

Part I: Foundations

Overview of Children with Learning Problems, Schools, and Approaches to Helping

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In most societies, educating children is a universal goal that takes between ten and twenty years. One's level of education has long-term economic, social, and personal implications; a child's failure or perceived failure in school has a significant impact, leading to a series of responses by families and educators intended to solve the problem or improve academic performance.

The field of learning problems continues to evolve as new information emerges and approaches change. This chapter provides an overview of the field of learning problems and the different entities that lead to problems in school.

PREVALENCE OF LEARNING PROBLEMS

Estimates of the prevalence of learning problems vary from 3% to 20%(1), but the current consensus is that 10% to 15% of school-aged children are experiencing difficulty at any point in time. This includes those with a number of different difficulties that require further definition for appropriate interventions.(2)(3)

For specific learning disabilities (LDs), the variability in prevalence is also a result of different cut-points or formulas used to define them. Depending on the range of intelligence quotient (IQ) chosen to determine average ability and the instrument used to measure academic achievement, different boundaries will lead to a different prevalence.(4) However, the figure of 10% remains the most consistent and supportable estimate.

Numerous attempts to define learning problems have been made as understanding has improved, and different models have been found useful. Many disciplines, including education, psychology, psychiatry,

neurology, and paediatrics, have looked at the issues. So it is not surprising that different aspects of the definitions have concerned investigators from different professional backgrounds. The most common reason for a child not acquiring academic skills is a learning disability. In 2002, the Learning Disabilities Association of Canada adopted a definition that is used by the national and provincial LD associations in Canada:(5)

Learning disabilities refer to a number of disorders which may affect the acquisition, organization, retention, understanding or use of verbal or nonverbal information. These disorders affect learning in individuals who otherwise demonstrate at least average abilities essential for thinking and/or reasoning. As such, learning disabilities are distinct from global intellectual deficiency.

Learning disabilities result from impairments in one or more processes related to perceiving, thinking, remembering, or learning. These include, but are not limited to: language processing; phonological processing; visual-spatial processing; processing speed; memory and attention; and executive functions (e.g., planning and decision-making).

Learning disabilities range in severity and may interfere with the acquisition and use of one or more of the following:

- oral language (listening, speaking, understanding)
- reading (decoding, phonetic knowledge, word recognition, comprehension)
- written language (spelling and written expression)
- mathematics (computation, problem-solving)

Learning disabilities may also involve difficulties with organizational skills, social perception, social interaction, and perspective-taking.

Learning disabilities are lifelong. The way in which they are expressed may vary over an individual's lifetime, depending on the interaction between the demands of the environment and the individual's strengths and needs. Learning disabilities are suggested by unexpected academic under-achievement or achievement that is maintained only by unusually high levels of effort and support.

Learning disabilities are due to genetic and/or neurobiological factors or to injury that alters brain functioning in a manner which affects one or more processes related to learning. These disorders are not due primarily to hearing and/or vision problems, socio-economic factors, cultural or linguistic differences, lack of motivation or ineffective teaching, although these factors may further complicate the challenges faced by individuals with learning disabilities. Learning disabilities may co-exist with various conditions, including attentional, behavioural, and emotional disorders; sensory impairments; or other medical conditions.

To succeed, individuals with learning disabilities require early identification and timely specialized assessments and interventions involving home, school, community, and workplace settings. The interventions need to be appropriate for each individual's learning disability subtype and, at a minimum, include the provision of the following:

- specific skill instruction
- accommodations
- compensatory strategies
- self-advocacy skills

Some, but not all, provincial ministries of education in Canada use this definition of learning disabilities. Other countries also have been wrestling with these issues, coming up with different terminology and definitions. In the United States, there is a federal definition for purposes of identifying who qualifies for programs for children with special needs:(6)

A disorder in one or more of the basic psychological processes involved in understanding

or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

These variations contribute to some of the confusion in the field, as these definitions may be different from the “medical” terminology.

Although the above definition describes the population, most assessment systems use a discrepancy formula to determine who is labelled as having an LD and who is labelled as having a cognitive delay, and therefore who is entitled to receive services and who is not. Medical assessment can define a child with *attention deficit hyperactivity disorder* (ADHD) (see the Glossary). Traditionally, the difference between a child's IQ (or cognitive potential) and the child's academic achievement is felt to quantify the presence and “severity” of an LD and to justify the level and type of service a child should receive.(7) This conceptual framework requires a full psychometric examination prior to diagnosis(8), which can lead to a block in service provision while waiting for the testing. However, the discrepancy formula may not be the most appropriate way to define the population of those with a reading LD, and an in-depth assessment may not be needed to provide interventions.(9)(10)(11)

Intellectual disability

The term *intellectual disability* (or ID; see the Glossary) is now used to describe children whose overall intellectual skills are significantly sub-average and have significant delays in their adaptive behaviour.(12) The specific level of intellectual disability will determine the educational program and prognosis. Chapters 11 and 17 discuss this further. Children with an intellectual disability will require support throughout their education.

Mild intellectual disability (MID)

School systems differentiate between children who have an average IQ and difficulties acquiring specific

academic skills who have a diagnosis of an LD, and those with a below-average IQ who are felt to have a general delay in the acquisition of most academic skills, which is known as a *mild intellectual disability* (MID) (see the Glossary). The specific IQ that differentiates these two groups varies from province to province but most use this model. Depending on the criteria used, between 2% and 5% of children would be identified with an MID. The approach to education is often modified to a lower level, and slow but gradual progress is expected. Children on this path will often be referred to vocational programs as they enter high school and may not be considered able to qualify for post-secondary education. With the new terminology regarding intellectual disability, this may become a source of confusion, as many children with this educational classification will have intellectual skills above the range for a diagnosis of intellectual disability.

Attention deficit hyperactivity disorder (ADHD)

Over the past ten years, there have been significant advances in knowledge about the diagnosis and treatment of ADHD. The current criteria for the diagnosis are listed in DSM-IV-TR(13), which separates the criteria for inattention and hyperactivity/impulsivity. Three subtypes of ADHD—predominantly inattentive, predominantly hyperactive/impulsive, and combined—are the current accepted diagnoses in North America. The predominantly hyperactive/impulsive type is expected to be eliminated in the next DSM revision. The ICD-10 criteria (14), used in Europe, are more stringent. A number of evidence-based guidelines and algorithms have been developed to support the evaluation of a child with possible ADHD. They include those published by the American Academy of Pediatrics, the American Academy of Child and Adolescent Psychiatry, and the *National Institute for Health and Clinical Excellence (NICE)* (see the Glossary) in Europe. The Texas Algorithm gives an approach to the medical treatment of ADHD.(15) Medical management is discussed in detail in Chapter 15.

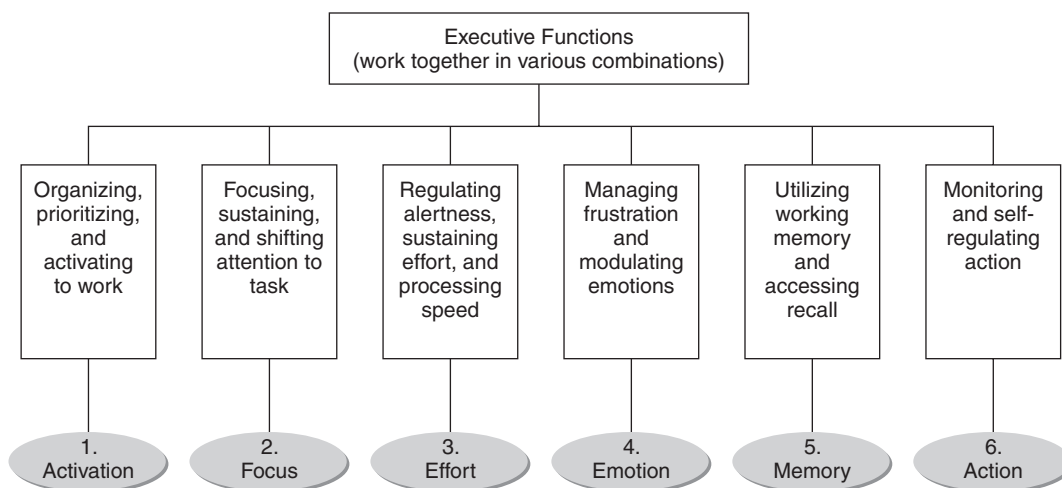
ADHD is a common problem. Estimates of prevalence vary from 1% to 14%, with good evidence

that at any point in time 9% of boys and 3.3% of girls will meet criteria for the diagnosis.(16) About half continue to show evidence of ADHD over time. (See Chapter 18.) One of the core weaknesses currently felt to explain the challenges children with ADHD experience is with “executive functioning.”

Executive functioning describes the skills necessary to be successful in school in the higher grades and, ultimately, in one’s vocation. *Executive functions* (see the Glossary) are skills involved in planning, organizing, strategizing, paying attention to and remembering details, and managing time and space. Understanding of the neurological basis of these functions and their measurement is evolving, and much of this literature comes from evaluating adults with acquired brain injuries. Measuring and tracking the development of these functions is an area of current investigation. Executive functioning is a theoretical framework, with different models advocated by different experts. A common application to ADHD is by Thomas Brown.(17) (See Figure 1–1.)

Executive functions affect skills necessary for social interaction and behaviour as well as academic functioning. Working memory, for example, describes the ability to keep information in active memory in order to manipulate and apply it. This is necessary for efficient performance in school, and children with different types of learning disabilities as well as children with ADHD are felt to have weaknesses in this particular function, compared to their peers.

Poor school performance is often attributed to attention difficulties, which include inattention to a teacher’s instruction and to quality of academic performance. But children with ADHD can show variable academic performance, including some marks above average.(18) Because medications are commonly used to treat attention problems, children are referred to a physician when they are not doing well in school, as caregivers and teachers wonder if ADHD is the explanation and if medical therapy will lead to significant improvement. Meeting such children’s needs is a driving force for the development of manuals such as this one. The relationship between problems with academic performance and attention difficulties is a source of ongoing study and clinical debate. A critical

Figure 1-1 Executive Functions Impaired in ADHD

Source: Brown. *Attention Deficit Disorder: The Unfocused Mind in Children and Adults*. New Haven CT: Yale University Press, 2005. Used by permission of the author.

difference between the two is that the diagnosis of a specific or general learning difficulty implies some measurement of a child's skills and aspects of functioning, while the diagnosis of ADHD is based on behavioural criteria and, usually, involves multiple observers.

There is evidence that both the structure and functioning of the central nervous system is different in children with ADHD, but the measurement of these factors remains experimental. There are also significant differences in the treatment of the two conditions. (See Part III.) There is a high incidence of co-morbidity with ADHD—including language disorders, LDs, anxiety, family problems, and other behaviour challenges(19)—leading to recommendations for multi-faceted support in clinics that deal with moderate to severe ADHD.

The critical issue is that the learning component of a child's problem is identified and dealt with as part of the overall treatment plan, and the physician can be a critical resource in ensuring that this factor is addressed.

TYPES OF LEARNING DISABILITIES

Since LDs clearly form a heterogeneous group, it should be possible to generate descriptions of

discrete types meeting the general definition. The first step in classification is to examine the skills and academic functions expected in school. These include language skills, reading, spelling, writing, and mathematics. Any or all domains may be affected individually or together, and within each function there appear to be a number of subtypes. Specific problems are labelled as dyslexia for problems reading, dyscalculia for problems with mathematics calculations, and dysgraphia for problems writing.

Even within one domain, there are different subtypes. For example, within the mathematics domain, one subtype might be represented by developmental Gerstmann syndrome, a primary difficulty remembering mathematical facts, itself overlapping with developmental dyscalculia.(20) Another is a so-called “nonverbal learning disability,” applicable to children who demonstrate, initially, good skills in reading and spelling but weaknesses in mechanical mathematics. They often have good automatic language skills. As they get older, they demonstrate increasingly severe problems dealing with new and complex material, concepts, and situations. They appear to be at high risk for the development of internalized emotional dysfunctions.

Reading difficulties may reflect specific developmental delays at different levels of complexity, such as phonemic analysis or word recognition, word analysis, oral or silent reading, or comprehension of written language, or they may specifically involve apparently discrete aspects of written language such as reading (receptive language), spelling, handwriting (graphomotor problems), or composition skills (written expressive language). The most common and certainly the most obvious manifestation in the early grades is difficulty in word recognition.

With the greater understanding of other processes that contribute to effective academic performance, there is also an attempt to identify underlying disorders such as *developmental coordination disorder* (DCD) (see the Glossary), which may cause significant difficulties with producing written work or participating in gym. This also helps identify that children often have trouble with their function outside school, in this example, with skills requiring motor coordination such as team sports.

While theoretical models are intriguing, there is no consensus on the classification of subtypes of LDs. Progress is being made with greater numbers of longitudinal studies. Regardless of uncertainty as to the existence of discrete subtypes, when a child is experiencing difficulty in school all of the various academic functions must be reviewed, as well as challenges in participation in activities outside the school environment.

RESPONSE TO INTERVENTION

The response to intervention (RTI) approach identifies children who are having trouble with academic development at an early age—around age six—and provides direct interventions to improve the skills without first undergoing any definitive diagnostic process. This is mandated as an approach in the United States and is used in some parts of Canada. Children are screened in school for difficulty, and those identified receive a structured systematic intervention and the results are measured. This has been most studied in the area of reading, and there is good evidence that a significant proportion of children experiencing difficulty improve to the point where their skills are the same as their peers. There also

has been demonstrated normalization of the brain functions needed for reading associated with the intervention. Children who make slower progress receive a more intensive program, and if difficulties continue, then more formal assessment and classification occur. This is different from the “waiting to fail” approach, as many children do respond to the intervention program. A description of the process, tools, and interventions can be found at www.rti4success.org.

ETIOLOGY/MECHANISMS OF LDs

No single etiology accounts for all LDs. Inherited forms have been identified; some cases may reflect disruption of neuronal migration in early gestation; some may reflect discrete injury; and some may be secondary to other neurological disorders. A number of faulty mechanisms involved in the processing of information through auditory or visual channels, alone or in combination, can be recognized in clinical, neuropsychological, or neurophysiological examinations. In the absence of a totally acceptable classification system, the relationship between pathology and dysfunction often remains obscure.

The understanding of the underlying mechanisms for LD has evolved through the analysis of the performance of certain tasks by persons with known brain lesions, usually adults. For example, it is known that people with a lesion in Broca’s area of the left frontal lobe have difficulty with an expressive aphasia. It was recognized early in this century that children with brain damage had significant problems with traditional academic learning, and such findings suggested that children with LDs similarly had some kind of neurological lesion affecting the areas responsible for the dependant function.

Explanatory models such as minimal brain damage or minimal brain dysfunction (MBD) grew from these associations, leading to searches for signs of “organicity” and recommendations for increasingly more elaborate neurological evaluations. There is evidence that routinely including electroencephalograms (EEGs) or neuroimaging in investigations of LD is unrewarding.⁽²¹⁾ Newer technological advances, such as computerized EEG analysis, positron emission tomography (PET)

scans, magnetic resonance and functional magnetic resonance imaging (MRI and fMRI), are proving to be more helpful and are leading to clearer understanding of the mechanisms of learning problems and their response to intervention, although these remain largely research tools and are not used clinically at this time.

As noted, LDs can lead to difficulties in performing a number of different functions and tasks, depending on an individual's profile of strengths and weaknesses. Most of the research on LDs has focused on reading, but recent information is beginning to define more precisely the normal processes involved, as well as possible mechanisms responsible for the different types of LDs.

Traditionally, it was thought that the process of reading involved a pathway encompassing numerous areas of the brain sequentially. Information relay from visual to language to speech to motor centres in the occipital, parietal, temporal, and frontal areas were assumed to be anatomic and functional substrates of the reading process.

Recent studies suggest involvement of two mechanisms that are somewhat independent. Neurophysiological experiments with skilled adult readers provide some evidence for an area in the visual cortex, near the occipital-temporal junction, that recognizes familiar words without involvement of the temporal lobe. Frontal areas are involved in giving meaning (semantic processing) to the words on the printed page.

Reading unfamiliar words includes the process of sounding them out (phonological processing). It is known that the left temporal-parietal area, specifically the angular and supramarginal gyri of the inferior temporal lobe, is involved in this activity. Until recently, it was thought that reading always involved some phonological processing; however, current findings suggest that skilled readers bypass the left temporal lobe.

Studies of known poor readers or so-called "dyslexics" have demonstrated some differences in the relative size of bilateral brain structures, such as the planum temporale, which is usually larger on the left side. Studies have shown a reversed asymmetry (planum temporale larger on the right) or a symmetrical planum in some persons with problems reading.(22)

Recent fMRI studies have confirmed that this area is underactive in some patients with dyslexia.

Neuropathological studies of persons with known LDs who died from other causes(23) have shown specific patterns of abnormality on microscopic examination. Numerous areas of architectonic dysplasias and neuronal ectopias have been found, with all individuals having involvement of the left inferior frontal and superior temporal regions. Such dysplasias are found in approximately 20% of autopsies of persons with LDs. In persons without known LDs, such findings are not found in the same numbers or concentrated in these areas. These lesions are felt to arise in the middle trimester, associated with microscopic brain maldevelopment, when neuronal migration is occurring. Researchers have suggested an autoimmune process, but there are no definitive explanations for the finding. The planum temporale was symmetrical in all subjects with LDs in one study, which is consistent with other data. Neuropathological studies, some of which are contradictory, have not produced complete explanations for the clinical phenomenon of LDs.

Clinicians involved with children with LDs are often struck by the apparent family history of similar problems, and there is some evidence of familial aggregation of LD in both chromosomal and family history studies. Although some genetic disorders, such as fragile X syndrome, may be manifested as LD(24), the search for genetic markers in most families has been elusive. With newer technology, a number of genetic markers are being discovered.(25) It is also difficult to prove the same type of LDs in adults and children because test profiles and performance may change with the passage of time. The linkage of the genetic and neurological data is assisting in the delineation of the pathophysiology in some individuals.

Groups of persons with LDs have been shown to have problems with a number of neuropsychological functions, including visual and auditory memory, integration of visual and auditory information, left-right confusion, auditory synthesis, temporal order judgment, spatial orientation, and phonological processing. Few persons with LDs have all of these problems, but most persons with LDs have some of these problems. Improved neurophysiological

imaging techniques should provide greater understanding of these brain-behaviour relationships.

Pregnancy and birth complications have sometimes been considered as probable, common, and significant contributors to learning problems. Prospective longitudinal studies, however, have questioned the validity of many perinatal influences as having a causal role for school dysfunction.(26) A prospective study of infants with very low birth weight found no increased incidence of reading problems at age eight(27), when allowances were made for social class and confounding attentional or behavioural problems. Very low birth weight does, however, appear to be associated with an increased incidence of both attention and fine-motor problems.

There is current interest in the role of environmental or dietary factors, such as exposure to toxins during the pregnancy, subtle lead intoxication, or iron deficiency.(28) From the perspective of the child in school, the determination of causation may have little practical value unless there is a correctable factor such as iron deficiency. If a thorough initial history and physical exam does not suggest further investigations, an extensive search is unlikely to be profitable and is not recommended.

Emotional disturbance or an adverse environment are specific exclusionary criteria for the diagnosis of LD, but are felt to contribute to other learning problems. The issues are complex. For example, it should be noted that:

- Family influence and dynamics are extremely important to persons with learning problems, perhaps even more than to other families, because these are chronic, disabling conditions.
- Children with chronic conditions are at significantly increased risk for mental health problems as a result of their disability.(29)
- The incidence of learning problems, including LDs, is greater in lower socio-economic groups.(30)

It remains difficult to sort out all the different mechanisms that may be contributing to an individual child's school performance, so that the physician's best efforts may culminate in a descriptive

formulation rather than a single, simple diagnosis. The high prevalence of learning problems such as ADHD and specific learning disabilities suggests that it is important to consider them whenever a child's academic achievement lags behind peers. In a multifactorial situation, learning problems may prevent the child from enlisting existing coping mechanisms. The physician needs to search for factors—at home or in school—that interfere with the individual's ability to adapt, as so many do, to their unique profile of strengths and weaknesses. Then the physician must identify the individual, family, and community resources that may be deployed to facilitate the child's adaptation.

NATURAL HISTORY

Some have claimed that infantile colic or fussiness may be an early warning sign of a variety of neurodevelopmental disturbances, but there are no sound longitudinal studies to determine the degree of risk associated with these early symptoms. Good evidence indicates that children with language delays—whether expressive, receptive, or mixed—are at high risk for having difficulty acquiring reading skills.(31)

Although there has been concern about preschool children with isolated perceptual-motor problems, this group seems to represent a relatively small proportion of the population with LDs. Preschoolers with *developmental coordination disorder* (DCD) (see the Glossary), however, are at higher risk of later LDs. Kindergarten teachers are able to reliably identify many children who will have problems in the primary grades. The response to intervention initiative has used universal screening of five- and six-year-olds to identify those needing intervention. Unfortunately, however, many educational authorities still do not provide assessment or programming for such children until after Grades 1 or 2, despite the evidence of the effectiveness of early intervention programs (EIPs).

Recurrent otitis media (ROM) has been another identified risk factor. Hearing losses and distortions associated with persistent or intermittent middle ear effusion have been alleged to affect phonemic analysis skills, language development, and subsequent reading skills, but prospective studies have

questioned this association despite a possible influence on attentional behaviour.(32) Evaluation of hearing and visual acuity is part of the basic assessment of children experiencing difficulty in school, and any findings require pursuit and correction if possible.

Once a child's difficulty is established, teachers and parents often express a desire for assessment, but the amount of assessment needed for diagnosis and a remedial program is controversial.(33) Attention problems may lead to requests for medical evaluation and treatment. Many school systems request a medical assessment of children being considered for special education, but expectations vary widely as to its scope or usefulness. (The issue of assessment is further discussed in Part II.)

When the diagnosis has been established and accepted as the basis for educational planning, the child may receive different types of help designed to improve the areas of difficulty, often with the goal of the child returning to a regular program if he or she has a specific LD. Special services may be needed for a short time or for many years. As children get older, the skills needed to achieve in school also change. Youngsters with learning problems often grow into their problems despite early optimism that they will grow out of them with maturity. Children with known learning problems may find new expectations difficult to meet just when they are beginning to overcome some of their previous weaknesses. For example, many children will find spelling difficult despite having developed good reading skills. Another group of children, with problems in such areas as reading comprehension, may have had acceptable achievement up until Grade 4 or 5, but be unable to cope with the demands of senior grades without assistance. Children with writing problems frequently experience increasing difficulty as demands are made for ever-greater output.(34)

In junior high school, the organization of many schools changes: the child no longer has only a homeroom or single teacher. Young adolescents experience greater social pressures. Some school systems de-emphasize remedial assistance at this stage and begin helping with organizational and planning strategies. While very appropriate for some, these interventions may be very difficult for youth lacking

the basic literacy skills for the core subjects. When there are many teachers, it may be very difficult to implement recommendations consistently, such as for classroom interactional styles, modified expectations, or individualized curricula.

As high school approaches, vocational or "basic" programs will often be recommended. There are excellent vocational courses and specialized secondary schools with good retention records, whose graduates consistently acquire useful technical and social skills. For students with specific LDs, however, this emphasis often reinforces the belief that they have insufficient skills and/or abilities to cope with an academic high school program. Unfortunately, some vocational or basic programs have high dropout rates (up to 65%), and graduates may not be eligible for post-secondary education. Even a very slow progress through regular high school courses may be a positive experience and leave the eventual graduate better equipped for ongoing learning. Continued instruction and accommodation may allow students with LDs to accomplish this goal.

It is also important to remember that some students with LDs proceed through high school to post-secondary programs, including university. Most will require some accommodations to be successful at the post-secondary level, particularly if they had help in high school. Many post-secondary institutions have modified entry requirements and/or provide resources to aid students with all types of disabilities. Confirmation of diagnosis may be necessary to qualify for services. The physician may be called upon to assist a family in decision-making regarding a high school program, which is crucial for the child's future. Decisions must be made on an individual basis, weighing the strengths of the child and family and not just the child's difficulties and the rules for inclusion in a particular educational category.

Secondary or reactive problems such as poor self-esteem, depression, and maladaptive coping strategies, such as *learned helplessness* (see the Glossary) or "acting out," are a significant concern for families of children with LDs and for those who work with them professionally. Preventing chronic failure through appropriate educational experiences and strategies should help children learn to take advantage of their strengths to compensate

for weaknesses. Higher self-esteem should lead to higher levels of motivation and work that students with learning problems need to achieve. High self-esteem is also felt to buffer students against adverse influences such as substance abuse and delinquent behaviour.

Those working in the field are often struck by the obvious suffering of children who are exposed to failing situations. One sees their anger, frustration, and sadness. Unfortunately, although many learning problems can be predicted from the developmental or family history or kindergarten experience, most systems require a record of established problems or failure before assessment or remedial services will be implemented: the “waiting to fail” approach. The fear of labelling and stigmatizing children inappropriately and creating a self-fulfilling prophecy leads some systems not to recognize the evidence of the cumulative files and the impressions of their own teachers. Yet children who fail will label themselves, often more destructively than the cruellest of peers or the most intrusive delivery of special educational support. This occurs long before their academic delay reaches the statistical requirements of certainty. For the physician, the question should be “Does this child need support?” rather than “What learning problem should be diagnosed?”

TREATMENT/MANAGEMENT

Many types of treatments are recommended and used for children with LDs. Some examples are mentioned briefly here and discussed in greater detail in subsequent chapters. Many disciplines both within and outside the educational system offer treatment or remediation. These interventions and their efficacy were usefully reviewed by Feldman.⁽³⁵⁾ Within the domain of education, these interventions can be classified as follows:

- direct remediation of skills (e.g., reading)
- use of cognitive strategies, such as mnemonics, to assist the retention of material or execution of processes
- deficit improvement directed, for example, to basic prerequisites, including memory or motor skills

- accommodation or modification of curriculum expectations
- bypass, circumvention, or substitution strategies, such as using computers and calculators to improve a function or to circumvent a disability

In addition to classroom teachers and remedial or special educators, educational psychologists may also be involved. Other disciplines, including speech-language pathology, occupational therapy, audiology, and social work, also can have a role in treating children with LDs. These disciplines are often accessed through health care systems and may be associated with multidisciplinary LD clinics. Research continues into the role of these added personnel and the efficacy of their treatments.

Physicians are often consulted about prescribing medication for children whose problems are associated with concentration difficulties or hyperactivity. There is considerable overlap between attentional and learning disorders, with many children having both problems. It is also true that children who are asked to do impossible tasks will have difficulty maintaining attention on them. It is not uncommon to encounter children whose needs for special educational help have never been addressed because medication has suppressed their behavioural difficulties. Prescribing medication for children in school should occur only after appropriate educational assessment and remediation plans have been implemented, or after it has been clearly established that there is only a problem with behaviour and attention. This issue is more fully discussed in Part III.

For students with *mild intellectual disability*, academic programming may be modified to a level lower than the expectations for other children of the same age. Direct teaching of skills occurs, but the content may be simplified, and slower progress is expected. There is emphasis on practical skills needed for life in the community.

SUMMARY

There are a variety of differing approaches to assist children who are slow to master the tasks of childhood required to acquire academic skills. With increasing knowledge of biological markers,

brain-behaviour relationships, and genetics, it is clear that LDs reflect innate individual differences in neurological functioning.

Early identification, particularly in the preschool period and ideally by the end of the kindergarten year, should lead to early interventions and allow most children with LDs to participate in programs that improve academic functioning, prevent the development of maladaptive coping mechanisms and poor self-esteem, and thereby reduce the need for ongoing, expensive, educational and mental health interventions at a later age.

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