

SCHOOL UNDERACHIEVEMENT AND SPECIFIC LEARNING DIFFICULTIES

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Finishing lessons at home

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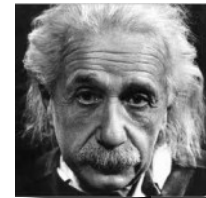
A child struggling in school causes concern. Difficulties with school tasks can leave children frustrated and parents and teachers wondering about the barriers that are preventing learning. Indeed, school underachievement is one of the most common reasons for referral to a visiting specialist in school or to a child guidance clinic. Underachievement may however be a symptom of any number of cognitive, emotional and social difficulties. In this chapter we will first review definitions of learning disorders and discuss issues surrounding their diagnosis. Although there is a growing body of evidence about mathematical and other non-verbal learning difficulties, our focus will be on *literacy learning difficulties* for two reasons. First, they pose a significant barrier to achievement across the curriculum and second, because substantial cross-linguistic information is becoming available about their behavioral manifestations in different language contexts, methods of assessment and intervention. We will also consider *school underachievement* when it is secondary to other conditions and, for a small selection of such syndromes, we discuss why this may be the case. We end the chapter with a discussion about priorities that low income communities can set, both for the identification of children with specific learning difficulties and remedial support.

Literacy

The ability to derive and communicate knowledge and meaning from written language.

CORE CONSTRUCTS

- There are many core skills that support learning. These different skills can be seen as multiple foundations for learning
- A child's performance can be examined in relation to each of the multiple foundations. We can expect the child's profile of skills to show a mix of strengths and difficulties
- When children's development is delayed in relation to at least one of the factors contributing to learning, they may be considered *at risk* for a learning difficulty. Conversely, when skills are generally available or present to above average levels, they may act as protective factors
- The criteria used for the diagnosis of learning difficulties are moderated by the learning context
- *Learning difficulties* are a dimensional construct – children with difficulties fall along a continuum, some show less difficulty and others more
- Criteria used for diagnosis may separate children who have a learning difficulty from those who do not. This is a categorical approach to understanding learning difficulties. The approach is popular, but it is important to note that cut-off criteria differentiating at-risk/not-at-risk children are arbitrary.
- There are distinct and specific learning difficulties that comprise a cluster of recognisable behaviours. Examples of specific learning difficulties (SLDs) are *dyslexia* (a difficulty with reading-related skills) and *dyscalculia* (a difficulty with numerical skills)
- SLDs can be present with other co-occurring problems or co-morbidities. Examples of co-morbid problems include speech and sound disorders, attention deficit disorders and emotional disorders.
- The manifestations of a learning difficulty can change over development. What appears to be mild at one age can become a significant problem in another life stage.



Many people suffer from dyslexia. Albert Einstein, Harrison Ford and George Washington are said to have had the condition

DEFINITION AND CLASSIFICATION

For many years, the most popular approach to identifying specific learning difficulties (SLDs) was to use *discrepancy criteria* – that is, to identify a child as having an SLD if their attainment was below that to be expected based on general cognitive ability. Indeed, the two main classification systems used in clinical practice at the time of writing – ICD-10 (World Health Organization) and DSM-IV (American Psychiatric Association) – follow the discrepancy model to classify children with learning difficulties. However, the use of the discrepancy approach in educational settings has gradually declined because there is little evidence of differences in etiology or prognosis for children with SLDs who have higher or lower IQ (Snowling, 2008). Accordingly, the proposal for DSM-5, which we will discuss below, moves away from this approach. An alternative approach to classification, known as the *response to intervention* approach, is gaining interest and because there are merits in this approach for low and middle income countries, it will also be considered.

The diagnostic systems differ in their approach to the identification of SLDs (see Table C.3.1). When compared to ICD-10, DSM-IV is less explicit about the extent of delay that must be recorded before a diagnosis is considered, and in DSM-5 it is proposed that the discrepancy formula be abandoned altogether. Diagnostic systems also differ in their treatment of co-morbidities. In DSM-IV and DSM-5, co-occurring difficulties receive parallel diagnoses. In ICD-10 co-occurring difficulties are placed on a hierarchy with the diagnosis pegged to one nodal difficulty or cluster of difficulties. Sometimes the status given to a co-occurring difficulty has implications for understanding the etiology of the difficulty (e.g., literacy difficulties and language difficulties occurring in parallel, or one following from the other).

All these diagnostic systems are fashioned after medical models and there is sometimes a mismatch between clinical diagnosis and the labels for various learning-related difficulties commonly used in educational settings. Below are examples of clinical diagnoses that do not easily fit into what is seen in regular classrooms:

- *Specific* difficulties with spelling. Poor spelling usually co-occurs with difficulties in reading, but in some writing systems (where reading is regular but spelling-sound mappings are inconsistent), spelling difficulties are more common than reading difficulties
- *Disorder of written expression*. There is an under-diagnosis of this disorder. This is not so much because poor written expression skills are difficult to identify but because written expression is seen as following on from a more fundamental difficulty with reading and spelling.

In addition, some diagnostic labels are umbrella terms and therefore uninformative for intervention. For example, both DSM-IV and ICD-10 classify together reading comprehension difficulties and reading accuracy difficulties. However, these are disorders which require different interventions: whereas interventions for reading comprehension focus on developing broader oral language and inferential skills, interventions for reading accuracy primarily target phonological skills.

For a discussion about issues surrounding classification see: [Changing concepts of dyslexia: nature, treatment and co-morbidity, November 2009; Journal of Child Psychology and Psychiatry Virtual Issue on-line](#)

Phonemes/ phonological skills

Phonemes are the smallest sound units in a language that are capable of conveying a distinct meaning (i.e., the m in mat or b in bat). Phonological skills concern an individual's ability to identify, categorize or manipulate these sounds, and include skills such as segmentation, blending, rhyming, and alliteration.

TABLE C.3.1 Approaches to classification

ICD-10	DSM-IV	Proposed for DSM-5*
<ul style="list-style-type: none"> Disorders include reading disorders (81.0), spelling disorders (81.1), disorders of arithmetic skills (81.2) and mixed disorder of scholastic skills (81.3) Conservative about extent of distance between age/intelligence and attainments for making a diagnosis On individually administered tests, differences in child's performance must be two or more standard errors below prediction based on age and general intelligence The lowered attainment must not be attributable to poor opportunity for qualified literacy instruction or other external factors such as disrupted schooling and recent entry into regular schooling Difficulties must be evident from the earliest stages of acquisition of the particular skill. This criterion is suggestive of abnormality in foundational cognitive skills and indicative of a difficulty that may have a biological basis rather than a socio-cultural/environmental basis. 	<ul style="list-style-type: none"> Disorders include developmental reading disorder (315.00), mathematics disorder (315.1) and disorder of written expression (315.2) The child's extent of learning must be substantially below that of peers who have received equivalent opportunity The lower levels of achievement must be seen to be interfering with academic achievement and daily living When a known sensory deficit such as nystagmus or low vision accompanies the underachievement, the extent of learning delay should be far in excess of the known contribution of the sensory deficit. The co-occurring difficulty must also be coded All co-morbidities should be recorded such as attention deficits, emotional difficulties and behavioral disorders Other associated social-emotional difficulties are known to occur including reduced self-esteem and self-efficacy for academic performance, and increased barriers for entry into school and post-school training as well as in the world of work. DSM-IV encourages that this and similar other associated difficulties be recorded. 	<ul style="list-style-type: none"> Learning disorder is the generic term to describe disorders characterized by difficulties in learning academic skills – accurate and fluent reading, writing and arithmetic – which significantly affect academic achievement or daily functioning if accommodations are not made Learning disorders are grouped together with communication disorders (as neurodevelopmental disorders) to reflect their onset during the pre-school or early school years Learning disorders described in DSM-5 are dyslexia, dyscalculia and disorder of written expression DSM-5 proposes to drop the discrepancy criterion. For the first time reading fluency will be recognized as an area of assessment for diagnosis (earlier manuals only mentioned reading accuracy). This change reflects the current understanding of the clinical picture of dyslexia – poor reading fluency is known to be a persistent problem into adulthood in most languages, and poor reading fluency (rather than reading accuracy) is a defining feature of dyslexia in many languages Specific difficulties with reading comprehension (previously classified within reading disorder) will not be clearly accounted for. Thus, diagnosis for two categories of children remains unclear: (i) those with exceptional decoding skills but poor reading comprehension, and (ii) those who begin with poor oral language and go on to have poor reading comprehension. The poor comprehender profile is noted as a feature of language impairment and perhaps will be classified in a new category called learning disability.

*Expected publication date is May, 2013.

Discrepancy criteria qualified by local conditions

For most childhood and adolescent disorders the process of arriving at a diagnosis must be sensitive to local culture and ways of living. Such sensitivity is critical for SLDs since many different factors affect the learning of basic skills, particularly literacy. For example, some children learn to read in their home language, others in a neighborhood language or a language imposed by socio-political forces, yet others achieve literacy in an entirely foreign language, having heard very little of the language at home, in the community and sometimes even in school. In other instances, children may learn to read in two or three languages, and become bi-scriptal or multi-scriptal. Learning how to read and write these multiple languages may happen simultaneously or sequentially, with children being introduced to additional languages at different stages in their school career. Any understanding of the specific literacy difficulties needs to be sensitive to the multiple pathways to literacy.

A strong relationship also exists between socio-economic conditions and literacy outcomes. In a survey of 672 high school children in the UK tested during the standardization of the *York Assessment of Reading and Comprehension*, a clear association was found between reading ability and social deprivation. The survey used the postal codes of children’s homes to rank them for social deprivation. A lower rank was for localities (postal codes) in which children experienced many forms of deprivation relative to the UK norm. The trends in the data are presented in Figure C.3.1. About 33% of children in the deprived neighborhoods were poor readers, close to double when compared to the more advantaged neighborhoods, where between 5% and 18% of children were classified as poor readers.

Reading fluency
The ability to read quickly, accurately and effortlessly, with appropriate expression and meaning.

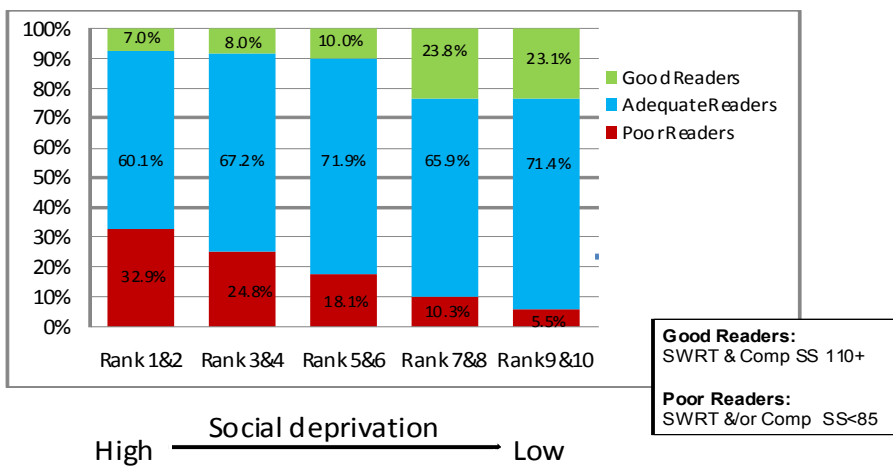
Reading accuracy
The ability to correctly decode the written language, especially when reading aloud.

Reading comprehension
Knowledge and understanding derived from text.

Reading attainment
Level of achievement in any or all reading skills, usually estimated by performance on a test.

Figure C.3.1 Reading ability is modulated by local conditions
(SWRT = single word reading; Comp = reading comprehension, SS = standard score)

Reading ability and social deprivation (n=672)



Bi-scriptal, multi-scriptal
The ability to read or write the scripts of two (bilingual) or more languages.

The influence of social deprivation on literacy attainments is also found among children gaining literacy in a second language although, similar to monolingual groups, the impact appears to be uneven across cognitive domains. The annual surveys of the Uganda National Education Board, for example, documented better language and literacy attainments in the relatively more advantaged localities in the capital city of Kampala and the surrounding urban area than in more deprived rural areas (NAPE, 1999-2008), while a pre-school survey of Spanish-English bilinguals in the US (Bohman et al, 2010) showed vocabulary learning to be more vulnerable to the influences of social deprivation than acquisition of basic grammar.

The discrepancy formula, which is favored by ICD-10 and DSM-IV but not DSM-5, is particularly difficult to apply when there is variable opportunity and the literacy environment leaves children far behind in their attainments. In such situations, the learning difficulties and low level attainments mimic the difficulties and skills profile seen among children with dyslexia. For example, when large numbers of children in a class are below the expected level for their grade and age, not all the underachievers will show a cognitive profile that is typical of dyslexia. Such children may be said to show a *dyslexia-like picture* but are certainly not eligible for a clinical diagnosis. Clarity about the distinction between the disorder and environmentally induced underachievement, that mimics the disorder, is essential. Without such a distinction there will be an over-diagnosis of the disorder and an unacceptable use of a deficit/disorder perspective for all interventions.

In many countries there are no locally standardized tests. In such contexts, test results can be difficult to interpret and there is a genuine concern that test findings can mislead. In other words, test results in the absence of normative data are an unreliable metric for deciding who has a learning difficulty and who is free of learning problems.

The discrepancy formula is problematic on several other fronts as well. For example, a formula using a child's age and predicted attainment for that age assumes a mono-grade classroom, with a pre-specified age band in each class. But in many communities the age-grade arrangement is quite different. Schools may be multi-grade with children from several grades in one class. In such schools learning targets may not follow a year-wise framework. Sometimes, the age criteria for school admission may be flexible with older children entering lower classes.

The discrepancy index between intelligence and attainment has also turned out to be problematic. The assumption here is that a higher IQ is associated with better reading scores, and when this is not the case then it is an indication of a learning difficulty. Evidence is now available from several large scale studies that the correlation between IQ and reading skill is modest, thus the simple intelligence-reading attainment discrepancy formula is not very useful and it is unclear what exactly a discrepancy index based on IQ can say about the nature of a learning difficulty.

Given all the above, the criteria used for “diagnosis” must be agreed within the context of the local educational setting. Such sensitivity can correct the mainly acultural nature of descriptions in diagnostic systems. It can ensure that there is a clear distinction made between learning difficulties attributable to poverty, deprivation and insufficiency of school-related experiences, and learning

Dyslexia

A developmental disorder affecting the skills involved in the reading and spelling of words, in the absence of any intellectual impairment. Symptoms range from mild to severe, and various subtypes have been proposed.

difficulties that follow from biologically-based cognitive deficits. But, even after we have smoothed out the jagged edges of our definitions and created a diagnostic system that is contextually appropriate, there remains one further difficulty with this approach – it is not grounded in educational practice and instruction. A diagnosis does not in itself indicate what may be the best way to intervene to help the child. Moreover, the diagnosis gives no indication of the cognitive deficits that underpin the disorder, nor does it highlight potential risk factors. Some of these concerns are addressed in the next section.

Response to intervention as an approach to diagnosis

In this approach to classification, children are said to have a specific learning difficulty if they *continue to struggle even after substantial individualized help has been given, and this is documented* through a continuous monitoring of their response to the intervention. The term *individualized help* means any teaching program motivated by the child’s specific learning needs. The individualizing of the program can be at the level of worksheets, teaching targets, time given to the child to finish an assignment and the ways in which the assignment is assessed. Individualized help may be through a mainstream program that is suitably adapted (the child remains in class and is given what everyone else is receiving but with some changes). Alternatively, the individualized program may be offered through remedial teaching in small groups or on a one-to-one basis. The term *continuous monitoring* means that there is a predetermined time plan for repeated evaluation of the child’s skills and attainments. This could be at the end of every school term or every academic year or at any other natural transition point in the school system. The scope of what is monitored is also flexible. The areas can cover foundation skills for learning as well as the main curriculum areas that are important for the child to show improvement in school.

The *response to intervention* approach recommends a postponement of diagnosis till after a *proven* intervention has been offered to the child. School under-achievement is a serious possibility for many children, not least because of poor quality teaching and long gaps in teaching input. An essential first step in such contexts is to defer the diagnosis and first arrange for a period of focused teaching support. The essential ingredients of such an approach are laid out in a recent report to the UK government ([The Rose Review; 2009](#)).

Models for response to intervention depend on how many layers of support are made available to the child. Each layer of support may be referred to as a “tier” or a “wave”. Figure C.3.2 below summarizes three responses to intervention models.

One concern about the response to intervention approach is that it is expensive. Another concern is whether the intervention on offer is indeed the best suited for the child. This is mainly because any intervention, by its very attempt to be focused and specific in its targets, may inadvertently neglect an important domain that needs remediation and skill-building. Thus, an intervention may be focused on reading-related skills while neglecting other skills such as language. If a child has a primary language difficulty, information gained from response to a reading intervention may be misleading. The intervention may simply not have addressed the skills the particular child lacked. Further, core curricular areas such as handwriting, math and expressive writing are often prone to neglect.

Expressive writing

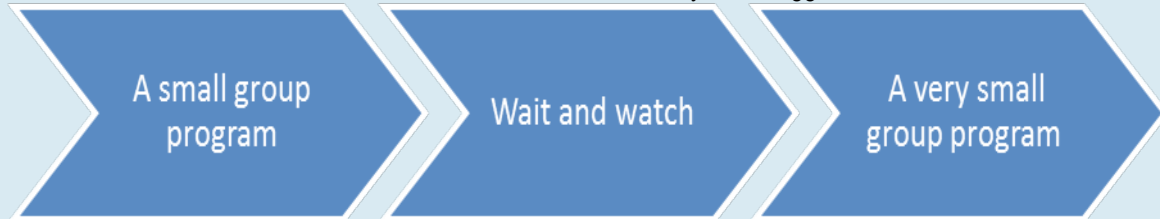
Writing which explores the personal feelings, experiences and opinions of the writer.

Figure C.3.2 Models that allow for assessment of Response to Intervention

Single-tier model: all children receive a fairly long quality program and then assessment is conducted.



Two-tier model: children receive a second intervention if they still struggle some time after a first module.



Three-tier model: children who are below expected level at each tier receive a progressively more intensive remedial program.



Summary

- School underachievement is often the reason for referral to child and adolescent clinics and allied settings. School underachievement is a visible feature for a number of different underlying difficulties.
- A diagnosis of one of the specific learning difficulties is heavily dependent on the educational, socio-economic and socio-cultural context.
- Popular approaches to diagnosis use discrepancy criteria – discrepancy is assessed between a child's age/grade/IQ-expected and actual performance on a specified learning task.
- Such a discrepancy formula is neither informative for intervention nor a description of underlying causes for the difficulty.
- An alternative approach to identification is to allow the child to *first* receive quality teaching (*quality-first*) which can assure the assessor that the symptom picture is not because of lack of opportunity. Following the intervention, those children who remain behind are the ones who qualify for a diagnosis.
- However, the *response-to-intervention approach* can be misleading if the intervention itself is of poor quality or the area of intervention is other than the specific difficulty of an individual child. In such instances measuring response-to-intervention is a futile exercise.

LITERACY LEARNING

Literacy learning is directly dependent on the writing system that a child is taught. Figure C.3.3 shows a map locating some of the scripts in which children are learning to be literate across the world. The map covers the Latin-derived scripts like English, German and French, the Cyrillic scripts of languages like Russian and Ukrainian, the alphabet systems of Arabic and Hebrew, the Asian scripts of Hindi, Bengali and Tamil, the mixed scripts of Japanese and Korean, the Chinese scripts of Hong Kong, Taiwan and other varieties on mainland China, the syllabaries of the native American languages and the *abugida* of Ethiopia. This list is by no means exhaustive (for example, some children are learning through the tactile modality – Braille), but underlines the sheer diversity in scripts and how easy it is to overlook the fact that understanding how specific learning difficulties impact literacy requires an understanding of the writing system of a region. In the following section, we discuss three aspects of writing systems: the direction of writing, the number of symbols in the writing system and the level of spoken language that is encoded in the symbols of the writing system.

Some defining features of writing systems

Writing direction is the reading direction

Modern day writing mostly lays out the symbols left to right (e.g., Bengali, English, German and Tamil), right to left (e.g., Arabic, Divehi, Hebrew and Urdu) or top-down (some forms of Chinese and Japanese). But there are several other symbol arrangements that are possible and that have been used successfully by literate societies down the centuries. Figure C.3.4 below gives two examples of symbol arrangements, no longer in use, but used by large communities for several centuries. Literacy instruction for these ancient writing systems would have perhaps focused on ensuring that learners understand the logic of the writing direction.

Figure C.3.3 A selection of scripts in which children gain literacy



Source: Wikipedia GNU free documentation license.

Figure C.3.4 Writing direction in the ancient scripts of early Greek and Egyptian Hieroglyphic.



One can only speculate on what the clinical picture of a specific literacy difficulty might have been in these contexts!

Writing systems have a symbol register

The symbol units in English, French and Italian are called *letters*, the Bengali, Hindi and Tamil symbols are called *akshara* and the Chinese symbols, *characters*. The symbol sets in each of these and other systems have unique contours and visual features that distinguish them from others.

The number of symbols in a writing system can be as little as in the 20s to as many as 2500 or more. We refer to the small symbol registers as *contained orthographies* and those with hundreds of symbols as *extensive orthographies*. The European languages for example have symbol sets of less than 35 and are examples of contained systems. The Asian alphasyllabaries, with 300+ symbols, and the Chinese systems, with 2000+ symbols, are extensive systems. The pace of learning the different number of symbols varies as a consequence. Among contained systems, children quickly master the basic symbol set, typically within one school year. Among the extensive systems, new symbols continue to be learnt in middle and high school, and beyond. Any attempt at making comparisons about symbol learning across the two types of writing systems is therefore not straightforward. And, as can be expected, when symbol learning demands are different, there is a knock on effect on how word reading, spelling, reading comprehension and expressive writing are developed within each system.

The differences between contained and extensive orthographies have another outcome that is of direct interest to understanding children who fall behind in literacy. In the extensive systems, because new symbol learning takes place over a protracted period of time, children vary in their level of symbol knowledge in middle school and even high school. Symbol knowledge thus becomes a robust concurrent predictor of individual differences in literacy development (for Indian *akshara* systems: Nag, 2007; for Chinese: Tong et al, 2010). Children who begin with lesser symbol knowledge are less accurate in reading words correctly and quickly (reading accuracy and reading speed). In the contained systems however, knowledge about the small number of symbols is easily gained by all children. Individual variations in letter knowledge disappear after an exceptionally short time, often confined to the first year of literacy instruction. Thus symbol



Click on the picture to access a website with a fascinating collection of scripts down the ages.

knowledge (or letter knowledge) is a useful concurrent index for understanding individual differences in literacy attainments only within the first few years of primary school. Nonetheless, symbol knowledge is a *good longitudinal predictor of literacy attainments* in both contained and extensive orthographies; children who are slow to learn the symbols of their language often remain slow in literacy development in the following years.

Writing systems represent sounds

A primary function of written language is to capture the words and meanings of the spoken language. However, writing systems vary in the level at which the symbol units capture spoken language. Below are four examples of differing levels of representation.

- The *alphabet* captures sound at the level of small sub-syllabic sound units called phonemes. English is an example of an alphabetic writing system. The sound /p/ for example is represented by the letter “p” (“pin”, “pot” and “picture”) and the sound /s/ by the letters “s” and “c” (“sun” and “sign”, “cell” and “center”). In the alphabetic systems, there is thus a correspondence between the symbols (letters or graphemes) and phonemic sounds. Several European languages including Dutch, Finnish, Greek, Icelandic, Norwegian and Spanish, use letters to represent phonemes. Other examples of alphabetic scripts are Hebrew, Arabic and Cyrillic.
- The *alphasyllabary* is another type of writing system. Alphasyllabic scripts have a *dual representation*; their symbols stand for syllable-level sounds such as /ka/ and /ko/ but can be further segmented to reveal the phonemic sound components (called phonemic markers). Thus an alphasyllabic symbol such as /ko/ can be pulled apart to represent which segment of the symbol represents the /k/ and which part the /o/. Several alphasyllabic writing systems are concentrated in and around the South and South East Asia region. These are Indic scripts that have their roots in the ancient Brahmi writing system, and some examples are Bengali, Gujarati, Hindi, Tamil, Thai and Sinhala. Other examples of alphasyllabaries are the *abugida* of Ethiopia and neighboring regions of North Africa, and the writing systems found in the northernmost parts of North America.
- In the *syllabary*, another closely similar writing system, the symbols map onto sounds only at the level of the syllable. The syllabaries are distinguishable from alphasyllabic symbols because they cannot be de-constructed visually below the level of the syllable to reveal smaller sound-bearing features. Examples of syllabaries are the Cherokee script and the Japanese *hiragana*.
- The *character* is the symbol unit of the Chinese writing systems, and is commonly called a *logograph*. The characters represent abstract ideas. They carry specific lexical information, often representing meaningful units of the language called *morphemes*. Thus, the symbols of the Chinese systems are meaning-bearing units rather than merely notations of the sounds of a language, as in the alphabetic, alphasyllabic and syllabic systems described above. Chinese characters, however, have distinct visual features called phonetic radicals which give clues to the sounds that the symbols represent. In other words, the characters of Chinese carry both lexical and phonological information and thus the writing system is more appropriately called a semanto-phonetic or morpho-phonemic.

Alphabetic systems

Writing systems in which letters, symbols or signs, usually arranged in a fixed order, are used to represent one or more phonemes in the language transcribed.

Alphasyllabic systems

Writing systems in which symbols and signs represent sounds at the level of both the syllable and the phoneme.

Chinese systems

Logographic writing systems, in which complex signs or characters are used to represent words or morphemes in the Chinese languages.

Contained and extensive orthographies

Contained orthographies are writing systems in which a relatively small number of symbols are used to represent sounds throughout the language (i.e. alphabetic systems, spanning around 24-36 letters). By contrast, extensive orthographies are writing systems in which a vast number of symbols or characters are used to represent sounds throughout the language (i.e., alphasyllabic systems; the Chinese system – spanning over 2,500 characters).

The cognitive processes that underpin literacy learning in each of the four writing systems described above are subtly different. But there is also growing research evidence to show that there are some commonalities involved in the foundation skills required for learning to read across writing systems. We turn next to describe these skills, as well as to highlight some script-specific cognitive demands.

The foundations for learning to read

Oral language skills are critical for the development of literacy. Teachers are often told that it is vital they trust the adage “speaking and listening help reading and writing”. This is exceptionally sound advice that has been borne out by literacy research. Children who have better language proficiency in the language of reading instruction are at an advantage. They have more language tools for the task of understanding the written material. Oral language supports several aspects of literacy including decoding words, making meaning of texts, and expressive writing. There is also evidence to show that when teaching specifically focuses on improving oral language, the gains are twofold: children get better at multiple skills associated with oral language *and* they show improvement in their literacy skills.

Oral language is an overarching term for several skill domains, namely *phonology*, *semantics*, *syntax* and *pragmatics*. *Phonology* refers to the speech sound system and how it maps to meaning, *semantics* refers to the meaning relationships between words (how our vocabulary knowledge is structured), *grammar* to the formal structure of the language (syntax and morphology) and *pragmatics* to the use of various cues which make communication meaningful (e.g., use of information, intonation, emphasis and gesture). Each of these skills supports the development of literacy but, among them, phonology has been a lead candidate for defining the core deficit in specific reading difficulties/dyslexia. In this section we discuss semantics, grammar and pragmatics under the umbrella term *broader oral language skills*. We then proceed to examine the role of phonology in more detail.

Broader oral language skills support literacy in various ways, and there is evidence that better oral language skills are associated with better performance on specific sub-components of literacy. It is important to note that we are discussing here the oral language skills that are specifically in the language in which literacy is being taught. When the literacy language is the child’s less proficient language then the child may lack these vital strategies.

Word recognition

- *Exception words* are words that do not show predictable symbol-sound associations. Examples of exception words in English are ‘knife’ with a silent ‘k’ and ‘whistle’ with an unusual letter string for the ending sounds. A straightforward decoding strategy cannot suffice and word recognition draws upon broader oral language skills. The role of semantics and syntax (together affording a linguistic context) in learning exception words has been shown in several languages.
- *Polymorphemic words* are words with more than one meaning unit yoked together. Broader oral language skills help decode polymorphemic words probably because better oral language allows children to “see” the embedded morphemic units more readily. Examples of polymorphemic words are



Click on the picture to access “Developing Early Literacy: Report of the National Early Literacy Panel”

Morphology

The study of the structure and content of a given language’s word forms and linguistic units.

Pragmatics

The study of the use of language in social contexts and the ways in which people produce and comprehend meanings through language.

Semantics

The study of meaning in language.

Syntax

The study of the rules governing the ways in which words combine to form phrases, clauses, and sentences (i.e., grammar).

compound words like *butterfly*, *sunshine* and *somewhat*, words with prefixes like *un-conscious*, *non-sense* and *poly-morphemic* and words with suffixes like *comb-ing*, *amuse-ment* and *electri-cian*. A language where lexical compounding is frequent is Chinese. An example of Chinese word formation through compounding is the three character word for *giraffe* (*chang2.jing3.lu4*) which represents the three morphemes *long.neck.deer* (Chenet al, 2009). We now have good evidence to show that those children who have insights into the internal morphemic structure of Chinese words are better at word reading.

- Some languages are densely inflected using many varieties of grammatical markers to communicate meaning. *Inflections* include case markers and person-number-gender markers which are either attached or closely associated with specific nouns, verbs and other grammatical units in sentences. In these languages, knowledge of inflections (inflectional morphology) helps to predict upcoming information in sentences and thus may facilitate word decoding. Examples of inflections in English are the past tense inflection *-ed* (*test- tested*) and the plural inflection *-s* (*result-results*).
- In some languages such as Japanese, the same symbols may change in sound value depending on whether it is a single character word or part of a multi-character word. Thus, the same symbol (called *kanji*) is the first symbol in *flower* and in *pollen*, but they each have a different pronunciation: */hana/* and */kafun/* (Wydell, 2003). The underlying rule for choice of sound has to do with whether the word is a native Japanese word (called *Kun-reading*) or a loan word from Chinese (called *On-reading*). Such changes in symbol-sound correspondences based on the native-foreign roots of words are seen in other languages as well, such as Tamil and Bengali, and the role of vocabulary knowledge is thus essential to decode the word.
- In some languages such as Arabic, texts for skilled readers do not represent the vowels (*unvowelised writing*). It is therefore the sentence context and broader oral language skills that allows the reader to recognize the word. Indeed, knowledge of morpho-syntax is crucial for reading because when vowel units are left unrepresented in the writing, a given consonant string can stand for any number of words.



Click on the picture to access a website (Reading for Meaning) with activity ideas for an oral language program.



Children's artwork in Arabic, preschool in Indonesia. (Picture: S. Nag).

- In some languages, words with multiple morphemes undergo subtle phonological changes particularly at the point where the morphemes join. In English the suffix *-tion* can cause phonological changes at the boundary – *connect* to *connection*, *separate* to *separation*. Knowledge of these morpho-phonemic aspects of internal boundaries of words can help decoding.
- Broader oral language skills can help to recognize a word that is proving difficult to decipher using a straightforward phonological decoding strategy. They are particularly used for reading less transparent words, words with multiple meaningful units and lesser known words, for example for learners in a non-dominant language.

Spelling

- In some languages, broader oral language skills (especially morphological knowledge) can help in deciphering the spelling of a word. Thus in English, knowing that *drama* and *dramatist* are morphologically related words, can help spelling them. Examples of other words in English, for which derivational rules make spelling simpler, are words with suffixes *-ment* (*involvement*), *-ness* (*wetness*), *-ion* (*connection*). Morphemic rules are used in word spelling in several other languages including Dutch, Kannada and Arabic.
- In some languages, different word forms are *homophones* (words with same sound but different spelling). It is only knowledge of how morphology maps to the written form of the word (meaning-symbol linkages) that can assure correct spelling. In French for example, conjugations of the verb *manger* (eat) are pronounced in the same manner even though they have different spellings: *je mange* (I eat); *tu manges* (you eat); *ils mangent* (they eat). In Cantonese, the syllable /fu/ is written with a different character depending on its tonal value: /fu1/ (skin), /fu2/ (tiger), /fu3/ (trousers), /fu4/ (symbol), /fu5/ (woman) and /fu6/ (father) (Tong et al, 2010).
- Morphological knowledge has been found to be particularly useful in languages such as Arabic, Japanese and Bengali where phonological values of symbols change depending on context. In Bengali for example, word medial consonant clusters are realized in spoken form quite differently from the written spelling - the word *podda* (lotus) is written as *padma* and *sotto* (truth) as *satya*. Knowing the rule that *consonants in word medial positions, even if geminated in spoken form, will be a mixed cluster*, however implicit this knowledge may be, helps in spelling these words.
- The use of morphological knowledge to read symbols is particularly important in morpho-phonetic writing systems like Cantonese and Mandarin. This is because the same tonal syllable in different polysyllabic words can be written with a different character. Take the Cantonese syllable /laan4/. It has a different spelling (character form) when it represents different meanings such as *block*, *column*, *orchid*, *waning* and *wave* (Tong et al, 2010).
- Some words carry unusual internal phonemic changes making spelling these words as demanding a task as reading them. Once again, morpho-phonemic knowledge about word internal boundaries helps in the decoding of such words.



Chinese is an example of an extensive orthography.

Reading comprehension

- Reading comprehension is closely linked with listening comprehension; therefore, children with better oral language skills are better at reading comprehension. Broader oral language skills help extract context-related information. Both context and word-level meanings combine to support comprehension of the written text.
- Individual words may carry both meaning and grammar-related information (morpho-syntactic information). In such instances, greater awareness of the roots and inflected markers for various grammatical functions has been found to be associated with better reading comprehension. In Kannada, a language of South India, the phrase *bijjagaLu nungidanu* (swallowed seeds) comprises the following morphemic units: *bijja* (noun + plural) *nungu* (verb + past, masculine, singular, 3rd person).
- Sentence processing depends quite critically on the mechanism of prediction. When children have a better idea of sentence structures they are better able to comprehend what they read. Better knowledge of syntax and grammar can therefore help to more accurately predict, and thus more quickly recognize, upcoming words in a sentence. For example in English, when there is an accurate interpretation of the word order, reading comprehension is supported.

Each of these interactions between broader oral language and the sub-components of literacy are critical right from the outset of literacy and are likely to affect literacy learning into adulthood. For example, findings from a [survey](#) of close to 40,000 households in the US found that young adults between the ages of 21 and 25 years who struggled with reading comprehension were also poor in spoken language tasks.

Mappings between cognitive domains support literacy development

The process of learning to read entails becoming skilled at mapping the symbols of the writing system (orthography) on to the sounds that they represent in the language (phonology). In addition, written words and sentences need to be mapped on to meanings (semantics). The schematic drawing in Figure C.3.5 is a simple illustration of how the three cognitive domains interact. Skilled reading, spelling and expressive writing require that connections across the domains are accurate and efficiently executed. For example, the process of decoding words commonly requires linkages to be made between orthography and phonology: from symbols to sounds for reading, and sound to symbols for spelling. But in many languages, such as Arabic, Bengali, Chinese, English and Tamil, the same symbol may have different sounds depending on the context in which it appears. In such cases, decoding additionally requires making links between orthography and semantics+grammar. These different types of links across multiple domains are the “glue” that hold written and spoken language together.

Mappings between phonology and orthography

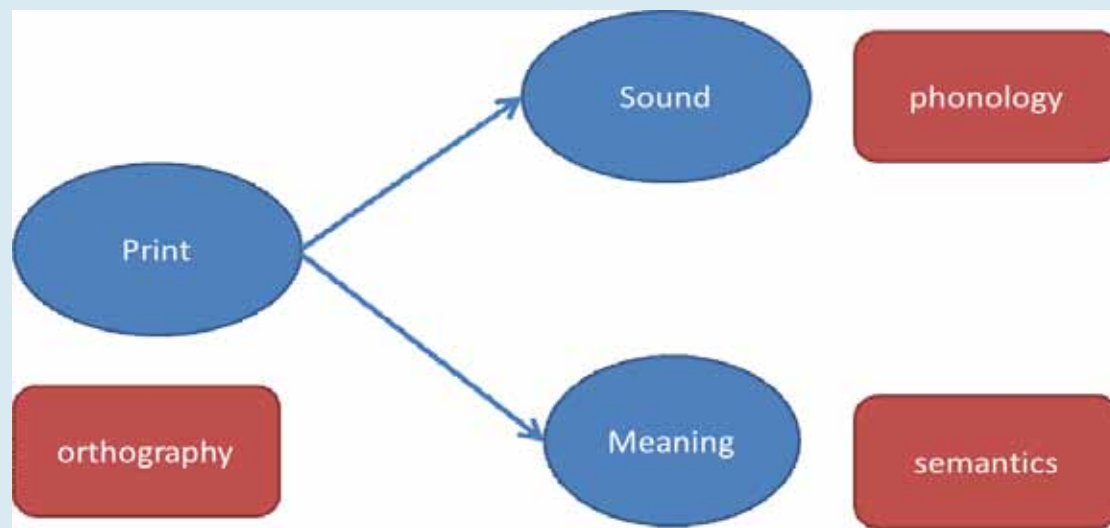
The linkages between phonology and orthography are more or less predictable in different writing systems. For example, if we take the letter string “*tea*”, in English it means a hot beverage and the written word maps on to the spoken syllable /*te*/. In Finnish, the same letter string “*tea*” is a name, and is sounded out exactly as it is written, making it a two syllable word /*te*/+/*a*/. The

Transparent writing system

A writing system in which only one letter (or symbol) is used for each phoneme (e.g., Finnish).

Opaque writing system

A writing system in which single letters (or symbols) can represent multiple phonemes (e.g., different vowel sounds in the English language), or where a single phoneme can be represented by multiple letters (i.e., *c* and *k* in the English language).

Figure C.3.5 A schematic representation of three cognitive domains involved in literacy.

difference between English and Finnish is one of “transparency”, which refers to that feature of writings systems “where it is approximately true that individual letters correspond reliably to individual sounds” (Seymour, 2005 p299). Finnish is a *transparent language* whereas English is an *opaque language*. Other examples of transparent languages are Italian, Serbian, Kannada and Divehi, while examples of more opaque languages are Bengali, Danish, Portuguese and Urdu.

We now know that when the mappings are regular, consistent and hence transparent, children learn to read faster. One of the biggest cross-linguistic studies to confirm this was initiated by a network of European researchers, the COST A8 Consortium (1995-1999). The COST A8 Consortium assessed children in grade 1, who were under what the authors called “standard teaching conditions” for the particular country (Seymour, 2005). Children were asked to read aloud lists of words and non-words (letter strings that are not meaningful). While decoding of words can draw upon both sound-symbol linkages as well as semantic knowledge, reading of non-words cannot draw upon meaning or context related strategies, and is thus often considered a pure indicator of phonological decoding skills, requiring detailed knowledge of what sounds the individual letters map on to. The comparison across countries confirmed the advantage that transparency of a writing system brings to the process of learning to read. In the more transparent languages, children in grade 1 were already accurate more than 90% of the time when decoding words. On non-words too these children were high in their accuracy, reading more than 80% of items on the list correctly. The exception was English, where the inconsistency of the mappings slowed down children’s mastery of decoding skills. Their accuracy rates fell to below 40%.

The languages compared by the COST A8 Consortium were all contained orthographies with symbol sets between 24 and 32 symbols. Similar effects of transparency on reading accuracy are also seen in the extensive orthographies. In a comparison of adult Hindi-Urdu bilinguals for example, reading was faster

Decoding skills

Skills necessary to analyze and correctly interpret the graphic symbols of a familiar language (e.g., the ability to connect a printed word to the spoken word it represents).

and better in Hindi (more transparent) than Urdu (less transparent) (Rao et al, 2011). In another comparison between two Japanese scripts, a similar difference was found between the more transparent Hiragana and the less transparent Kanji (Chen et al, 2007).

There are a number of possible explanations for the differences in speed and accuracy observed across writing systems:

- Transparent writing systems allow for ease of assembling sounds because once the individual symbols are decoded in these systems, a mere assembly of the sounds will reveal the word. The less transparent systems on the other hand need other layers of knowledge to work out the word. The phonological assembly route to decoding and the route via other layers (usually lexical) broadly differentiate the more and less transparent systems.
- The processes involved in learning about the mappings between symbols and sounds differ. This is a slightly different learning challenge from the end-processes that support decoding outlined above. Transparent systems have a straight forward mapping which allows for faster grasp of the symbol-sound linkages. This is essentially statistical association learning between visual and verbal codes. Less transparent systems require many more instances of exposure to learn the variations in the system. In other words, it is easier to learn that the sound of “p” is always /p/ (transparent) than to learn that the sound /ai/ may be represented though /il/, /eighl/, /ail/ or /layel/ (not transparent).

The role of phonology in literacy learning

Phonological processing skills refer to knowledge about the sounds of a language and the skill to manipulate these sounds. An example of a phonological skill is the ability to drop the first sound in words like “meat” and “shut” (to get “eat” and “ut”), or the skill to replace their first sounds with “l” (thus “leat” and “lut”). There is good evidence from across languages and different age groups that learning to read continuously draw upon such phonological skills. In turn, developing reading skills re-shapes phonological skills. Awareness of phonemes, for example, is a robust predictor of single-word reading attainment in several alphabetic and alphasyllabic languages – for example, English (Muter et al, 2004), Arabic (Abu-Rabia et al, 2003) and Kannada (Nag, 2007). Importantly, difficulties with phonological skills are a defining characteristic of many poor readers, in different types of writing systems and languages and across age groups into adulthood.

What is the reason for such a close associations between phonology and literacy? First, writing systems directly represent phonology and hence learning to read immediately draws upon this cognitive domain. Second, in the process of reading, the segmental units in spoken sounds become better represented because the symbols are visual representations of phonological units. However, the level at which the specification occurs varies across writing systems because, as discussed above, writing systems differ in the level of spoken language they represent:

- For alphabetic systems, the specification is at the level of the phoneme.
- For alphasyllabic systems, the specification begins with the syllable and moves onto the phoneme.
- For Chinese systems, the specifications are mainly at the level of the syllable.

Visuo-motor skills and visual processing skills

These are two areas that have not been included in the schematic diagram in Figure C.3 5. There is, however, reason to believe that both of these skills are important foundation skills in the visuo-spatially complex writing systems such as the Japanese *kanji*, the Chinese systems and perhaps also some of the Indian alphasyllabaries. Research in this area is ongoing but initial data from both cross-sectional as well as longitudinal studies suggests that visuo-motor skills and visual processing skills are associated with individual differences in reading skills (Nag & Snowling, 2010; Tong et al, 2010; McBride-Chang et al, 2005; Wydell, 2003).

Summary

- Typical literacy development draws upon multiple cognitive domains. Of these, phonology, vocabulary and syntax, as well as the skill for mapping efficiently between visual and verbal codes, are the best researched foundation skills for literacy development
- When the symbol system is visuo-spatially complex, visual processing skills appear to be important predictors of early literacy attainments
- Children are learning to be literate in a variety of orthographies and these writing systems differ on several counts including the number of symbols they carry and the level at which they represent spoken language. The cognitive demands of learning to be literate are therefore subtly different in each writing system
- However, behind the script-specific details are some common cognitive processes that are essential for literacy learning in all writing systems. These critical foundations include oral language skills and skilled mapping between sounds and symbols.

Table C.3.2 opposite lists the broadly similar foundation skills across writing systems, but note the specificities of each of the typologically very different systems.



School, Maputo,
Mozambique.
Photo: Peter Reid

Table C.3.2 Foundation skills are broadly similar across writing systems.

	Arabic ¹	Kannada ²	Chinese ³	English ⁴
Phonological skills	Phonemes	Syllables and phonemes	Syllables and lexical tones	Phonemes
Orthographic knowledge	Letters and diacritics, symbol form according to position in word	Akshara, diacritics and ligaturing rules, knowledge of akshara-syllable mappings	Characters, phonetic radicals, knowledge of specific characters for homophones	Letters and legal letter sequences
Sound-symbol mappings	Level of word & morphemes especially for unvowelled text and homographs	Level of syllable, phoneme and onset-coda	Level of word, morpheme, syllable and phonetic radicals	Phoneme and rime level
Vocabulary knowledge	Knowledge of inflections, derivatives and compounds	Knowledge of derivational morphology, morpho-phonological rules in polymorphemic words	Knowledge of homophones, structure of polymorphemic words and rules of lexical compounding	Knowledge of exception words, inflections, derivatives and compounds
Grammar knowledge	Knowledge of markers for case, person, number, gender, awareness of agreement features	Knowledge of markers for case, person, number, gender, awareness of agreement features	Knowledge of acceptable word order	Knowledge of tense markers, constraints of word order

Note: based on work by Elinor Saiegh-Haddad¹, Sonali Nag², Catherine McBride-Chang³ and Margaret Snowling⁴



Ancient rock art and inscriptions, Edakkal, India. (Picture: G. Arulmani)

LITERACY DIFFICULTIES

In this section we will review what we know about literacy difficulties: how common are they in the population, what their clinical picture is and what we know about their etiology. We will also discuss current trends in assessment and intervention. The literacy difficulties we focus on are not just limited to those children who fulfill the criteria laid out in the diagnostic manuals. We also focus on children who are in the mild to moderate range for literacy delays, reflecting the knowledge that reading (and spelling) is a continuous trait. This is in keeping with the view that both the risk factors for specific learning difficulties and the manifest clinical picture are dimensional in nature rather than simple, categorical entities (see Chapter A.3).

Epidemiology

Information from epidemiological studies helps us understand how common a particular difficulty is by checking its frequency in a population. Such studies also gather information about the distribution of the problem – whether it predominantly occurs in a particular location, in which age groups the problem is observed, what are the circumstances under which the clinical picture changes, and whether there are differences in occurrence over time. Analyses of this kind help us gain a better understanding of the multiple factors that shape the manifestations of a difficulty, as well as to develop appropriate policies for people who are affected.

A review of published epidemiological studies suggests similar trends across countries; this is not surprising since prevalence rates depend upon the precise criteria used to define these disorders and different studies tend to adopt similar cut-offs – e.g., lowest 5% or 15%: USA (Shaywitz, 1998), India (Nag, 2000; Nag & Snowling, 2010). Accordingly, narrow band definitions of reading disorders based on conservative cut-offs place the prevalence rates of specific learning difficulties between 4% and 8%. In contrast, broad based surveys that identify poor readers *due to multiple underlying causes* show prevalence rates of up to 18%. Incidence rates appear to increase over the early school years, with estimates showing a peak around the end of primary school (age 8-10 years), and new “cases” continuing to be identified through middle and high school, higher education and beyond.

The components of literacy that are prioritized for surveillance of literacy difficulties change over the school years, usually reflecting prominent concerns of community leaders, parents, teachers and clinicians for each level of schooling (see Box in next page). In the primary school years, the focus is on children’s difficulty with word-level decoding skills. By middle school, in addition to the children who already show an early disadvantage because of poor word decoding attainments, a second group of late-emerging poor readers also begins to be identified. These are poor readers with more or less adequate word-level decoding skills but substantially poor reading comprehension skills. From this level of school onwards, difficulties with spelling and expressive or narrative writing also attract diagnosis. In older children, adolescents and adults, more “cases” may be identified depending on the formula adopted by the particular survey for categorizing low achievement. However, when a consistent cut-off is used, estimates appear to be more stable. For example, in a longitudinal study over a three year period, the number of poor readers was 16% (Vellutino et al, 2008) though this need not imply that the same children are affected at each stage.

An example of a framework for monitoring reading attainments: The SACMEQ* II surveys

A group of countries in Africa have been conducting cross-national surveys since the 1990s. Called the *Southern and Eastern Africa Consortium for Monitoring Educational Quality* (SACMEQ), the group comprises the ministries of education in southern and eastern Africa¹. Given below are the levels of reading assessed in the SACMEQ II Surveys (2000-2003):

- Level 1. Prereading:* matches words and pictures involving concrete concepts and everyday objects.
- Level 2. Emergent reading:* matches words and pictures involving prepositions and abstract concepts; uses cuing systems to interpret phrases by reading forward.
- Level 3. Basic reading:* interprets meaning (by matching words and phrases completing a sentence) in a short and simple text.
- Level 4. Reading for meaning:* reads forward and backward to link and interpret information located in various parts of a text.
- Level 5. Interpretive reading:* reads forward and backward to combine and interpret information from various parts of a text in association with (recalled) external information that completes and contextualizes meaning.
- Level 6. Inferential reading:* reads through longer (narrative, expository) texts to combine information from various parts of a text to infer the writer's purpose.
- Level 7. Analytical reading:* locates information in longer (narrative, expository) texts to combine information to infer the writer's personal beliefs (value systems, prejudices, biases).
- Level 8. Critical reading:* locates information in longer (narrative, expository) texts to infer and evaluate what the writer has assumed about both the topic and characteristics of the reader (for example, age, knowledge, personal beliefs, values).

*SACMEQ member countries are Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (mainland), Tanzania (Zanzibar), Uganda, Zambia, and Zimbabwe.

Multiple contexts

Epidemiological data are sensitive to local conditions. For example, in an epidemiological survey in the city of London, UK, the prevalence of dyslexia was put at 3% in the metropolitan area while in another survey using exactly the same tools and criteria for identification, prevalence rate was 6%. The second survey was in the more deprived inner city schools (for a review see [Rutter & Yule, 2006](#)).

A similar picture of the impact of socio-economic disadvantage is available from surveys in the Southern Indian city of Bangalore where socio-economic circumstances were more crucial in explaining prevalence rates than children's language of literacy learning. Among schools catering to families belonging to the middle socio-economic classes and offering reading instruction in a non-dominant language (English), the prevalence rate was 18%. However in an institutional home for children in conflict with the law who were learning to read in their home language (Kannada), the prevalence rate jumped to 60% .

It is important also to note that most currently available epidemiological information is from high income countries. What this means is that data come from a particular type of schooling environment that typically subscribes to a mono-grade organization and strict age-grade stratification, class sizes are small to moderate and teacher: student ratios are healthy. Many of these schools are able to offer literacy instruction in the child's home language, or have well developed

bridge programs for transition from the home language into the school language. However, in many low and middle income countries, school arrangements may be quite different. Schools may have multi-grade classrooms (e.g., children between the ages of 5 and 8 studying in one group, with instruction spanning grades 1 to 3). Age range within a class may be quite large. For example, in a survey of about 8000 children in Uganda, the average age in grade 3 was around 10 years and the age range was between 6 and 15 years (UNEB, 2008). Schools may be informal or non-formal, with school timing being customized to the target group in the region (e.g., children who work with their families for a living). In these countries, the language of literacy instruction is often not the same as the home language, and language programs to ease the transition into the school language may be bypassed. In addition, teacher: student ratios may be unreasonably large (even up to 1:120 in some cases). It is clear that in these settings, prevalence rates cannot be easily predicted from what is documented in high income countries.

Further complicating the picture are the multiple sources of influence on the pace of literacy learning. The nature of the writing system, the child's proficiency in the language of literacy instruction and the effectiveness of the instruction program can all change the rate at which children become skilled in literacy. The variable trajectories of literacy learning need to be factored in when making definitions of who has a literacy difficulty. Table C.3.3 lists some of the parameters that can change the estimates of school learning and therefore define the local conceptualization of school underachievement.

Table C.3.3 Some influences on the pace of literacy learning.

Parameters that can influence the pace of learning	Likelihood of longer learning time
<ul style="list-style-type: none"> Are the links between the symbols and the sounds clear and consistent? Is the writing system transparent or opaque? 	<ul style="list-style-type: none"> With opaque writing systems (e.g., Portuguese, English, Japanese kanji, Tamil, Bengali, Arabic, Hebrew)
<ul style="list-style-type: none"> How many symbols are there in the writing system? Is the symbol set contained or extensive? 	<ul style="list-style-type: none"> With extensive writing systems (e.g., Chinese, Indian akshara)
<ul style="list-style-type: none"> What is the morpheme length of most words in the language of literacy? 	<ul style="list-style-type: none"> When words contain many morphemes and there are word internal changes either at the level of one morphemic unit or a morpheme boundary
<ul style="list-style-type: none"> What are the types of inflections in the language of literacy? 	<ul style="list-style-type: none"> With less productive inflections, greater distance between agreement features
<ul style="list-style-type: none"> Is literacy learning occurring in the first, second, third or another later-learned language for the child? 	<ul style="list-style-type: none"> When literacy is in the less dominant language (e.g., in many parts of the Asia Pacific, Africa and Central Europe)
<ul style="list-style-type: none"> Is the child learning to read in more than one language? Is the child receiving literacy instruction to become bi-scriptal or multi-scriptal? 	<ul style="list-style-type: none"> When literacy instruction is simultaneous in more than one language (e.g., many parts of South Asia)
<ul style="list-style-type: none"> Is the literacy instruction of appropriate quality and adequate duration? 	<ul style="list-style-type: none"> With poor quality teaching and insufficient duration of teaching
<ul style="list-style-type: none"> Is the home and community environment nurturing of literacy? 	<ul style="list-style-type: none"> In non-nurturing environments for literacy development

Epidemiological data not available

It should be clear by now that the cut-offs used for epidemiological surveys of literacy difficulties are externally defined by the context, and rates reported from epidemiological studies in one context must be interpreted cautiously in other contexts. Keeping this in mind, we suggest that it is best to begin with a brief survey in locations where epidemiological data are not available. A survey can help to understand the local prevalence rates of the literacy difficulty in different age bands and its distribution across locations (e.g., public vs. private schools, mother tongue schools vs. other language schools, poorly functioning schools vs. well functioning schools). The following are examples of tools for surveys:

- [Progress in International Reading Literacy Study \(PIRLS\) – Student Questionnaire \(2001\)](#)
- [The Child Development Index](#) (Nag & Arulmani, 2006 p30). This questionnaire is for village community workers.

Clinical picture***Dyslexia***

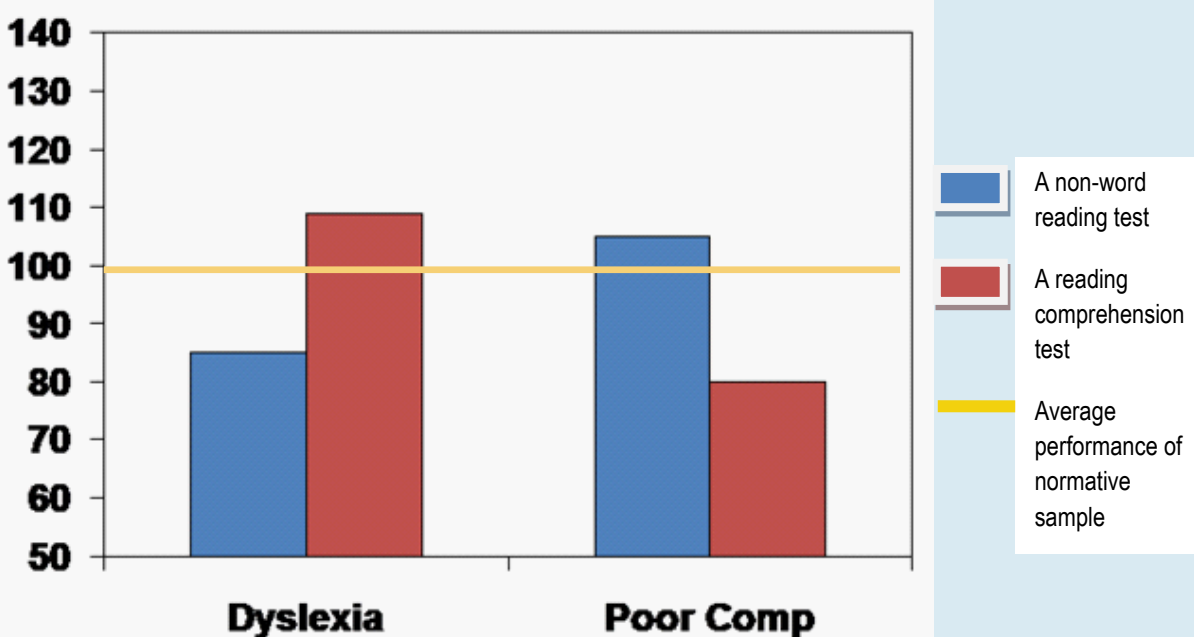
Although dyslexia was originally described by medical practitioners who focused on what they considered to be visual impairments, a landmark review pointed also to a variety of verbal deficits (Vellutino, 1979). In due course, and with evidence from several strands of research principally with alphabetic languages, the verbal deficit hypothesis evolved into the now dominant view that the core deficit in dyslexia is in the *phonological domain* and encompasses overlapping difficulties in phonological awareness, phoneme segmentation, phonological memory and phonological learning (Vellutino et al, 2004). Finally, though not yet fully understood, are deficits in *rapid automatized naming*, which requires the efficient retrieval of phonological codes (verbal codes like letter sounds, number and color names) from their visual forms (letters, digits or color swatches). Rapid automatized naming deficits have been found in semanto-phonetic Chinese scripts like Cantonese and Mandarin, the alphasyllabic scripts like Kannada and Korean and alphabetic scripts like Arabic, English, German and Greek.

An explanation of dyslexia that is entirely drawn from within the phonological domain is, however, insufficient to cover the range of deficits found among poor readers, particularly in the non-alphabetic writing systems. Ho et al (2002), for example, found that 50% of all poor readers were slow in rapid naming, 39% and 37% showed lowered orthographic processing (symbol awareness) and visual processing respectively, and 15% were poor in phonological processing. In a similar multi-factorial explanation for reading difficulties for Kannada, a language of South India, Nag and Snowling (2010) found that all poor readers were poor in symbol knowledge (in this case *akshara* knowledge), 62% were slow in rapid automatized naming, 60% were poor in phonological processing, 14% in visual processing and 62% in oral language. Findings from surveys such as these strongly endorse a multiple-deficit view of reading difficulties (Pennington, 2006). It is clear from these and several other cross-linguistic studies that explanations of poor reading, reading difficulties and dyslexia have to take into account domains of oral language, attention and visual processing and orthographic knowledge.

Two distinct forms of reading difficulty. In dyslexia the clinical picture is characterized by *compromised decoding skills while comprehension skills are intact* (either appropriate or above expectation for the child's age, grade or general abilities). There is however a second group of struggling readers who are poor in reading comprehension. While their decoding skills are appropriate for age, grade and general ability, they lag behind in comprehension skills. Figure C.3.6 below shows the difference in the attainment profiles of the two groups. There is converging evidence from several cross-linguistic studies that such discrete profiles are often seen among poor readers. This suggests a double dissociation between phonological skills for reading (decoding) and semantic skills for reading (comprehension).

A dimensional view of dyslexia. Figure C.3.6 presents reading difficulties as a modular phenomenon. There are however several challenges to such a neat, categorical view of dyslexia and literacy difficulties. The field of behavioral genetics has shown that genes have rather general effects and hence are unlikely to produce such neat dissociations with any frequency. Furthermore, single-deficit accounts fail to explain why some children succumb to reading impairments while others, with similarly affected processes, do not. Moreover, literacy difficulties show continuities with language impairments and co-morbidities are common. It is against this background, that the proposal of a dimensional view of developmental disorders has been made (see Hulme & Snowling, 2009 for a review). Developing this line of argument, a recent review in the UK concluded that dyslexia is a dimensional disorder with no clear cut-offs (Rose, 2009). Co-occurring difficulties include problems with language, motor co-ordination, mental calculation, concentration and personal organization, though it must be noted that none of these are, by themselves, markers of dyslexia.

Figure C.3.6 Two distinct attainment profiles: Children with dyslexia and poor comprehenders (Poor Comp).



A corollary of this view is that whether or not a child develops dyslexia depends both on the number of risk factors a child carries and their severity. Thus, mild phonological deficits may be easily compensated. However, more severe phonological deficits will impact on phonological decoding skills and spelling accuracy. More information for a multi-factorial understanding of the dimensions and risk factors in dyslexia comes from surveys. In Chinese, Ho et al (2002) found that more than 50% of poor readers had cognitive deficits in three or four domains while less than 25% of poor readers had difficulty in just one domain. Similarly, for Kannada, Nag and Snowling (2011) found that 13.8% of all poor readers had deficits in the five domains examined in the survey: oral language and speed of processing, and the orthographic, phonological and visual processing domains.

Developmental Trajectory. It has been known for many years that dyslexia runs in families and recent studies suggest there is about a 40% risk of dyslexia in first degree relatives. Although debated, there appears to be a greater likelihood of a boy being affected than a girl, perhaps because dyslexia is associated with developmental language problems which are more common in males. Although dyslexia is most usually diagnosed in middle childhood it is clear from longitudinal studies that its effects are evident as early as age three and persist through adolescence into adulthood. Table C.3.4 shows the risk factors for dyslexia at different stages of development.

Children with reading comprehension impairment

These children (sometimes referred to as *poor comprehenders*) have a pattern of reading difficulty that contrasts sharply with dyslexia. They can read words and

Table C.3.4 Risk factors and behavioral symptoms indicative of dyslexia at different developmental phases.

STAGE OF DEVELOPMENT	RISK FACTORS FOR DYSLEXIA
Birth	<ul style="list-style-type: none"> Affected family member
Preschool	<ul style="list-style-type: none"> Late talker Speech difficulties Slow to learn colors and letters
School entry	<ul style="list-style-type: none"> Poor knowledge of letters Poor rhyming or phoneme skills
Middle school	<ul style="list-style-type: none"> Expressive language difficulties Small sight vocabulary Problems reading novel words Spelling difficult to decipher Poor written expression Verbal working memory impairments
Secondary school and beyond	<ul style="list-style-type: none"> Low level of reading fluency Spelling problems Written work below expectation based on verbal performance Inattention Poorly developed study skills Often academic self-esteem is low

spell words accurately but have problems understanding the meaning of what they read. The poor comprehender's profile can be seen on its own or in combination with other disorders, for example, autism, when the term “hyperlexia” is sometimes used. As a group, poor comprehenders have been much less studied than children with dyslexia and the condition is not well recognized by teachers even though, in alphabetic contexts, studies suggest that between 6% and 10% of primary school pupils appear to be affected (see Hulme & Snowling, 2010 for a review). Reading comprehension impairment may therefore be considered a “hidden” disability associated with underachievement.

Given that the specific problems experienced by poor comprehenders are in reading for meaning, it is not surprising to find that their language skills are weak in relation to non-verbal intelligence. In contrast to dyslexia, they show normal levels of phonological awareness, rapid automatized naming and phonological learning but they have difficulties with semantic processing and in grammatical skills. They also show a range of difficulties in higher-level text processing, such as problems with making inferences, especially across large sections of text where verbal working memory is involved, knowledge of story structure and comprehension monitoring. The findings of a small number of prospective longitudinal studies of poor comprehenders suggest that their cognitive profile is stable over time and the skills which they bring to the task of reading include well developed phonological skills coupled with vocabulary impairments.

Turning to *bilingual and multilingual children*, we now know that some aspects of the broader oral language develop faster than others in the languages learnt later – sometimes referred to as *profile effects* (Oller et al, 2007). In Spanish-English and Turkish-English bilinguals for example, English vocabulary and the complex grammar such as seen in passive sentences are slower to develop than simple grammar (Bodman et al, 2010; Chondrogianni & Marinis, 2011; Oller et al, 2007). It follows that many children who are learning to read in a non-native language will be at risk of reading comprehension impairment associated with their limited command of the language of instruction. Similar trends were also seen in a recent survey in the UK for the standardization of the *York Assessment of Reading and Comprehension*. Secondary school pupils who had English as an additional language did as well in word-level reading as their monolingual English peers but had significantly poorer reading comprehension. Broadly similar profile effects have been reported among learners of other languages.

AETIOLOGY

Dyslexia

It is now well established that reading and phonological skills are *highly heritable* and hence dyslexia runs in families (Pennington & Olson, 2005). A recent behavior-genetic analysis of Chinese-speaking children suggests this is likely to be the case across languages (Chow et al, 2011). Importantly, however, some of the shared genetic variance between twins is due to gene-environment interaction. Thus, the home literacy background provided by more literate parents may foster reading skills, and better readers may themselves actively seek out more literary experiences; it can be expected that such gene-environment interactions will play out differently in low and middle income countries.

In the proposed DSM-5, **reading comprehension difficulties** are simply listed as a symptom of language impairment, rather than as a disorder per se, a decision which has caused consternation.



Second language

The initial phases of learning additional languages can be slow, leaving many clinicians confused about when to assume that the child will “catch up” and when to assess for dyslexia. For an online resource on issues related to second language learners and the diagnosis of literacy difficulties, click on the picture above.

Studies of the molecular basis of genetic influences on reading have used a variety of methods. To date, the strongest evidence for linkage with dyslexia (in terms of number of replications) is [a site on the short arm of chromosome 6](#), and currently molecular biologists are having some success in [identifying candidate genes](#). It is important to remember, however, that genetic influences are probabilistic; disorders like dyslexia depend on the combined effect of many genes, as well as on environmental influences.

It has been reported that there is a wide range of *structural and functional brain differences* between people with dyslexia and controls and an exciting line of research is exploring whether candidate susceptibility genes for dyslexia are also responsible for subtle cortical abnormalities that are related to neuronal migration and axon growth. The use of neuroimaging to identify which brain systems might be impaired in dyslexia holds great promise, although there are still methodological issues to resolve. For example, if one group suffers from a reading disorder and the other group does not, their performance on reading tasks will differ and so will their reading experience. These methodological problems will be compounded when one considers people who are learning to read in a language that differs from the home language, and people who are bi- or multi-scriptal.

Notwithstanding these concerns, a recent meta-analysis (Richlan et al, 2011) reported underactivation in inferior parietal, superior temporal, middle and inferior temporal and fusiform regions of the left hemisphere in people with dyslexia during reading or reading-related tasks. In addition, there were left frontal abnormalities in the inferior frontal gyrus accompanied by overactivation in the primary motor cortex and the anterior insula. The studies reviewed were from several European languages, the assumption being that these patterns are universal across alphabetic writing systems. At the time of writing, the evidence pertaining to brain activation in dyslexia in non-alphabetic languages is in need of replication. More generally, the causal status of brain differences in dyslexia is debatable; brain development shows considerable plasticity and both its structure and function are shaped by use.

Reading Comprehension Impairment

Much less is known about the etiology of reading comprehension impairment. The gender ratio appears to be more equal than in dyslexia but epidemiological data are sparse. It seems probable, given its association with language impairment, that genetic influences on reading comprehension impairment will be substantial. Preliminary data from behavior genetics suggest this is indeed the case but findings are in need of replication.

Social and environmental influences

Aside from biological and cognitive factors, it is important not to overlook the critical role of the environment in shaping a child's literacy development. Evidence indicates that reading disorders show a strong social gradient and surveys suggest that poor readers often come from large families, where later-born children may face delays in language development. Direct reading instruction in the home is also important, as different styles of home literacy are associated with individual differences in the pre-reading skills which children bring to school (Senechal & LeFevre, 2002). In turn, schooling can make a substantial difference to reading



The social and environmental context is a complex, multi-dimensional construct. However, researchers reduce measurement of this construct to a manageable set of measures, common proxies being mother's educational level, enrolment in welfare schemes such as school lunches, and location of schooling, such as the school district and government vs. private ownership of the school the child attends. A good starting point when attempting to understand reading disorders in low and medium income countries is to develop a picture of the social and environmental context. Click the picture above to see a description of the multiple dimensions of social and environmental realities of primary school children in the Southern district of Chamarajanagara in India.

achievement (NAPE 1999- 2008). In addition to these factors, being a poor reader affects the motivation to read. From very early in development, children differ in their interest in books, and children at risk of dyslexia may well be among those who are more difficult to engage.

One variable that can have a significant impact on the behavioral manifestations of a reading disorder is reading practice which, in turn, depends on “print exposure”. Indeed, the effects of low exposure are cumulative, causing differences in reading competence to become magnified over time. While poor comprehenders can read fluently, it is unlikely they will read for pleasure. It follows that low levels of motivation for reading may affect these children as much as children with dyslexia and there will be a wide range of sequelae affecting classroom performance and achievement in school.

In summary, as might be expected for a complex skill such as reading, the etiology of reading difficulties and reading disorders is varied and depends on both genetic and environmental factors. Some children carry a genetic risk of dyslexia but whether or not they are classified as dyslexic depends upon the particular language and school context in which they learn and the other skills (or deficits) they bring to the task of reading. A dimensional view of literacy difficulties moves us to think of the causes of disorders as not just multi-factorial but also as occurring due to the accumulation of risk and protective factors that shape (moderate) its manifestation.

ASSESSMENT

Research from multiple languages has given us insights into the components of literacy and associated cognitive domains that need to be assessed to gain insights into a child’s literacy learning difficulties. This section lists these domains and gives examples of tasks that have been shown to be useful for assessment. Where possible, sample items are included. This section does not suggest specific tests. This is because literacy and language tests are useful only if they assess skills and knowledge that are known to be specifically associated with particular writing systems and languages. Moreover, tests are valuable only if they have been locally standardized.

A framework is described in the box below that draws upon a multi-factorial view of literacy development, a dimensional view of learning difficulties and the

A broad framework for assessment

1. Literacy learning occurs within the larger context of language and its functions. Assessment of literacy learning difficulties must cover the sub-skills of language development
2. Literacy learning has multiple foundations. Assessment must be across multiple cognitive domains
3. Criteria for literacy difficulties are moderated by local context. Assessment results must be interpreted in comparison to only those who have closely similar linguistic, socio-economic and teaching histories
4. Dyslexia and learning difficulties are dimensional constructs shaped by multiple factors. Assessment must not only comment on the current clinical picture but also the ‘risk’ and ‘protective’ factors concurrently documented.

acknowledgement that the cut-off for diagnosis is externally negotiated based on the local context. Apart from these theoretical underpinnings, it is also important to recall two trends in diagnosis: the use of discrepancy criteria is increasingly falling out of favor and the use of a response to intervention approach is particularly relevant when children have had low opportunity for quality instruction.

A comprehensive assessment of literacy needs to document attainments in component skills such as:

- Letter knowledge
- Reading accuracy
- Reading speed
- Reading comprehension
- Spelling accuracy
- Rate of writing, and
- Quality of written expression.

On the other hand, an assessment of the supporting foundations for literacy needs to cover both language and cognitive domains. The language domains of interest are the broader skills associated with semantics, morphology, syntax and pragmatics as well as the more basic skills associated with phonological processing. Other domains of interest are general abilities and non-verbal processing, visual processing and speed of processing. There is increasing evidence that learning difficulties co-exist with other difficulties (comorbidities). Should there be any indication of additional areas of difficulty, these too need assessment.

A final point has to do with sources of information about these domains. A prudent approach would be to *collate information from multiple sources* rather than depending on a single source or test. Table C.3.5 gives the domains that must be assessed and Tables C.3.6 to C.3.8 show the tasks that can be used.

Ideas for assessment of general cognitive and perceptual skills

General abilities

Culture fair tests are difficult to find. The test with the most widespread use currently is the [Raven's Progressive Matrices](#).

Speed of processing

This can be done with a collection of tests that time children's performance, such as visual search or coding from the Wechsler tests. More specific tests linked to literacy performance include the rapid automatized naming task and timed tasks of phonological manipulation (examples in Table C.3.7).

Visual processing

The use of visual processing tasks in literacy assessment is gaining interest for languages with extensive, visuo-spatially complex symbol sets. There are several ways in which visual processing has been assessed. One set of tasks targets visual short term memory, where children have to recall just shown visuals of different orientations and degree of detail. Another set of tests assesses visual sequential memory where strings of visuals are shown and children have to recall the target string from a set of distracter sequences.



Click on the picture to access a Special Issue of the Journal of Pediatric Psychology on ADHD, its co-morbidities and links to school underachievement (open access).

Table C.3.5 Areas of assessment that are of diagnostic importance

LITERACY SKILLS	PHONOLOGICAL PROCESSING	BROADER ORAL LANGUAGE	OTHER AREAS	POTENTIAL CO-MORBIDITIES
<ul style="list-style-type: none"> • Symbol knowledge • Reading accuracy • Reading speed • Spelling • Reading comprehension • Expressive writing - quality and rate 	<ul style="list-style-type: none"> • Phonological awareness • Syllable processing • Phoneme processing • Verbal short term memory • Rapid automatized naming 	<ul style="list-style-type: none"> • Vocabulary • Grammar knowledge • Knowledge of inflections 	<ul style="list-style-type: none"> • General cognitive abilities • Speed of processing • Visual processing 	<ul style="list-style-type: none"> • Attention deficits • Speech sound disorders • Numeracy difficulties • Motor coordination difficulties • Anxiety symptoms

Table C.3.6 Sample tasks for assessment of literacy skills.

Symbol Knowledge: assessed by giving a list of the symbol set of the writing system.

- For contained orthographies all symbols are shown.
- For extensive orthographies, symbols are chosen according to some agreed criteria. For the akshara languages for example, the list may be sets of Ca, CV and CCV symbols.

Reading and Spelling accuracy: assessed using both lists and sentences.

- Word can be graded for frequency, regularity and length of words. School textbooks can sometimes be a good source for constructing these tests.
- If words in the language require oral language skills for accurate decoding (see examples in pgs 12-13), consider adding such words as a subset in the list.
- Non-word lists can be developed by changing one or more symbol units in words.

Reading speed: typically assessed as number of words correctly read per minute.

Reading comprehension: assessed using single sentences and longer passages.

- Both factual and inferential questions are necessary.
- Asking to give a title to a passage is a useful way to capture comprehension.
- Using multiple choice questions is a useful way to capture comprehension if children are reticent or not very fluent in the language (e.g., with second language learners).

Expressive writing: assessed using narrative skills on a prescribed topic or a self-chosen topic.

- Rate of writing – number of words per minute.
- At the word level, writing may be assessed for spelling, use of particular grammatical structures like adjectives, connectors and determiners and use of dialect words.
- For the narrative, assessment parameters include sequencing, style and usage.

Table C.3.7 Sample tasks for assessment of phonological processing

Phonological awareness: assessed using segmentation and blending tasks.

Sample: Break up 'lomputer' into small sounds. Response expected from child: 'lom-pu-ter'

Sample: Join the following sounds: 'gu – ha – na'. Response expected from child: 'guhana'

Phonological processing: assessed by asking child to manipulate a target sound. Sample of syllable and phoneme processing tasks using non-words:

Type of Task	Arabic	Bengali	Chinese	English
<i>Deletion of initial syllable*</i>				
Target item	wahid - /wa/	baro - /ba/	túshū- /tú/	fifty - /fif/
Expected response	hid	ro	shū	ty
<i>Deletion of initial phoneme*</i>				
Target item	wahid - /w/	baro - /b/	túshū- /t/	fifty- /f/
Expected response	ahid	aro	úshū	ifty
<i>Deletion of final phoneme*</i>				
Target item	wahid - /d/	baro - /o/	túshū- /ū/	fifty - /y/
Expected response	wahi	bar	túsh	fift

*may also be administered as a timed task for additional information about speed of processing

Verbal short term memory: assessed by asking child to repeat 2 to 5 or 6 just heard items

- Non-word repetition using syllable strings (e.g., *supila, mantockvip, kavasinuta*).
- Digit span using numbers (e.g., 2-9, 2-5-8, 4-6-9-2).
- Word span using early acquired words (e.g., *pen, leaf, cup, tin*).
- If using digits and words, items should be similar in length (e.g., all bi-syllabic).

Rapid automatized naming: assessed by asking children to read out quickly a neatly laid out set of digits, symbols or colour swatches.

- If using digits and colours, items should be similar in length (e.g. all bi-syllabic).

Attention

Many children with ADHD read well, though some experience problems of reading comprehension owing to its working memory and executive demands. However, there is a strong tendency for dyslexia to co-occur with symptoms of inattention and recent genetic data suggest a common genetic basis. It follows that it is important to make an assessment of a child's ability to control and sustain attention. Ideally, information should be sought from parents and teachers and in this regard rating scales are popular. The Strengths and Difficulties Questionnaire (SDQ, Goodman, 1997) includes 5 questions pertaining to attention and can provide a screen for "hyperactivity" and poor attention. It is also useful to supplement these data with behavioral observation in the classroom.

Motor coordination

Developmental coordination disorder (also called *dyspraxia*) is one of the most common co-morbid conditions of childhood. Its nature and developmental

Developmental coordination disorder

A developmental disorder in which children fail to develop normal motor coordination in the absence of general learning difficulties. The disorder can affect both fine and gross motor skills, and is present despite the individuals having had similar opportunity to gain motor skills as their peers.

Table C.3.8 Sample tasks for assessment of broader oral language skills

Vocabulary: assessed by asking for picture names or definitions (**expressive vocabulary**); vocabulary knowledge can also be assessed using picture-word matching (**receptive vocabulary**)

- Word lists must be graded for age of acquisition, concrete and abstract words, and frequency.
- A scheme for scoring child's response: errors (Sc = 0), passive use of word in idiomatic language (Sc = 1), use of word in sentence form (Sc = 2), definition, equivalent word from another language (Sc = 3)
- If using pictures, trial for cultural appropriateness and clarity of illustrations. See example below, target item is 'rainy'.



Grammar knowledge: assessed using a variety of tasks, three are listed here.

- Sentence Repetition task: children are asked to repeat a just heard sentence (e.g., Item: 'the cats ran to the milk store' Child's response: 'Cat run to milkshop')
- Grammaticality Judgement task: give a mix of grammatically correct and incorrect sentences and ask child to identify which one is in error.
- Pointing to pictures (receptive task, useful for reticent children, second language users and children with working memory difficulties): have a set of four pictures broadly linked to a sentence. Call out sentence and ask child to point to the most appropriate picture.

Knowledge of Inflections: assessed by focusing on inflections in stimuli given to the child

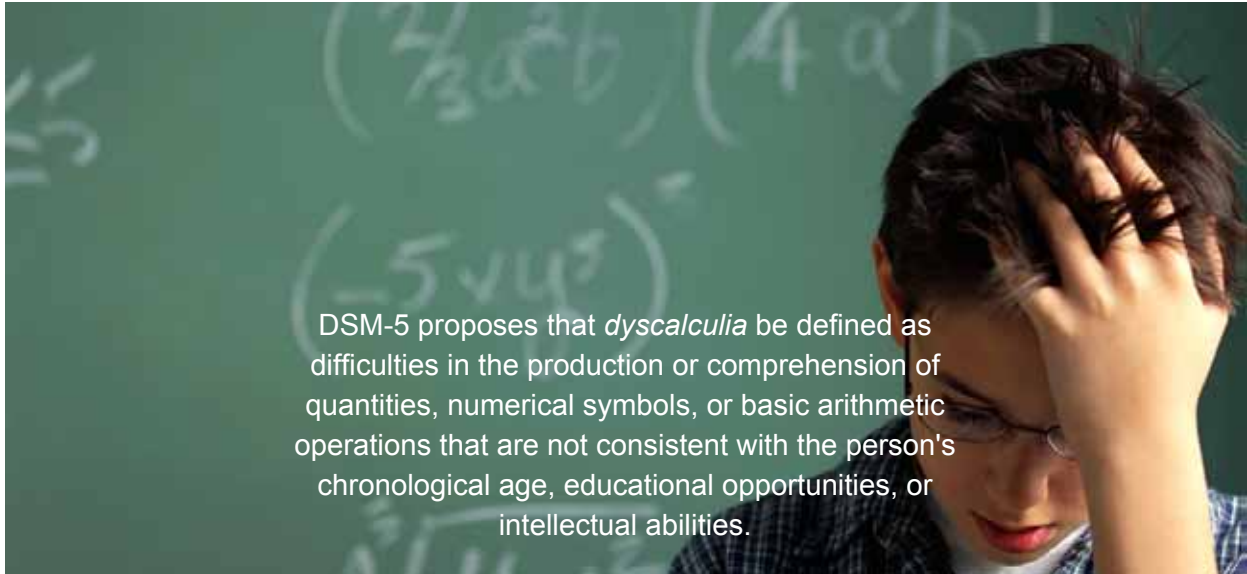
- The sentence repetition task can be used to pick out omissions, substitutions or additions of inflections (e.g. the child drops plural -s in the 'cat' item given above)

Sentence stubs can be used for prompting inflected words. (e.g. to elicit past tense -ed inflections: 'I like to paint. Yesterday I _____ (painted)').

course together with procedures for assessment and treatment are described in this document. The [Dyspraxia Foundation](#) also has a useful website for professionals and families. It is possible to use the information in these two resources to develop a checklist which will be useful in the community being served (be it pre-school, primary or secondary level). In terms of behavioral assessment for a suspected comorbidity with specific learning difficulties, it is important to make an assessment of pencil control, quality of writing and copying skills. For the older child, producing complex diagrams (e.g., in science) and using scissors and other tools (e.g., for project work in middle school, in vocational courses that are oriented to fine motor skills such as carpentry and in design & technology courses) may pose a problem.

Number skills

DSM-5 proposes that *dyscalculia* be defined as *difficulties in production or comprehension of quantities, numerical symbols, or basic arithmetic operations that are not consistent with the person's chronological age, educational opportunities, or intellectual abilities*. When numeracy is an issue for a child, it is important to know if their difficulties are associated with number facts and their manipulation



DSM-5 proposes that *dyscalculia* be defined as difficulties in the production or comprehension of quantities, numerical symbols, or basic arithmetic operations that are not consistent with the person's chronological age, educational opportunities, or intellectual abilities.

(arithmetic) or with more abstract mathematical thinking. Many children with dyslexia struggle to learn number facts, especially multiplication tables, but may be good mathematicians. In contrast, the poor comprehender profile has been reported to be associated with poor mathematics in the face of well-developed arithmetic skills. It follows that both aspects of numeracy should be assessed. DSM-5 advocates that multiple sources of information be used to assess numerical, arithmetic, and arithmetic-related abilities. Where standardized tests are not available, it is possible to devise short age-appropriate tasks to tap basic arithmetic facts, simple addition and subtraction and verbally posed mathematical problems for solution. The website "[About Dyscalculia](#)" provides ideas for observations teachers can make in the classroom.

Anxiety and coping

Many children with specific learning difficulties experience anxiety in the classroom and, for some, this may contribute to a more general anxiety disorder. Similarly, self-esteem is lowered as a consequence of literacy problems since these can affect performance in most areas of the curriculum. The SDQ (Goodman, 1997) is a useful tool for understanding children's emotional and behavioral difficulties. This is a 25 item questionnaire covering emotional behavioral problems, conduct problems, hyperactivity/inattention, issues with relationships especially with peers and the strength of positive social behaviors. There are translations of this questionnaire in several languages, and importantly, [SDQ](#) is an open access tool (see also Chapter A.5).

Some practical questions

When a child is taken for assessment, some key requirements are the availability of skilled professionals, reliable testing tools and quality support services; in many middle and low income countries, access to all three of these basic requirements is either patchy or minimal. This is problematic because a poor quality assessment has the potential to mislead or, worse, cause harm to the child. The most worrisome contexts are where children live in exceptionally deprived circumstances, school systems do not recognize the learning difficulties, parents and community elders are unaware about the disorder and provisions and

Table C.3.9 Five questions to ensure ethical practice in the assessment of school underachievement

Is there a collective understanding of the:

- Authorized person who can diagnose?
- Professional protocols for assessment and diagnosis?
- Classification system and/or diagnostic manual to be followed?
- Reliability and validity of the tools being used?
- Follow-up support that will be offered?

hence cannot advocate for the child, professional training programs do not give up-to-date details about literacy difficulties and their assessment and there are no standardized tests. Table C.3.9 shows a set of questions that can be asked in such situations. Articulating answers for these questions can help set the agenda for developing an assessment system for screening and identification of specific learning difficulties in communities where such a practice is not yet mature.

The move is towards resource intensive assessment devices. A gold standard for assessment is an individually administered test that has sound psychometric properties. This is often an expensive proposition, requiring not just theoretical expertise but also large numbers of personnel to collect and analyze the standardization data. Many middle and low income countries are nowhere near developing such tests.

A first step could however be to *develop informal graded tests*. These tests are based on locally sourced materials which are not expensive to collate (e.g., textbooks, recordings of children's speech and local stories). The types of tests could be around the tasks suggested in Tables C.3.5 to C.3.8. These informal tests can begin to reveal children's profiles of strengths and difficulties and allow for the first level of identification. More importantly, these tests can give a wealth of information for developing focused interventions.

A second step would be to *identify who are the most vulnerable*. This can be done through collecting local data and using an arbitrary cut-off. A useful cut-off for identifying the most vulnerable is to pick all those children whose scores fall below 1.5 standard deviations of the mean score on a test. An even more stringent cut-off may be preferable in unstable contexts (e.g., frequent school closure, recently changed language of instruction, a recent traumatic event in the region like a war or natural disaster). The local data can be from a selection of schools and the main expense here is the mass production of the tests and time needed to prepare, administer, score and identify the mean scores and standard deviations for each test.

A logical next step would be to *develop standardized tools*. Such an enterprise should follow from a theoretical model of how literacy is acquired in the language of interest, and a good grasp of the sample characteristics of the region. In contexts where standardized tests have been developed, it is useful to remember that norms change over time and hence, tests should be reviewed *periodically for relevance*.

INTERVENTION

A good starting point for developing an intervention is an understanding of the causes of a reading disorder. Indeed targeting impaired processes provides the motivation for the design and content of an intervention.

For the alphabetic languages, a number of meta-analyses have guided the development of good practice for the teaching of reading, notably that of the [US National Reading Panel](#) and by the [National Early Literacy Panel](#). In turn, there are now a growing number of evidence based interventions for dyslexia; a useful website from the UK is [Interventions for Literacy](#), with intervention ideas for children struggling to read in English, both when this is their home language (English as first language) or a non-dominant language (English as second language).

For lower and middle income countries a good understanding of the principles of interventions and their suitability for different children is the first step to indigenous programs. [Snowling and Hulme \(2010\)](#) reviewed the ingredients of evidence-based interventions for language and literacy difficulties, and this can be a good starting point for developing local interventions. Principally it is good practice to ensure that interventions:

- Are systematic, well-structured and multi-sensory,
- Incorporate direct teaching-learning,
- Incorporate a good amount of time for consolidation,
- With frequent revision, to take account of the likely limited attention and learning difficulties of the child.

For dyslexia in the alphabetic languages, effective interventions should include training in letter-sounds, phoneme awareness, linking letter and phonemes through writing and reading from texts at the appropriate level to reinforce emerging skills. In contrast, poor comprehenders require a different “diet” attuned to their needs and can benefit from training in oral language skills particularly vocabulary training, the development of inferencing skills and work on story structure and narrative. Of course it is important to bear in mind that many children will have problems with decoding and comprehension, in which case a mixed approach is needed.



Unfortunately, the field of dyslexia is plagued with advertised “cures” which have no evidence base. It is therefore important for professionals to critically review the content of programs to ensure their suitability. Click on the picture to access a video by Professor Dorothy Bishop which provides good advice in this regard.

Websites with ideas for intervention

- Preferably, intervention should be delivered early, focusing on building the foundations for literacy development in the early childhood years. This [Nuffield Foundation website](#) gives ideas for intervention in a pre-school setting, but can also be adapted to informal groups in the community and within the home
- Interventions for children in primary school can be either in a group setting or one-to-one. The website [Reading for Meaning](#) gives ideas that can be quickly adapted to different languages and writing systems
- Involving parents in supporting their children’s literacy development at home is good practice. This [DysTalk video](#) provides ideas as to what might help both in pre-school and after school entry. Although the video focuses on alphabetic contexts, the principles are useful for non-alphabetic writing systems also. The key assumption is that parents have a level of literacy and financial resources to try out these home-based ideas
- These documents from The Promise Foundation give examples of low cost interventions in pre-schools, primary schools and the community: [Handbook on Prevention of Child Labour for Anganwadi Workers](#) and [Handbook on Prevention of Child Labour for Village Community Workers](#).

Role of visuo-motor training for visually complex characters

Some writing systems have more detailed characters than others and hence writing them requires very well-developed visuo-spatial and motor skills. It has been suggested that repeated writing of orthographic symbols, for example kanji for children in Japan (Wydell, 2003) and akshara for children in southern India (Nag, 2011) is good practice. Children in these languages may also benefit from practice of motor sequences for writing a symbol/ word: in Japan called KUSHO – ‘writing in the air’, in India, writing in sand or traditionally in plates of grains. These techniques find their parallel in Western cultures in the *Fernald method* of teaching which involves tracing letters, which experimental studies have shown to be effective.

Summary

- Dyslexia and comprehension impairment are dimensional constructs similar to obesity, hypertension and many other disorders. In other words, the presence of literacy difficulties is along a continuum of severity and the most severe among them qualify for a diagnosis as formulated by the diagnostic manuals.
- Prevalence across countries range from 4% to 18% depending on the definitions used and the cut-off set. Epidemiological data are, however, extremely sensitive to location and definition; in places where there is no local data available a useful first step is to gather prevalence data. This will help to clarify the frequency of the difficulty, its distribution and what is the nature of the services that need to be planned.
- Spoken language is a foundation for reading and literacy. Language skills may also be an important compensatory resource for children with poor phonology (dyslexia). Interventions that target broader oral language in early childhood and primary school years can strengthen compensatory resources.

SCHOOL UNDER-ACHIEVEMENT SECONDARY TO OTHER DISORDERS

Childhood psychiatric disorder

An epidemiological survey of 1403 children between the ages of 8 and 12 in the Southern Indian district of Calicut (Kerala State) showed a prevalence of childhood psychiatric disorders of 9.4%. There were strong associations with socio-economic parameters but, more importantly, with both general school underachievement and specific difficulties with reading and vocabulary (Hackett et al, 1999). For the city of Bangalore, prevalence was higher: 13 % for psychiatric disorders among 4 to 16 year olds; up to 10% showed scholastic difficulties and up to 2% showed co-occurring psychiatric disorder and school underachievement (Srinath et al, 2005). Studies in other countries have also shown an association between literacy difficulties and childhood psychiatric problems. One reason why academic underachievement may co-occur with psychiatric disorder is because of the disorder interfering with school attendance. Other reasons could be symptoms of the disorder disrupting concentration during lessons, study time and exams. Some of the main reasons for dropping school grades are transient adjustments and

post-traumatic stress disorders. These may follow life experiences such as abuse, the loss of a parent or events such as war or natural disaster.

Neurodevelopmental disorders

Neurodevelopmental disorders (formerly known as developmental disabilities and mental retardation) are a related group of conditions associated with learning disabilities and school underachievement (see also Chapter C.1). The prevalence of learning and developmental disabilities in high income countries is between 10% and 20 % while in low and middle income countries prevalence may be higher (Durkin et al, 2005). The trends in increasing prevalence rates in developmental and associated learning disorders in high, medium and low income countries may have different origins. In high income countries, there is a discernible growth in recognition of developmental disorders and increased awareness in the general public, a notable example being the autism spectrum disorders. For middle and low income countries, two different social health care processes have been unfolding: on the one hand, there has been a definite reduction in child mortality but, on the other, there are multiple disadvantages experienced by children. As a consequence, more children are at risk for developmental disorders generally, and for learning difficulties specifically. Given below is an illustrative list of neurodevelopmental sources for school underachievement:

- *Genetic*: chromosomal disorders such as Down's syndrome, segmental autosomal syndromes such as Prader-Willi syndrome, and autosomal dominant neurocutaneous syndromes, such as neurofibromatosis
- *Nutritional*: such as iodine deficiency and vitamin A deficiency
- *Prenatal or perinatal infections* such as toxoplasmosis, rubella, group B streptococcus and HIV
- *Postnatal or childhood infections* such as encephalitis, meningitis, cerebral malaria, polio and otitis media
- *Toxic exposure in the prenatal period* to alcohol, lead and mercury, and to drugs taken by mother such as antimicrobials (e.g., sulfonamides, isoniazid, ribavirin), anticonvulsants (such as phenytoin, carbamazepine), and other (such as thalidomide). Lead and mercury exposure continues to be dangerous in the post-natal and childhood period
- *Brain injuries* caused by premature birth and birth asphyxia
- *Other forms of traumatic brain injuries* caused by accidents, child abuse and neglect
- *Chronic disadvantage* from poverty, economic backwardness, severe malnutrition, continuous social deprivation and absence of cognitive stimulation.

Sensory impairment

Sensory impairments are one of the most obvious causes of educational underachievement. Although problems of vision or hearing are easy to notice when severe, like learning difficulties, they manifest along a continuum of severity and subtle impairments can slip recognition. For example, about 10% of all primary school children in low income communities have eyesight problems (Bundy et al, 2003), and many among them go undetected. In such undiagnosed cases, children

DSM-5

[Click here to access the whole range of neurodevelopmental disorders proposed for DSM-5](#)

may be underachieving at school because the primary difficulty with vision has escaped notice. Therefore, at a systemic level, the urgent issue is to inform parents, teachers and children about sensory difficulties (watch *Nanna Kannu* (My Eyes) to see an example of a sensitization program targeting children in Southern India).

Vision

A simple fact is that properly fitted eyeglasses (spectacles) can in most cases correct poor eyesight. Eyeglasses also indirectly help in school achievement. One large-scale study of eyeglasses intervention documented this knock-on effect on school performance, showing that children who were given glasses “were less likely to fail a class” (Hannum & Zhang, 2008). However, access to intervention can be a challenge with very few children actually getting spectacles in some exceptionally poor or marginalized communities. For these children, vision problems go undetected because screening programs do not cover their communities; even if the vision difficulty is detected, the benefits of treatment may be lost because eyeglasses are simply unaffordable. The accumulated impact of uncorrected vision on school achievement for such children is substantial.

Moreover difficulties with vision may be accompanied by subtle cognitive impairments. Children with *convergence insufficiency* for example experience blurred vision, double images, headaches and eye fatigue when reading and writing (see case vignette).

Hearing

Hearing problems, like visual impairments, have both direct and indirect effects on school attainment. If children are unable to hear what their teacher says and is in too big a class for lip-reading to be useful, then they will be left behind in all areas of the curriculum. More subtle impairments will affect attention to auditory information and the development of literacy skills. While in high-income countries (e.g., Norway, UK) many children with congenital hearing impairments are now fitted with bilateral cochlear implants, which significantly improve their hearing and consequent language development, neither screening nor implantation programs are widespread in low and middle income countries. Less severe problems, including conductive hearing loss, may also go unattended.

As discussed above, phonological skills are a foundational skill for word decoding. It can be inferred that children who are hearing-impaired will be at high risk of reading problems. However, being hearing impaired does not automatically imply that children will be limited in their ability to reflect on the sounds of the language (Leybaert, 2005). Instead, individual differences in phonological processing depend upon the availability of speech skills and communication experiences. Early childhood experiences can either have a high emphasis on auditory input, amplification, speech reading and cueing (*oral-aural mode*) making optimal use of the residual hearing available to the child, or in the use of gestures, signing and finger spelling in conjunction with speech and audition (*total-communication mode*). It appears that phonological skills are slow to develop among children exposed to the *total-communication mode* when compared to children exposed to the *oral-aural mode*. These differences are independent of the type of writing system the child is learning to read – e.g., the alphasyllabic orthographies (Vasanta, 2007), the alphabetic scripts (Nielsen & Luetke-Stahlman,



Nanna Kannu (My Eyes), Kannada with English subtitles (5:00). Click on the picture to view a video clip to help children talk about their vision difficulties (from Southern India).

Convergence insufficiency

An inability to focus both eyes simultaneously on a single point at a close distance, over a sustained period of time. Typically, one eye will turn outward when focusing on a word or object from closer than a certain distance.



Poverty, vision difficulties and learning

Click on the picture to access findings from a survey in rural China. Similar trends have been reported in several other low income communities.

Case Vignette: Vision difficulties and school under-achievement

NT began avoiding books in pre-school. He particularly seemed to avoid reading under bright lights (“I really like working in the dark... mostly I don’t like tube light”). It was sometime before a specialist recognized that NT had convergence insufficiency – a disorder of near vision where the two eyes have a strong tendency to drift outwards rather than to come together and work as a team. If both eyes do not aim at the same spot, many activities become difficult – including reading and writing.

NT began exercises to help both eyes cooperate; by grade 5 the convergence difficulties had begun to improve. NT reported “I am no longer seeing double” when reading “very small words”. However, subtle difficulties with school work remained. The first assessment for school underachievement showed NT was reading more than three years below his grade level. Simultaneously he was showing significant anxiety. The challenge at this stage was to identify if school under-achievement was stemming from the vision difficulties, the severe anxiety, or an independently occurring dyslexia or language impairment which had gone undetected. The source of NT’s reading difficulties became clearer over time. Two years later, with anxiety substantially under control, his delay in literacy attainment continued. When reading he showed low accuracy, particularly for unfamiliar words (“phonograph” read as “photography”). However, on phonological tasks his performance was above average for phoneme segmentation, deletion and substitution. This (among other tests) confirmed that literacy difficulties were not because of poor phonological-decoding skills, and thus ruled out dyslexia. In addition, his grasp of grammatical structures as well as vocabulary was ahead of his age and grade, ruling out difficulties subsequent to language impairment. With the contribution of anxiety controlled for, the assessment confirmed the presence of learning difficulties secondary to vision difficulties.

As is the case with many learning difficulties, the domains of difficulty persisted into high school. At age 16, NT’s reading accuracy for low frequency words was low, with a reading delay of 2 years. Further, he read approximately 105 words per minute and, when tired, less than 70. This reading speed is exceptionally slow: by 13 to 15 years of age, a range of 170 to 200 words per minute is expected. NT’s cognitive attainments were also uneven. On a standardized test (WAIS II), NT was exceptional in verbal comprehension (93rd percentile), average in working memory (55th percentile) but borderline in processing speed (just 4% of children were below his score). The processing speed tasks in WIAS II are similar to passage reading because both need continuous visual tracking and thus a convergence of both eyes. Clearly, NT was still poor in this skill. NT needed extra support to help him face exams in high school (grades 8 to 12). He received a comprehensive report which was then used to win for him extra time during exams. The table below summarizes how his scores improved with 70% extra time.

Task	15 min timed test	With extended time
English language questions	<ul style="list-style-type: none"> Completed 50% of test Performance at 57%. 	<ul style="list-style-type: none"> Needed 10 minutes extra Performance now at 70%.
Analytical-logical questions	<ul style="list-style-type: none"> Completed 50% of test Performance at 43%. 	<ul style="list-style-type: none"> Needed 12 minutes extra Performance now at 90%.

NT will continue needing help beyond school, whether he attends university or other further education institution. Educational courses have critical activities in which a student must show competence. NT would do well to choose a higher education course – ideally one which draws upon his interests and aptitudes but is not particularly dependent on visual tracking and high quality convergence. He will also need to plan his study time in such a way that he is not reading (or performing other eye coordination activities) for a long time because this will compound his eye fatigue and slow him down. Finally, he would benefit from extra time for exams, especially when a lot of writing is required.

2002). It follows then that the nature of the sensory deficit and the methods of management of the primary sensory impairment can have long term implications on literacy acquisition, and school underachievement.

Summary

- Not all children who present with poor school attainment will have primary learning difficulties. Differential diagnosis is important since learning difficulties may be a symptom of another psychiatric disorder or of a sensory impairment.
- In some countries, school systems have arrangements in place which make allowances for children's learning difficulties and additional needs. These may include extra time during formal assessments, the use of scribes, ability to drop a second and third language in school and to study a simpler course.
- These concessions in the curriculum and for school examinations are meant to ensure that scholastic achievement of children with special educational needs are as close to their true potential as possible.
- Often these provisions are made available to some or all of the following areas of difficulty: sensory impairments, developmental disorders, emotional and behavioral disorders and neurological difficulties.
- These provisions are, however, rarely made available to children with transient adjustment difficulties, victims of natural disasters, or other traumatic situations such as war and civic strife.

CONCLUDING COMMENTS

Classification

- Categories of developmental disorder are underpinned by dimensions and associated "risk factors"
- Dyslexia is a dimensional impairment even though it is often discussed as a diagnostic "entity" with clear-cut boundaries
- Dimensional impairments interact during development to produce heterogeneity within and between disorders
- The reliability of cross-sectional indicators may be less than of longitudinal indicators. It is better to recruit all low performing children into adapted interventions and then to monitor their response to the intervention. Those not catching up to grade level in spite of individualized support would be the ones most reliably diagnosed as with SLD
- Language-based measures, more than intelligence and general processing measures, are better predictors of later literacy difficulties
- There is a need for context-specific assessment tools that are not merely a translation from tools developed elsewhere. Indeed, blind translation of screening tools can seriously mislead diagnosis.

- Language and phonological skills may be taken as the foundation skills for literacy development. When skill and sub-skills in either one of these domains are selectively impaired “compensation” is possible. But the more severe the impairment and the greater the number of sub-skills that are impaired, the more severe will be the literacy difficulty. The profile of difficulty will either be one of dyslexia or a reading comprehension difficulty or a mix of both
- Two aspects of current child development research – resilience and social ecology – have influenced current understanding of what may be the best practices for children in need. Both of these socio-emotional constructs remain crucial in any evaluation and intervention process that have been set up for children with school underachievement and specific learning difficulties.

Instruction

- Quality of instruction in mainstream classrooms decides how many children will fall behind. Thus, with poor quality instruction many more children will fall below a cut-off of attainments
- For many children showing early difficulties, supplementary input and adapted programs can help resolve difficulties. For older children and later emerging difficulties, remedial programs can help
- Quality of instruction in remedial programs also decides how many children will respond to intervention. With poor quality remediation, the preventative role of interventions will be minimal
- Some patterns are visible in the occurrence of co-morbidities between literacy difficulties and other disorders. It is essential to more fully understand these co-occurring difficulties and their implication for instructional programs
- When interventions to promote reading or language are based on a theoretically valid framework this can be effective
- Targeted interventions need to focus on the dimensions that underpin literacy difficulties (broader oral language and phonology).

What to invest in?

- *A preventative approach rather than a curative approach.* Hence, prioritize quality-first teaching for all, early identification of children whose development is delayed, interventions for children showing mild difficulties which may increase if left unattended and interventions that address the multiple foundations for learning
- *Screening tools.* For literacy difficulties, measures related to language and reading; for math, measures related to reading and number skills
- *Formats for determining risk status.* This is an arbitrary cut-off and may, for example, be any child below the 50% mark for the grade. If there are several children with low attainments, choose a whole class and mainstream an



One language is never enough

To see this sentence written in many of the scripts of the world click on the picture.

intensive program

- *An intensive whole class program.* This is not just for the nurturance needed for all children but also because classification is easier if we know that children have received quality intervention and in spite of that they are still struggling
- *Decide on which group will be prioritized for support.* For example, focus could be on children who are on the borderline of underachievement and who will respond to intervention and quickly move out of the “at risk” status. Alternatively, priority could be given to those who are substantially behind and who appear to have long term reading difficulties
- *Format for determining diagnosis.* Mix response to intervention approaches with approaches that depend on discrepancy criteria for diagnosis. Thus if the child remains below grade and age level despite intervention and if the child’s cognitive profile is below his peers, then confirm diagnosis of a general learning difficulty (having discounted emotional or behavioral problems)
- *Develop a nuanced picture of the social and environmental context.* This is important, particularly to understand the role of local social deprivation and its impact on attainment in literacy and language.



William-Adolphe Bouguereau
(1825-1905) *La leçon
difficile* (The Difficult Lesson)
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Paul Mlangasi, a blind teacher, explains a passage in Braille to a young boy at the Wilson Carlile school for blind children at Buigiri, near Dodoma, Central Province, Tanzania. The National Archives UK.

