparingly in teaching beginning reading.

Intervention/Remediation Beyond Primary School

Statistics reveal that children who are identified as reading disabled beyond the primary school years are considerably less responsive to remediation (Fletcher & Foorman, 1994). Despite this, many reading disabled children are not identified until the end of the primary school

years and sometimes even later. As well, the literature on remediation and prevention of reading disability focuses almost exclusively on the preschool and primary school population. As such, there is a dearth of information regarding the most useful ways to help children overcome their reading problems when identified as reading disabled after their primary school years. Nevertheless, despite the lowered probability of remedial success, we must, once they are identified, take appropriate measures to ensure they achieve to their remaining potential.

Attempts to help children at this late stage must be multifaceted. As in the preschool and early primary school years, remediation should begin immediately upon identification as Felton (1998) has determined that students who are poor readers in grade three will continue to be poor readers in grade eight. He determined as well, that poor readers make more gains between grades three and five than between grades five and eight, particularly in their facility with decoding, thus highlighting the critical need for intervention to occur as early as possible. This finding may be due in part to the greater emphasis placed on the active teaching of various reading skills which continues to a greater degree during the early elementary school years than in the junior high years when a person generally has acquired fluent reading skills and uses these skills to facilitate learning in other subject areas. Remediating skill deficits should continue to be a focus, though not necessarily the primary one, of a remedial program at this time. Phonological awareness and phonics training should be a part, but not the major thrust, of a comprehensive remedial program. Such training should lead to more rapid decoding and word recognition (Siegel, 1989a).

However, training in metacognitive strategies which teaches the student to monitor

his/her reading, thus leading to enhanced comprehension of the material being read, should be an integral part of any remedial program at this level (Dole, Duffy, Roehler & Pearson, 1991; Duffy, Roehler & Herrmann, 1988). In addition to remedial strategies, a comprehensive program at this late stage should also focus on helping the student develop compensatory strategies so that, when decoding and word recognition skills fail, s/he will have another route to acquire knowledge which is the primary task of older elementary and early high school students (Brozo, 1990; Gillet & Temple, 2000). Such compensatory strategies include using oral aids such as taped texts and lectures, voice-activated microrecorders and oral note-taking. Strategies at this level should also focus on developing comprehension and general background knowledge by careful listening rather than relying primarily on reading to develop information.

Interventions which result in skill development or enhancement can lead to positive changes in adolescents' self esteem, and students in this age group respond well to such interventions (Special Education Programs, 1999). Successful interventions include instruction in the use of self-monitoring and repair strategies, peer-assisted learning and instruction in the use of comprehension strategies. Direct, explicit strategy instruction in all areas appears to be the most effective means of helping such students ameliorate their reading difficulties. Successful interventions are those which teach adolescents multiple strategies through intense and frequent instructional sessions. Lyon (1998) contends that the intensity and duration of intervention programs must increase exponentially as children get older in order to approximate the same degree of remediation possible during the very early school years.

It appears, however, that the most successful strategies at this level include efforts to raise self-esteem, to empower a child to take control of his/her reading and to create expectations of success (Harwell, 1989; Satz & Fletcher, 1988; Special Education Programs, 1999). Such strategies encourage the child, despite past failure, to believe in him/herself and develop the confidence to undertake this seemingly insurmountable problem, and, in so doing, enable him/her to develop some of the skills which will make reading easier. It also appears that encouraging a child's parents to believe in him/her, as well as encouraging the child to put forward a greater effort, can result in greater gains in the child's reading achievement (O'Sullivan, 1992; O'Sullivan & Joy, 1994). Many of these children, as well as their parents, are discouraged by years of failure at reading. Such support and encouragement for all parties would promote perseverance in this difficult task and instill a desire to succeed, a strategy which may be more beneficial than any other remedial strategy the child has acquired to date. Such feelings of learned helplessness or passive failure, which make the adolescent feel that no matter what one does nothing will help, make students resistant to intervention. These students believe that, regardless of their efforts at remediating their reading difficulties, they have little or no control over their successes or failures in school. These feelings of helplessness can be reduced through modeling the literate behaviour of respected and trusted individuals. Such modeling as successfully reading a book or tackling a difficult writing assignment provides the struggling student with motivation and builds incentive to overcome reading difficulties (Gillet & Temple, 2000).

A comprehensive review of remedial strategies and programs suggests that prevention is the most productive and cost efficient way of dealing with a reading disability and this can be achieved most effectively through the provision of sound instruction for everyone, not just those who may be at-risk for reading disability. Snow et al. (1998) state that the type of reading instruction children receive is critical to the prevention of reading difficulties. As well, effective instruction is an essential component of the successful acquisition of reading competency for everyone. Quatroche (1999), in her review of the current status of reading performance in America as determined by the 1998 National Assessment of Educational Progress, found that the following five principles underlie effective initial reading instruction: (a) a focus on using reading to derive meaning from print; (b) developing understanding of the structure of spoken words; (c) helping children understand how the orthographic system works; (d) practice in the use of sound symbol/relationships and (e) the provision of many opportunities for reading and writing in meaningful contexts. Beyond this, children must have an understanding of how sounds are represented by print and frequent opportunities to practice reading to develop fluency, to increase their vocabulary and to monitor their understanding of what they are reading.

What is needed is a change in focus from the primary reliance on the whole language approach to one which places more emphasis on decoding skills in initial reading instruction. Adams (1997) advocates such an approach when she states that proficient knowledge of spelling/sound correspondences of English does not come naturally. It requires much practice and for many children does not occur without intensive, direct and explicit teaching. Vellutino (1991)

stated this position earlier in the decade and concluded that with well-designed reading instruction which includes explicit teaching of grapheme-phoneme relationships. all but one to three percent of children can learn to read fluently. Despite what whole language proponents believe. learning to read is not like learning to speak. Reading is not a natural process and whole cultures throughout the ages have not used written language despite always having a spoken one (Byrne & Liberman. 1999: Gough. 1993: Gough & Juel. 1991: Lyon. 1998: Shaywitz. 1998). While whole language's emphasis on rich literature is commendable. it is not sufficient for a number of children to learn to read. Research comparing the use of childrens' literature instead of controlled vocabulary texts (either high frequency words or phonics-based) suggests that while the former is effective in developing in children the basic print concepts it is not as effective in facilitating their decoding and word recognition skills (Juel. 1999). Many children need explicit instruction in the sound/symbol relationships on which our alphabetic print system is based as well as experiences with reading repetitive text which makes use of this knowledge (Hiebert. 1994).

With our rigid adherence to primarily a whole language approach we are. in effect. creating a generation of disabled readers. This writer is not advocating that the whole language methods of early reading instruction be thrown out. What is needed is a balanced approach to the teaching of reading. one which uses a variety of methods while recognizing that children learn to read in many different ways and one which takes into account these individual needs in instructing children in beginning reading. Bock (1998). Juel (1999) and Lyon (1998) agree with

this position and argue that the more soundly based aspects of the whole language approach, particularly the immersion of children in literature-rich environments, should not be abandoned. Instead we can supplement the rich language/literature base provided by this approach with some explicit instruction in deciphering the alphabetic code as well as in reading controlled-vocabulary texts. They argue that, contrary to what whole language proponents advocate, we do not have to take an all or nothing approach to beginning reading instruction. Rather, what we should do is pick from the menu of beginning reading choices to tailor a program which fits the child's individual needs and results in his/her learning to read while being mindful of the research which overwhelmingly shows that decoding strategies taught within the context of whole language produces the best readers.

In keeping with this multi- faceted approach to teaching beginning reading, Stanovich and Stanovich's (1999) reiteration of the ideas brought forward by Jeanne Chall (1967) in her classic review of the acquisition of beginning reading skills, provides further support for the use of varied methods in initial reading instruction. In this summary of effective prereading and early reading skills, Chall reminds us that phonics taught in isolation from the reading of good books is not recommended. She suggests, instead, that library books rather than work books be used by children not working with the teacher. A further suggestion is that writing be incorporated into reading instruction. Her analysis strongly argued that some children in whole language classrooms do not readily acquire the alphabetic principle through simple immersion in print and writing activities, but need explicit instruction in sound/symbol correspondences if they are to

learn to read. It appears, however, that society in general and education advocates in particular are slow to learn from history, as we continue to make the same mistakes repeatedly despite massive amounts of research to the contrary. In her summation of the needs of beginning readers, Adams (1997) has stated that 100 years of scientific research has meticulously, repeatedly and incontrovertibly determined that for children to read fluently and with reflective comprehension they must first acquire a deep and readily accessible working knowledge of the spellings of words and their mappings to speech, and second that poorly developed concepts of spelling and sound/symbol correspondences are the most pervasive cause of reading delay (Rack, Snowling & Olson, 1992; Stanovich, 1986a, b). Furthermore, instruction is critical in enabling children to acquire this knowledge and research suggests that well designed instruction can make readers out of 97 to 99 percent of the population of school children instead of the almost 80 percent we currently produce (Vellutino et al., 1996), thus sparing this other 17 to 19 percent of students the ordeal of severe reading delay know as dyslexia.

Further research by Foorman, Francis, Fletcher, Schatschneider and Mehta (1998) confirms this summation in its finding that instruction which includes explicit, systematic instruction in the alphabetic principle as well as activities and materials which engage children in the practicing of their growing knowledge of sound/symbol correspondences and spelling, both in isolation as well as in meaningful activities, are most likely to produce fluent readers. Goswami (1999) would add instruction in rhyme and analogy skills to the explicit teaching of grapheme/phoneme correspondence strategies to enable children to learn more readily to crack

the code.

Grossen (1997) confirms the value of high quality instruction which places decoding skills at the center of the teaching of early reading skills and contends that the weight of research findings proposes the following seven principles of good instruction in early reading: (a) begin to teach phonemic awareness directly, very early in the child's life, (b) teach sound/symbol correspondences explicitly and systematically, (c) teach frequent, highly regular spelling/sound relationships, (d) teach children exactly how to sound out words, (e) use connected, decodable text for children to practice their spelling/sound relationships, (f) use interesting stories to develop language comprehension and (g) balance the use of comprehension and decoding strategies but don't mix them in the same lesson while children are still learning to decode.

Future Directions

The field of learning disabilities, including the specific area of reading disability, continues to evolve as it has since its inception over a hundred years ago. Many gains have been made in identifying children with such disabilities and determining the characteristics which comprise these disabilities. Gains have also been made in the development of procedures which attempt to overcome or circumvent such disabilities. Nevertheless, much remains to be done.

Perhaps the area of greatest need in the reading disabilities field, as noted by the controversy in the literature, is an identification procedure which is not tied to IQ scores (Badian, 1994; Siegel, 1989a, b, 1992; Stanovich, 1989a, b, 1993; Stanovich & Siegel, 1994). Many researchers contend this would result in a more complete and appropriate identification of most

or all children with a reading disability. Conclusive, long term studies in this area would put the issue of IQ discrepancy versus non discrepancy in the identification procedure to rest, thus allowing the efforts currently expended on such matters to be channeled into more productive areas including the development of better early identification and improved remediation procedures. More longitudinal studies are also needed, which compare the reading performance of IQ discrepant and nondiscrepant groups of children with reading difficulties, to determine whether differences in IQ should be the basis for providing differential remediation to these groups of poor readers (Felton, 1998; Lyon, 1994; Siegel, 1989a; Stanovich, 1988).

Building on the research of the past ten to fifteen years, knowledge must be disseminated to those most in need of it, parents of young children and teachers, particularly those who work with preschool and primary children (Adams, 1990; Butt, 1998). Contemporary teacher education programs must reflect this knowledge of how children best learn to read in the courses provided to preservice teachers. Learning to read and teaching preservice teachers how to effectively teach these skills must be accorded top priority in any teacher training program. Such programs must also give prospective teachers the knowledge to identify language delays and reading difficulties long before they become entrenched and much less resistant to remediation. Prospective teachers need to develop knowledge of remedial procedures which will enable them to put in place, very early in the child's formal school life, strategies to help him/her overcome reading difficulties.

Chall (1997) argues that new and current teachers must be trained in the teaching of phonics and other beginning reading skills. Teachers need to understand why phonics is a

necessity as well as the specific sequence of phonic skills to teach. We also need to educate teachers in ways to prevent reading difficulties in young children and make them realize that the methods which work best for normally achieving children. also work for those having difficulty. This will enable us not only to produce better readers but also to reduce the number of children who will experience reading problems. Effective instruction to prevent reading difficulties. according to Lyon (1998). must be instilled in teachers during their preservice training programs. He contends that most teachers have not been given the opportunity to acquire basic knowledge about the structure of our English language. reading development and the nature of reading difficulties. Such preservice programs for teachers of young children must be changed so that new teachers will acquire the necessary content and pedagogical experience which. research has overwhelmingly demonstrated. leads to effective reading instruction and the prevention of all but a very small percentage of reading difficulties.

Correcting the lack of appropriate preservice training for teachers is an important first step. Adams (1997) maintains that many teacher education institutions are not doing a good job of teaching teachers to teach reading. Teachers emerge from such preservice programs with little specific knowledge of how to proceed. and even at times with inaccurate information about which is the best way to teach reading. Such institutions are failing teachers and their students in not sharing the thrust and weight of the research which overwhelmingly favors a code-based approach over others.

Textbook publishers also. must share some of the blame as they develop whole series of

graded reading texts and lobby various education departments to adopt their particular series. Such publishers provide a variety of support and promotional materials, as well as inservices in these materials, to ensure their texts will be used. As a result, commercial interests decide, to a large extent, how and what beginning readers will be taught. Instead, well informed committees who have delved into the research, should determine what needs to be included into a beginning reading program and then find materials which fit this criteria. What we have instead is a set of materials which tries to mold children's reading into a predetermined set of skills, regardless of a child's identified needs or what the research says (Adams, 1997). A comprehensive preservice teacher training program should include, not only courses on reading and writing instruction, but also language development, children's literature and other topics relevant to literacy. Teachers must be provided with a solid understanding of the theoretical and scientific underpinnings of literacy development. Preservice teachers must acquire an extensive knowledge of the development of phonological awareness and the process of learning to read. They must be knowledgeable about children who are experiencing difficulties and know how to assess and remediate these difficulties. Additionally, teachers must understand the structures of the language, the phonology, morphology, syntax, text structure and pragmatics. A preservice education program for teachers should include the following components: (a) information about how our language is structured, how written language represents spoken language and what is required for children to become proficient readers and (b) a supervised practicum which includes exposure to readers at all stages of reading development including delay and arrest. Moreover,

school psychologists who diagnose reading disabilities must know how to distinguish reading disabilities from other learning disabilities as well as how to differentiate between phoneme awareness and comprehension difficulties. An understanding of the research on the cognitive and linguistic correlates of reading problems as well as knowledge of the kinds of errors children make at different points in their literacy development is crucial to informed diagnosis and treatment recommendations.

Many of the teachers in our schools are not recent graduates and perhaps are not fully aware of the recent research into learning to read and reading difficulties. Continuing professional development for such teachers, especially those who completed their education programs more than ten years ago, is a must. This ongoing education is necessary to ensure that their classroom practices reflect the knowledge of reading development which has accumulated over the past ten to fifteen years. As well, it must also address the issue of identification and remediation of reading disabled children, who were previously served in segregated classrooms and were not primarily the responsibility of the regular classroom teacher, as they are today.

Curriculum must also reflect current knowledge of reading development. In so doing it must move away from its over reliance on whole language and whole word recognition to encompass first, the phonological and phonemic awareness strategies and then the phonic skills which are known to facilitate prereading and beginning reading skills, particularly in the population predisposed to develop reading problems (Adams, 1990; Chall, 1997; Snow et al. 1998). Such moves would not only enable children with reading difficulties but all beginning

readers, to acquire more efficient reading skills. While most readers learn to read regardless of the approach used, research has shown that most reading disabled children need to be explicitly taught these skills and strategies, including decoding strategies, and provided with numerous opportunities in their use, if they are to learn to read as well as they can.

There is evidence recently that some curriculum developers are beginning to consider the weight of evidence suggesting the need for a more balance approach to the teaching of reading. For example, the Atlantic Provinces language arts curriculum, which promotes a balanced approach with its integration of the phonological, syntactic, semantic and pragmatic cueing systems to teaching reading, is an acknowledgment of the current research which strongly suggests that exposure to excellent literature alone, will not make readers out of the entire school population. Such curriculum initiatives are representative of the direction of other language arts curriculums across Canada, New Zealand, Australia, the United Kingdom and other parts of the world.

Reading methods must change. There must be a much greater emphasis on the explicit teaching of skills, including phonics. Research into reading methods from the 1900s to the 1960s which has seen code-based approaches replaced by meaning-based ones and vice versa, was analyzed by Jeanne Chall (1967) in her classic work, *Learning to Read: The Great Debate*. This researcher states that history has repeatedly and irrefutably demonstrated that code-based approaches to teaching beginning reading are superior to other methods for all children, but are crucial for those deemed to be at-risk for reading failure. Things had not changed when Chall

(1983) wrote her update of *The Great Debate*. In her more recent work, *Are Reading Methods Changing Again?* (Chall,1997), she confirms what her earlier analyses have already borne out: instruction in the code leads to better results both in word recognition and comprehension. Code based approaches continue to be superior to other methods of teaching beginning reading. What implications this has for such literature-based approaches as whole language is unknown. What is known, however, is that previous approaches which explicitly taught children to crack the code always recommended the teaching of connected reading via good literature. This time around, we may be able to marry the two approaches into a unified one which, in drawing on the strengths of each one, enables us to overcome the limitations of the other (Chall, 1997; Otuya & Krupka, 1999). The recent development of new curriculum in the Atlantic Provinces, which mirrors what is happening in other parts if the world, is encouraging in its advocacy of a multi-method approach to the teaching of reading, particularly beginning reading skills.

If many children need explicit instruction to crack the code and learn the alphabetic principle, we must provide explicit, systematic instruction in phoneme awareness and the use of the phonetic strategy. However, the current state of knowledge does not provide us with a recognized sequence for acquiring such skills. We know that children learn first about words, then syllables, and then individual phonemes. We also know that a part word strategy is inferior to a phonetic strategy and eventually becomes a negative predictor of reading ability. This is particularly true of multisyllabic words. Having decided that all children can benefit from the use of phonic strategies, we must recognize that the most beneficial sequence of learning these skills

has not yet been determined. We need research to identify the specific sequence of teaching phonetic skills which will allow the vast majority of young children to acquire decoding skills in the most expedient manner (Badian, 1997). Chall (1997) also states that more collaboration between remedial specialists and regular classroom teachers is needed if we wish to reduce the incidence of reading difficulties among children. It is important to note that the weight of research which advocates a return to the systematic, explicit teaching of the alphabetic principle is not advocating a rejection of whole language methods and reinstatement of "old" phonics methods. Rather, it proposes an integration of the two, which incorporates the best of both instructional worlds for young children (Chall, 1997; Otuya & Krupka, 1999).

Summary

Early identification and intervention with children evidencing reading and other language problems is crucial if we are to reduce the incidence of reading difficulties, including reading disability, in school age children. Research has provided us with the knowledge to identify these children very early in life as well as the means to help them achieve to their maximum potential. Early literacy development from infancy through the preschool years, followed by excellent teaching practices once the child begins formal schooling, can make fluent readers out of 97 to 99 percent of the population. The other one to three percent of school age children, those who evidence significant disruption in acquiring fluent reading skills and referred to in the literature as reading disabled or dyslexic, must be provided with remedial and compensatory strategies which will enable them to achieve to the best of their ability, whatever that level is for each

individual.

Research since the 1900s through to the present day has repeatedly and overwhelmingly demonstrated that the most effective way to help children, particularly dyslexic children, acquire proficient reading skills is to instruct them in the use of the alphabetic principle via code based approaches to teaching beginning reading. This instruction must be supplemented with the reading of connected text, particularly good literature. This two-pronged approach has demonstrated that most children can learn to read fluently. The challenge for parents, educators and other professionals working with young children is to ensure that the thrust of the research into teaching reading and preventing reading problems in young children is disseminated to those responsible for teaching young children to read.

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