LEARNING DISABILITES ASSOCIATION OF ONTARIO

Operationalizing the LDAO Recommended Practices for the Assessment, Diagnosis and Documentation of Learning Disabilities

Tests for the Assessment of Learning Disabilities

THINKING AND REASONING ABILITIES

At least one of the following tests should be administered in the formal assessment:

WPPSI-R, WISC-III, WAIS-III or Stanford-Binet IV* -- Full scale IQ
WPPSI-R, WISC-III, WAIS-III* -- Verbal IQ
-- Performance IQ
WISC-III* -- Verbal Comprehension Index
-- Perceptual Organization Index
Kaufman Assessment Battery for Children (K-ABC)*
-- Mental Processing Composite
-- Sequential Processing Scale
-- Simultaneous Processing Scale
Woodcock-Johnson Tests of Cognitive Ability (WJ-Revised or WJ-III)*
-- Fluid Reasoning component
Leiter – Revised*
Differential Abilities Scale (DAS)*

* In determining which tests to use, professionals will rely on the technical adequacy, reliability and validity of the tests. The professional judgment of the evaluator is a key component in determining the tests that are used.

When determining intellectual potential, the astute clinician will be aware that FSIQ is not always the most reliable and valid indicator of intellectual ability. Although tests such as the WISC-III provide separate verbal and performance IQ measures, Kaufman & Lichtenberger (1999) argue that, when these two scales are comparable, then Full Scale IQ is the best estimate of overall intellectual potential. When the difference between Verbal IQ (VIQ) and Performance IQ (PIQ) is abnormal, however, there is no justification in this practice. Indeed, Kaufman and Lichtenberger argue that the best estimate of an individual's abilities will be found in either VIQ or PIQ. Kaufman and Lichtenberger argue that a difference of 17 points or more between VIQ and PIQ is required for the scores to be clinically discrepant. In such a case, the FSIQ should not be used as a measure of intellectual potential.

In some circumstances, the factor scores may be considered to be the best estimate of intellectual/cognitive abilities. When there is a large degree of scatter among the four index scores of the WISC, it may be necessary to use the higher of either VC (Verbal Comprehension) or PO (Perceptual Organization) as the best estimate of a person's intellectual abilities. This is because deficits in the subskills measured by Freedom from Distractibility (FFD) and/or Processing Speed (PS) may be creating spuriously low estimates of a person's intellectual abilities when VIQ or PIQ are not calculated independent of the effect of these factors.

At the same time caution must be used when assessment data indicates only an isolated area of strength. An average scale score on one subtest likely reflects a splinter skill and is insufficient to provide an adequate measure of intellectual ability.

A factor analysis of the WISC-III normative data by Kevin Parker and Leslie Atkinson (1994) has demonstrated that the four index scores, as normally calculated, are interdependent. The supplementary analysis completed by Parker and Atkinson partials out the effects that each of the four factors of the WISC has on each other. The contributions of each of the WISC subtests on each of the four factors is calculated by differential weighting (rather than equal weighting as in the WISC factor scores). Thus, the Parker and Atkinson model provides a more "pure" estimate of an individual's separate intellectual abilities, partialling out the effects of any underlying processing disability.
As discussed above, employing the four differentially weighted factors as advised by both the Parker and Atkinson analysis (1994), and also Caruso and Cliff (1999) will further improve estimation of ability unencumbered by the effects of any underlying processing impairments.

If a standard composite score from a test is not employed as the best measure of cognitive potential, an explanation MUST be included as to why the standard measure of ability is not indicative of actual ability. e.g. "Given the substantial discrepancy between verbal and non-verbal intellectual scores (20 points), his Full Scale IQ score is not an accurate measure of his verbal reasoning abilities (which are average). As such, his verbal IQ was employed as a measure of intellectual potential for comparison purposes". Furthermore, the alternative measure of intellectual potential must be based on an array of skills that are meaningful to the student's learning as opposed to splinter skills or isolated strengths such as an average scale score on only one or two subtests such as coding or object assembly.

PSYCHOLOGICAL PROCESSES RELATED TO LEARNING

The tests listed under the various psychological processes are intended to provide common examples, rather than to be exclusive and exhaustive, and it is anticipated that good clinical judgment will be exercised both in their selection and in their interpretation.

Phonological Processing:

Examples:
Test of Phonological Awareness (TOPA)
Comprehensive Test of Phonological Processing (CTOPP)
Rosner Test of Auditory Analysis
Auditory Processing Factor (Ga) from the Woodcock-Johnson
Phoneme-Grapheme knowledge factor from the WJPB-III

Memory and Attention:
Examples:
Test of Memory and Learning
Children's Memory Scale
Wechsler Memory Scale
Wide Range Assessment of Memory and Learning
Working Memory component of the WAIS-III
Detroit Tests of Learning Aptitude
Short-term memory factor (Gsm) from the Woodcock-Johnson
Long-term retrieval factor (Glr) from the Woodcock-Johnson
Rey-Osterreith Complex Figure

Processing Speed
Examples:
Processing Speed Index on the WISC-III
Processing Speed factor (Gs) on the Woodcock-Johnson
Detroit Tests of Learning Aptitude

Language Processing
Examples:
Clinical Evaluation of Language Fundamentals – Third Edition (CELF-3)
Test of Oral Language Development
Verbal IQ on the WPPSI-R, WISC-III, WAIS-III
Verbal Comprehension index on the WISC-III
Peabody Picture Vocabulary Test – Third Edition (PPVT-III)
Expressive Vocabulary Test (EVT)

Perceptual-Motor Processing
Examples:
Beery-Buktenica Developmental Test of Visual-Motor Integration
Beery-Buktenica Developmental Test of Motor Coordination
Beery-Buktenica Developmental Test of Visual Perception
Bender-Gestalt Test of Visual-Motor Integration
Slingerland Tests of Specific Language Disability
Gardner Test of Visual Perception Skills
Gardner Test of Visual-Motor Skills
Evaluation Tool of Children's Handwriting (ETCH)
Test of Visual Perceptual (TVPT-2)

Visual-Spatial Processing
Examples:
Performance IQ on the WPPSI-R, WISC-III, WAIS-III
Perceptual Organization index on the WISC-III
Raven's Coloured/Standard Progressive Matrices
Test of Nonverbal Intelligence
Rey-Osterreith Complex Figure

Executive Functions

Examples:
Token Test
Wisconsin Card Sort Test
Woodcock-Johnson fluid reasoning factor
Woodcock-Johnson planning subtest
Word fluency tests
Design Fluency Tests
Categories Test
Tower of London

ACADEMIC ACHIEVEMENT TESTS

General Achievement Batteries

Examples:
Wechsler Individual Achievement Test (WIAT)
Woodcock-Johnson Tests of Achievement
Kaufman Test of Educational Achievement (K-TEA)
Peabody Individual Achievement Test – Revised (PIAT)

Oral Language

Examples:
Listening Test
Test of Problem Solving (TOPS)
Word Test (Revised)

Reading

Examples:
Woodcock Reading Mastery Test – Revised
Gray Oral Reading Tests – Third Edition
Test of Reading Comprehension – Third Edition
Wide Range Achievement Test – Third Revision – word decoding only

Written Language

Examples:
Test of Written Language – Third Edition

Spelling

Examples:
Test of Written Spelling – Fourth Edition
Woodcock-Johnson Psycho-educational Battery-III, Spelling subtest

Mathematics

Examples:
Key Math Diagnostic Test
Stanford Tests of Mathematical Ability

CO-EXISTING CONDITIONS: PERSONALITY, BEHAVIOURAL AND EMOTIONAL FUNCTIONING

Examples of additional tests that can be used in order to identify or rule out co-existing conditions:

Piers-Harris Children's Self-Concept Scale
Children's Apperception Test
Robert's Apperception Test
Rorschach Test, Comprehensive System
Draw a Person
Conners' Rating Scales – Revised
Achenbach Child Behaviour Checklists
Vineland Adaptive Behaviour Scale
Behaviour Assessment System for Children
Trauma Symptoms Inventory for Children (TSIC)
Children's Dissociative Experiences Scale (CDES)
Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL)
The Multidimensional Anxiety Scale for Children (MASC)
Beck Depression Inventory for Youth
Beck Anxiety Inventory for Youth

Diagnostic Criteria

In order to demonstrate a clinically significant disparity, the following areas of functioning must be evaluated:

a) Intellectual/ cognitive potential
b) Information processing
c) Academic achievement

Relying exclusively on a disparity between intellectual potential and achievement is not advisable as the sole method of identifying a learning disability, as individuals may be able to maintain adequate achievement only with extremely high levels of effort and support. Conversely, individuals who did not complete high school, or who had little academic exposure may perform poorly on tests of academic achievement for reasons other than a specific learning disability. For this reason, we recommend identifying the underlying processing impairment that, in turn, is causing the academic or functional difficulties.

How to assess individuals with abilities outside of the average range

Within the average range of intelligence scores (i.e. 90-110), confounds such as regression to the mean have little influence on the identification of learning disabilities. Hence, when determining a disparity in persons within this range, a variety of methods may be employed.

Please note: employing grade equivalent scores for establishing that a disparity exists has no validity, nor is it statistically defensible. It is therefore recommended that assessors not employ grade level scores from tests as evidence for or against the presence of a learning disability.

Clinicians must exercise a great deal of caution when attempting to identify a disparity in persons whose obtained IQ score falls outside of the average range (i.e. 90-110). Psychometric phenomena such as the regression to the mean make the likelihood of over-diagnosis (false positives) greater in persons above this range, and under-diagnosis (false negatives) of persons below this range. For instance:

Table 1: predicted WIAT scores for persons with high and low IQ

WISC-III IQ Scores	***Predicted WIAT score based on obtained IQ score***
140	128
130	121
120	114
110	107
100	100
90	93
80	86
70	79
60	72

For this reason, it is strongly recommended that clinicians diagnosing learning disabilities for people with intelligence outside of the Average Range (90-110) have a clear understanding of

the difficulties involved, have experience (or supervision from someone with experience) working with these groups, and employ regression formulae[1] when determining if the observed achievement score falls significantly below where one would have predicted based on ability.

Clinicians who need assistance in calculating discrepancies may use the **Test score discrepancy Analyzer** (from the website: Intervention central).

The Test Score Discrepancy Analyzer 2.0 (TSA 2.0) is a web-based application that runs discrepancy analyses between intelligence and academic achievement tests. The program uses a statistical formula that accounts for regression (degree of correlation) between a student's IQ and achievement test scores. The TSA2 incorporates 'best practice' guidelines for statistical comparison of score discrepancies first recommended by the Special Education Programs Work Group on Measurement Issues in the Assessment of Learning Disabilities (Reynolds, 1985).

The website address is: http://216.121.101.68/servlets/tsa2

Interested clinicians are also encouraged to read the supporting document: "Best Practices in Calculating Severe Discrepancies Between Expected and Actual Academic Achievement Scores: A Step-by-Step Tutorial" by Jim Wright, Syracuse City Schools

This may be found at the following web address:
www.interventioncentral.org/htmdocs/tools/tsa/tsamanual/testExpl/testexpl.shtml

It is an excellent tutorial that explains, step by step, how to calculate whether a test score is significantly different than one would have predicted based on the obtained IQ of an individual.

[1] Part of the difficulty with using a simple discrepancy formula is related to the fact that there is statistical dependence between ability and achievement. A more defensible approach is the use of predicted achievement scores as outlined in the Manual for the Wechsler Individual Achievement Test (1992).

Diagnostic Pitfalls when performing assessments

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Several diagnostic hazards have been demonstrated to influence clinical judgment and interfere with a valid and reliable diagnosis (Turk & Salovey, 1988). These include illusory correlations, confirmatory bias, disregard for base rates and failure to consider differential diagnosis.

Illusory Correlations

Research indicates that many school psychologists make diagnoses of LD based on what are known as illusory correlations (Gyns, Willis & Faust, 1995). This occurs when clinicians hold false beliefs that certain pieces of diagnostic data are differentially related to learning disabilities and do not occur in normally achieving individuals. Research shows that illusory correlations are a key source of error in clinical decision-making, and yet such false beliefs account for much clinical folklore. For instance, many psychologists hold the false belief that a large amount of inter-subtest scatter on the Wechsler scales is diagnostically related to the presence of a LD, when in fact such scatter is statistically normative (Gyns, Willis & Faust, 1995). In fact, normative data for the WISC-R shows considerable inter-subtest scatter (an average of 7 scaled score points). Hence, even a 9-point discrepancy between subtests would not be uncommon nor by itself an indication of an underlying learning disability (McLean, Kaufman & Reynolds, 1989), and larger variation is typical in groups with higher levels of intelligence.

Matarazzo and his colleagues (Matarazzo & Herman, 1984; Matarazzo et al., 1988; Matarazzo & Prifitera, 1989; Matarazzo, 1992) present some sobering information regarding the normative frequency with which one finds subtest scatter. Indeed, they point out that even when one finds substantial subtest scatter, this in itself is not an indicator of brain dysfunction, inasmuch as it is a characteristic of the cognitive functioning of normal subjects. Hence, subtest scatter in and of itself is not clinically diagnostic of cognitive impairment.

It has also been demonstrated that psychologists hold the false belief that a difference in Verbal and Performance IQ scores of more than 15 points is clinically significant and highly indicative of a LD. As has been repeatedly demonstrated (e.g. Schiff et al., 1981; Patchett & Stansfield, 1992; Silver & Clampit, 1990; Matarazzo & Herman,1984), differences of this or greater magnitude are not exclusively found in persons with an underlying LD, and such differences are also quite normative in certain populations. For instance, in the entire standardization sample of the WAIS-R, the range of differences between VIQ and PIQ scores was from -43 to+49. In addition, greater VIQ-PIQ discrepancies are more typical in persons of higher overall IQ (Patchett & Stanfield, 1992; Schiff et al., 1981). Hence, VIQ-PIQ scatter is not necessarily pathognomonic when it constitutes the only evidence of impairment. Unfortunately, such unfounded beliefs are quite resistant to corrective interventions (Gyns, Willis & Faust, 1995)

Gyns, Willis and Faust (1995) demonstrated that school psychologists were more likely to diagnose a non-LD child as LD if a high degree of inter-subtests scatter were present, even if other diagnostic and historical evidence failed to support such a diagnosis. They also chide psychologists for making what they call a "fundamental attribution error"; that is, attributing academic problems to a disorder within the child rather than investigating other environmental causes.

Confirmatory Bias

Another source of potential error in clinical judgment that appears particularly relevant to the differential diagnosis of LD in adolescents and adults is confirmatory bias. Confirmatory bias is the result of a tendency to preferentially seek out and attend to information that confirms an initially adopted hypothesis. As a result, premature abbreviation of information searching may occur and generation of multiple diagnostic hypotheses may be restricted (Dumont, 1993). Consequently, a positive finding that confirms the working hypothesis may be emphasized over negative findings (Dowie & Elstein, 1988). Thus, even if a restricted number of diagnostic hypotheses are generated, confirmatory bias still may discount information that would support alternative hypotheses.

Many clinicians may not fully assemble information prior to formulating testable hypotheses. Instead, they allow confirmatory bias to enter into the diagnostic process by relying on incoming case information to act as cues to confirm an already adopted hypothesis. Fortunately, confirmatory bias may be avoided, or the probability of such errors reduced, through generation of a set of multiple hypotheses that discourages premature commitment to a single diagnostic possibility (Turk & Salovey, 1988).

References available by contacting resource@ldao.on.ca

Assessment of Individuals Learning through a Second Language

Many children who will receive instruction at school in English or French speak another language before they enter school. In order to determine whether there are learning difficulties over and above problems that may be related to second-language learning and cultural adjustment issues, extreme caution must be exercised when assessing children (or adults) for whom English is neither the first language of the home nor the individual's primary language of thought. Whenever possible, an assessment of skills in the first language should complement the assessment completed in the language of instruction at school.

When assessing young ESL children, or others for whom the language of instruction at school differs from the home language (e.g. students in French immersion programs), observation of progress over time is key in evaluating strengths and determining areas of instructional need. ESL students in school typically require varying amounts of time to catch up to their native English-speaking peers in different aspects of English proficiency.

- With respect to *conversational fluency*, students who experience extensive exposure to English both within the school and out-of-school environments can generally function effectively, and use appropriate phonology, within 1-2 years.
- With appropriate instruction, ESL students can also acquire many of the *specific component skills of reading* (e.g. phonological awareness, letter knowledge, basic decoding skills) in the early years of schooling at the same time as they are acquiring conversational fluency in English. These discrete language skills can be taught directly and ESL students who are developing normally show minimal or no lag in acquisition of these skills in the early years of schooling.
- However, extensive research suggests that it typically requires a much longer period of time (at least 5 years) for ESL students to catch up to their native English-speaking peers in *more general verbal abilities and academic aspects of English proficiency* when these abilities are assessed with standardized norm-referenced measures. During this period, standardized measures of verbal abilities are likely to underestimate the academic and verbal/cognitive potential of ESL individuals.

The following diagnostic implications of these patterns are important for accurate assessment and interpretation of test scores:

(a) While conversational fluency in English is of limited relevance to the identification of learning or reading disabilities among ESL students, delays in acquisition of conversational fluency may be indicative of specific speech or language processing problems.

(b) Significant delay in development of discrete language skills such as phonological processing and rapid automatized naming of letters and words *that cannot be attributed to inadequate instruction*, is potentially indicative of learning or reading disability among ESL students.

(c) Significantly better performance on listening comprehension than on reading comprehension measures may be diagnostically relevant in identifying learning or reading disability among ESL students.

(d) Until the ESL student has been learning English in an academic context for a period of at least 5 years, performance on measures of verbal cognitive abilities (e.g. vocabulary tests) should be interpreted as reflecting present level of familiarity with the English language rather than the student's overall verbal or processing capabilities.

In situations where it is feasible to administer an assessment in the ESL individual's first language, this information can add significantly to the knowledge base for interpreting the nature of the individual's learning difficulties. Again, however, first language assessment must be interpreted very carefully due to the fact that, particularly with younger students, ESL individuals' first language verbal abilities may decline over time. This decline results from the fact that they are no longer being schooled through their first language and English may be taking over communicative functions that previously were conducted through the first language. In addition, as with the assessment of English verbal abilities, assessment of first language abilities must take account of the range of regional varieties in any language.

Potential test bias is not confined only to language-based tests; in addition, many nonverbal test items may contain subtle cultural or linguistic biases that may not be immediately obvious, even to a seasoned practitioner. Therefore, a broad-based assessment of ESL individuals is extremely important, incorporating a variety of sources, including observational and anecdotal data, reports from relevant home and community contacts, standardized measures of adaptive behaviour, and so on. In particular, it is often necessary to take account of emotional factors, especially when there is a chance that there have been traumatic experiences (e.g. refugee camp, war, displacement issues) in the individual's life. There is also a need, wherever possible, to be cognizant of and to respect individual cultural norms with respect to the assessment situation as a whole.

Diagnosis of Nonverbal Learning Disabilities

In concert with the new definition of learning disabilities, a diagnosis of a nonverbal learning disability (NLD) can be made under the following conditions:

(a) The individual's thinking and reasoning skills are at least average. Normally in the case of NLD, strengths would be noted in verbal thinking and reasoning areas, but it is also possible for an individual's nonverbal reasoning abilities to be at least average.

(b) There are significant, relative deficits in one or more nonverbal psychological processes (e.g., visual, tactile and/or motor memory; visual, tactile and/or motor attention; visual, motor and/or visual-motor processing speed; perceptual-motor processing; visual-spatial processing; executive functions). In addition, various aspects of pragmatic language are often deficient (e.g., comprehension/use of metaphor, analogy, humour, sarcasm, intonation, prosody, "small talk," etc.), interfering with an individual's interpersonal relationships. In many cases, verbal abilities are overdeveloped for an individual's general developmental level, and the individual has difficulty adjusting the level of verbal sophistication to suit specific interactions. It should be noted that the process by which an NLD individual reaches a solution is important. Thus, specific scores on test batteries are not useful without clinical comment regarding the individual's processing style, problem-solving approaches, and organizational strategies.

(c) These nonverbal deficits are causally related to academic achievement that is unexpectedly low relative to the individual's thinking and reasoning skills. It is not uncommon for academic abilities to be within the normal range during the early grades of school, due to relatively strong auditory processing, language, and verbal memory. However, once comprehension, analysis, organization and production of more complex material is required (e.g., as in math problem-solving, reading comprehension, creative writing, research projects, etc.), achievement begins to deteriorate, and academic deficits are more noticeable. If a young child's cognitive profile is consistent with (a) and (b) above, the youngster is at risk for NLD, even if measured academic skills appear to be within the average range.

While a number of researchers and authors (e.g., Rourke, 1995; Thompson, 1997; Tanguay, 2002) postulate a broad range of criteria included in the NLD Syndrome, others (e.g., Mamen, 2001) have suggested that more specific subgroups may exist (i.e., perceptual, social, written expressive and attentional).

Nonverbal learning disabilities affect a wide spectrum of interpersonal and adaptive behaviours, and are often initially identified by parents, teachers, caregivers, and others as behavioural, organizational, emotional and/or social difficulties, rather than as obvious academic lags.

References available by contacting resource@ldao.on.ca

Considering coexisting conditions

Comorbidity is described as a situation where two or more conditions that are diagnostically distinguishable from one another tend to occur together. The exact nature of the relationship between comorbid conditions is a matter of some debate in the research literature (Martini, Heath & Missiuna, 1999; Clarkin & Kendall, 1992; Goff, 1992). It is particularly difficult to determine whether one condition is in fact a symptom of the other, i.e. causality versus correlation. These important debates aside, research provides support for a number of conditions co-occurring with learning disabilities more often than expected "just by chance".

The largest body of studies supports a comorbid relationship between learning disabilities and attention deficit disorder (with or without hyperactivity). This extensive research, featuring comorbidity estimates as high as 70%, was summarized recently by Riccio, Gonzalez & Hynd (1994) and Maynard, Tyler & Arnold (1999).

In fact, learning disabilities are sometimes confused with **Attention Deficit Hyperactivity Disorder (ADHD).** It is important to note that these are *two distinct conditions*, in spite of the significant level of co-morbidity. ADHD is *not* a specific learning disability. The distinguishing characteristics of students with ADHD include being more easily distracted, failing to finish assignments, weaker persistence of effort, day dreaming, looking away more often from activities they are requested to do and demonstrating less persistence of effort when completing boring activities (Barkley, Dupaul & McMurray, 1990). As well, children with ADHD have been distinguished from those with LD based on their higher levels of activity and impulsiveness. As mentioned above, a very large percentage of those who have ADHD also have accompanying learning disabilities, while approximately 30% of those who have learning disabilities also have ADHD. Nevertheless, the interventions that benefit people with ADHD and those who have learning disabilities are not necessarily the same. Therefore, it is important to diagnose these conditions accurately, before developing a treatment plan.

A group of disorders also found frequently to co-exist with learning disabilities is that involving **social, emotional, and/or behavioural difficulties** (Kamphaus, Frick & Lahey, 1991; Glassberg, Hooper & Mattison, 1999). Studies suggest that anywhere from 24% to 52% of students with learning disabilities have some form of such a disorder (Rock, Fessler & Church, 1997). This group encompasses diagnoses such as conduct disorder and oppositional/defiant disorder (DeLong, 1995; Shaywitz & Shaywitz, 1991), as well as social adjustment disorder (Lyon, 1996). Research also suggests that depressive or dysthymic disorders co-occur with learning disabilities (San Miguel, Forness & Kavale, 1996) although the nature and direction of the relationship continues to be controversial (Wiener, 1998).

In a comprehensive review of the literature, Hartlage, Alloy, Vazquez, & Dykman (1993) clearly demonstrate that **depression** effects cognitive processes that require more effort (i.e. "fluid reasoning" processes that require attention, take place serially, inhibit other pathways, and are influenced by cognitive capacity limitations) but do not interfere with more automatic processes (i.e. more crystallized abilities). Hence, persons who are depressed show specific deficits in abilities such as recall memory (but not recognition), problem solving, speed of information processing and motor speed, and sustained attention and concentration. Depressed individuals can thus present with a clinical picture that is cognitively very similar to persons described as having non-verbal learning disabilities (Rourke, 1987; 1988).

Confusion sometimes also arises for students who have learning problems arising from an **acquired brain injury**. While several symptoms of this condition also occur in individuals with learning disabilities, acquired brain injury is sometimes treated as distinct from learning

disabilities. It is obvious that anything which affects the brain will affect learning. It is now well substantiated that factors within the brain itself, genetic influences as well as in the environment can have an impact on learning and consequently on learning disabilities. In the area of reading disabilities, for example, careful research has estimated that about half of the individual differences in these conditions are related to genetic factors.

Environmental factors can roughly be divided into factors that influence the development and integrity of the brain during pregnancy, during the birth process, and after birth. During pregnancy, it is well established that both prescription and non-prescription drugs (especially alcohol and nicotine) can contribute to disorders which may include learning disabilities. Traumatic conditions during the birth process, particularly those resulting in lack of oxygen during birth can cause brain damage and result in learning disabilities. At birth, both low birth weight and prematurity (especially in combination with Respiratory Distress Syndrome) are associated with a variety of negative outcomes, including learning disabilities. Following birth, any source of acquired brain injury may result in a range of effects, including learning disabilities.

As reported in the McCain & Mustard *Early Years Study*, 1999, both physical and emotional abuse and neglect during the early years of development have also been found to be associated with later learning problems and learning disabilities. There is also some evidence that recurrent middle ear infections (which are known to be aggravated by second-hand smoke) may contribute to language processing difficulties, depending on the age when they occur.

In older individuals, strokes and tumours may result in learning disabilities. It has also been noted that post-traumatic stress syndrome (e.g. in individuals who have been held in a foreign prison or concentration camp, or who have been victims of torture), also gives rise to symptoms which are similar to (or may actually be) acquired learning disabilities, such as memory loss, inability to concentrate, poor motor co-ordination, etc.

It should be noted that all of these conditions described above can lead to global impairments in some individuals, and to learning disabilities in others, depending upon a variety of factors.

Differential Diagnosis

In order to accurately diagnose a learning disability, clinicians must be aware of other disorders that can present with symptoms similar to a neurologically-based learning problem. Using an approach of generating multiple hypotheses, one can then work to systematically confirm the presence of the symptoms of a specific learning disability, while disconfirming the hypotheses that other disorders may better explain the reported deficits.

It should be remembered that disorders can overlap. Cohen (1994), for instance, notes that childhood attentional disorders can be difficult to tease apart from affective disorders. A primary problem in one area may result in problems in other areas; one disorder may look like another. There are many biologically based factors that can cause someone to be inattentive or have learning problems. It therefore behooves the clinician to be knowledgeable about the signs and symptoms that assist one in differentiating between disorders with overlapping or similar looking symptoms, as opposed to ones that are co-existing.

Research provides significant evidence supporting the co-morbidity of the following disorders with learning disabilities:

- Tourette's Syndrome (Burd, Kauffman & Kerbeshian, 1992; Shady, Rulton & Champion, 1988; Chase, Friedhoff & Cohen, 1992; Walter & Carter, 1997).
- Schizophrenia (James, Mukherjee & Smith, 1996; Gillian, Johnstone, Sanderson, Cunningham & Muir, 1998);
- Epilepsy (Kerr & Espie, 1997; Espie, Kerr, Paul, O'Brien, Betts, Clark, Jacoby, & Baker, 1997; Laidlaw, Richens & Chadwick, 1993);
- Language/communication disorders (Riccio & Hynd, 1993; Schoenbrodt, Kumin & Sloan, 1997);
- Hearing impairment (Bunch & Melnyk, 1989);
- Visual disabilities (low vision, blindness) (Erin & Koenig, 1997);
- Developmental co-ordination disorder (Missiuna, 1996; Fletcher-Finn, Elmes, & Strugnell, 1997; Martin, Heath & Missiuna, 1999);

References available by contacting ***resource@ldao.on.ca***

Reassessment

Reassessment of cognitive and information processing abilities is indicated if the initial assessment was not sufficiently comprehensive (i.e., includes all components suggested in this assessment protocol), or if the initial assessment did not state a diagnosis. If a comprehensive assessment has been undertaken, and a diagnosis of a specific learning disability rendered by a qualified Registered Health Professional, there is no need to reassess to establish whether or not the diagnosis still applies. Reassessment would, however, be required at transition points in the individual's educational career, primarily to document the extent to which compensatory strategies and recommended accommodations have assisted in reducing the impact the disability has in the person's academic functioning. Evaluation of appropriate accommodations would also occur at such junctures.

Assuming a comprehensive assessment and diagnosis have been rendered, the reassessments would take place when moving from elementary to secondary school, secondary to post secondary, or school to work.

These assessments would evaluate academic functioning and other underlying processes identified as interfering with academic achievement. The goal would be to determine: a) whether the present strategies and accommodations are appropriate and sufficient, and b) whether additional accommodations or strategies might be appropriate in the new setting; for instance, whether use of voice output software, books on tape, access to word processors, etc., would be of benefit to the student in the new setting.

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