

Dyslexia in First and Foreign Language Learning

Dyslexia in First and Foreign Language Learning:

A Cross-Linguistic Approach

By

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Cambridge
Scholars
Publishing



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This book first published 2016

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

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ISBN (10): 1-4438-9485-0

ISBN (13): 978-1-4438-9485-2

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PREFACE

Mastery of reading and writing inducts us into the literate community. Conversely, the lack of fluent reading and writing skills (dyslexia) excludes a person from this community. According to International Educational Statistics (2008), there are total of 654.9 million school-age children in the world. If dyslexia affects 10–15% of these youth (Fletcher et al. 2007), this translates to approximately 65–98 million students with difficulties in reading and writing. Gruber (2003, 6) observes that, “in a non-literate society someone with this kind of disorder [dyslexia] would not experience the same functional problems,” and possibly would not be detected. For full inclusion in a literate society, one needs to be able to read and write.

This is hindered by dyslexia, which impairs the learning of a language system. Irrespective of culturally imposed differences, reading and writing are operationalised by the same biological functions that are defined by the universal perspective. However, language systems differ in terms of their transparency; for example, English and French are considered opaque scripts, whereas Spanish and Italian are described as transparent orthographies. These differences are discussed as part of the language specific perspective. It is therefore plausible for a dyslexic reader to experience reading difficulties differently depending on the language system they study. A dyslexic L1 learner of Spanish would manifest dyslexia differently to a dyslexic L1 learner of English. Consequently, a dyslexic learner mastering Spanish L1 and English L2 would experience reading problems at different levels of word decoding (Castles and Coltheart 1993) and would manifest their difficulties in relation to different reading strategies.

The EU strategic plan for education (2010) recognises the need for EU citizens to speak a foreign language. Foreign language courses are introduced on an obligatory basis at the primary level of education. Dyslexic students are not exempt from this regulation. Thus, they are confronted with different language systems that must be mastered. The difficulty escalates if the systems differ significantly in their levels of transparency. This in turn can raise questions such as: "Is a dyslexic student equally impaired in any language they study?" or: "Is the type of difficulty primarily dependent on the language system or is it rather a

dyslexia syndrome?" Answers can be seen in the synergy of research on reading difficulties in first and foreign languages and existing taxonomies of dyslexia sub-types.

The detailed analyses of dyslexia sub-types (Johnson and Myklebust 1967; Boder 1973; Gough and Tunmer 1986; Bowers and Wolf 1993; Castles and Coltheart 1993) and Castles and Coltheart's dual route model of reading (1993) shed light on the possible language difficulties experienced by a dyslexic learner studying two language systems. In educational contexts, this allows for the more accurate identification of reading difficulties in bilingual learners. Proper identification of dyslexia is the key to designing appropriate remedial reading programmes and implementing accurate school adjustments.

In reference to the number of speakers of English as a second language (over 375 million) and speakers of English as a foreign language (750 million), the data obtained from the research on dyslexia in English is of pivotal interest to both researchers and educators. According to the British Council (2012), speakers of English as a foreign and second language outnumber those who speak it as a first language. In the light of these estimates, it seems necessary to investigate how the findings on dyslexia in English as a first language relate to the findings on dyslexia in English as a second or foreign language. In other words, to what extent is dyslexia a universal condition, and to what extent is it language specific? In the context of teaching English as a foreign language, these language specific aspects are of great pedagogical importance.

Research data on language acquisition in dyslexic learners does not only add to a better understanding of the cognitive skills of a dyslexic mind, it is also directly applicable to the educational setting. In school practice, foreign and native language teachers use a dyslexia certificate as the basic source of information about the cognitive profile of a dyslexic student. This situation raises at least two questions: does the language competence of a dyslexic student verified with L1 screening tests determine a student's L2 language skills? Furthermore, are the recommendations for tutorial work in the native language directly transferable to the foreign language context?

This work consists of five chapters. Chapter one discusses dyslexia as a research issue in neurolinguistics and education. It focuses on the biological, cognitive, and educational basis of dyslexia. Sections 1.1–1.3 review research on the genetic factors that cause dyslexia, specific brain anatomy, and the comorbidity of dyslexia with other dysfunctions. Section 1.4 presents the cognitive symptoms associated with dyslexia with

reference to the educational setting. Sections 1.5–1.6 discuss identification and screening procedures for dyslexia, while section 1.7 provides information on intervention procedures. The closing section presents conclusions referring to dyslexia screening and intervention procedures.

Chapter two presents a historical perspective on dyslexia as a language learning disability. This chapter offers a systematic description of the emergence of the concept of dyslexia. It also discusses the etymology of the term *dyslexia* and the process of defining it. Sections 2.1 and 2.2 describe the complexity of the symptoms that create difficulty when it comes to reaching a consensus on a universal formula. They also point to an observed shift from a field-embedded definition to an eclectic perspective on dyslexia. Section 2.3 explains the classification of the subtypes of dyslexia. Finally, section 2.4 presents conclusions on these concepts as well as historical perspectives on dyslexia.

Chapter three discusses the development of reading abilities in first and foreign languages, focusing on the notion of reading competence. Section 3.1 presents selected perspectives on the development of reading ability with reference to dyslexia. Section 3.2 focuses on the bi-directional transfer of reading skills between L1 and L2. Cross-language skill transfer is discussed in relation to both universal and language-specific factors. Comparative studies of languages that represent transparent and opaque orthographies are reported in this section. The aim is to explain the notion of language-specific factors and their influence on learning how to read. Section 3.3 discusses the key concepts that govern the relationships between reading in a first and foreign language. The concepts of readers' developmental interdependence, linguistic threshold, and access to pre-existing language skills are discussed in terms of the extent to which they may account for reading impairment. In addition, theories underpinning the extraction of visual information and the concept of the assumption of specificity are addressed. Section 3.4 presents research on the language basis of reading, i.e. the relationship between language abilities and language achievement in reading. Evidence of the association between phonological processing and reading is presented with reference to decoding techniques, reading rate, and rapid naming. Section 3.5 gives an account of the various phases in reading and their development in dyslexic readers. Section 3.6 addresses the challenge of reading with the additional burden of dyslexia. Special attention is paid to the concept of orthographic depth in Polish in Section 3.7.

Chapter four provides a discussion in dyslexia in foreign language learning, including a comprehensive overview of the relevant hypotheses. It aims to explain the variations in achievements of dyslexic students who

learn foreign languages. Section 4.1 presents the early stages of research on dyslexia and foreign language learning. Section 4.2 summarises the Linguistic Coding Difference Hypothesis and discusses the categorisation of good and weak foreign language learners with reference to their prototypicality. Section 4.3 presents the Hypothesis of Granularity and Transparency and validates its underpinnings against research on bilingual readers. It also introduces the Dual-Route Model of reading aloud in order to explain the deficits that dyslexic students experience in learning transparent and opaque orthographies. Section 4.4 discusses the Phonological Representation Hypothesis, which stresses the pivotal role of the underlying phonological representation of words over phonological awareness in the process of reading. Section 4.5 summarises the Double-Deficit Hypothesis that links naming-speed deficits with dyslexia in transparent orthographies like German or Dutch. As a complement, section 4.6 discusses the Psycholinguistic Grain Size Theory (Ziegler and Goswami 2005) with relation to consistency, granularity, and availability in order to explain research on literacy development in European orthographies. It also presents data on how reading strategies influence the reading of dyslexic learners in orthographies that differ in consistency, granularity, and availability. Sections 4.7 attempts to draw partial conclusions as regards the implications that the discussed hypotheses have on dyslexia.

Chapter five presents research on the transfer of reading skills in dyslexic students who learn languages with different orthographies than their first language. The discussion centres on the interrelations between L1 and L2 reading skills in dyslexic learners in selected languages and distinguishes three main categories of research on dyslexia in foreign languages. Section 5.1 presents comparative research on reading development and dyslexia in children from diverse L1 backgrounds. Section 5.2 offers an account of the incidents of dyslexia in children with English as their first language who are learning a foreign language. Section 5.3 presents research on dyslexia in learners of English as a foreign language with relation to their reading skills in their first language. Section 5.4 presents partial conclusions. The closing section, 5.5, offers suggestions for further research and educational practice in the field of dyslexia in bilingual learners.

At this point, I would like to express my gratitude to the many people whose help was invaluable in completing this manuscript. First and foremost, I wish to thank my supervisor Professor Hanna Komorowska from the University of Warsaw for her approval of the research aims and

her patient guidance through the process of research formation. Professor Komorowska's doctoral seminar was where I learnt the craft of research in applied linguistics and first presented the tenets of this study.

I am particularly grateful to Professor Emerita Leonore Ganschow for supporting and advising me for the past five years at all the stages of this study. I thank her for the time she spent discussing the research agenda with me and for never tiring of my questions.

Last, but not least, I want to thank my family for supporting me in the whole process of researching and writing: my husband Sylwester for being supportive and patient with me while I spent months on end sitting at the computer screen, and my sons for understanding why their mum was busy.

ABBREVIATIONS AND TYPOGRAPHIC CONVENTIONS

Bold:

For key words (e.g. **disorder**, **deficit**)

Italics:

For lexical items (e.g. *make*, *do*)

Single quotation marks:

For the meaning of lexical items (e.g. 'by ear', 'language specific')

Double quotation marks:

For quotation from other authors

Brackets:

<>

For spelling (e.g. <p>,)

//

For phonemic transcription (e.g. /d o g/, /d u/)

[]

For phonetic transcription (e.g. [h o u s e])

()

For statistical values (e.g. (1.17 S.D.), (MA=80, 27, SD=31.52))

CHAPTER ONE

DYSLEXIA AS A RESEARCH ISSUE IN NEUROLINGUISTICS AND EDUCATION

1.0 Introductory Remarks

Reading and writing are cultural skills (Høien and Lundberg 2000) that have to be learned if we are to become active members of a literate community. Irrespective of culturally imposed differences, reading and writing are operationalised by the same biological functions. To understand reading problems, biological, cognitive, and social functions need to be investigated. Gruber (2003, 6) claims that, “in a non-literate society someone with this kind of disorder [reading difficulties] would not experience the same functional problems,” and possibly would not be detected. In a literate society, however, the skills of reading and writing are important for effective communication. Therefore, early diagnosis allows reading disabled children to be provided with appropriate intervention and treatment, which enables them to function properly in society.

This chapter discusses the biological, cognitive, and educational basis of dyslexia. Sections 1.1–1.3 sum up the research on genetic factors that cause dyslexia, regarding the specific brain anatomy and the comorbidity of dyslexia with other dysfunctions. Section 1.4 presents cognitive symptoms associated with dyslexia with reference to the educational setting. Sections 1.5–1.6 discuss identification and screening procedures for dyslexia, while section 1.7 provides information on intervention procedures. The closing section, 1.8, presents conclusions referring to dyslexia screening and intervention procedures.

1.1 Genetic Bases of Dyslexia

It has been observed that dyslexia runs in the family (Snowling 2006; DeFries 1996). There is a 50% chance of dyslexia in the child of a parent with dyslexia (Londhe et al. 2007, 284). The probability of a boy

becoming dyslexic is 50% if his father is dyslexic and 40% if his mother is dyslexic (Snowling 2006, 6, Symmes and Rapport 1972, in DeFries 1996). The Colorado family reading study (DeFries 1996) was initiated to measure reading, symbol-processing speed, and spatial recognition in groups of probands and controls. The results revealed that the differences between probands and controls were significant ($p < 0.05$) for each of the three measures. However, for the reading measurement the deviation from the norm reached a negative 1.8 S.D., making it the largest of all measurements. An interesting pattern for reading was also observed when interaction between family type and gender was investigated. The data revealed that brothers of probands had more difficulty reading than their sisters. The same gender correlation was observed when the reading skills of mothers and fathers of probands were calculated. It showed that fathers of probands had more difficulty reading than their mothers.

There is abundant evidence (Fagerheim et al. 1999; DeFries 1996; Voeller 2006; Beaton 2004) that dyslexia may be linked to specific chromosomes. A study by Smith et al. (1983, in DeFries 1996) investigated nine families with reading disabilities in three successive generations. The logarithm of the probability of co-transmission between the character and marker was computed to observe the linkage between the hypothesised allele for reading disability and different genotype and chromosomal markers. The linkage was computed for each family individually. The co-transmission between reading difficulties and a marker on chromosome 15 yielded a value of 3.2, indicating a level in favour of the linkage. Later studies showed a connection between reading difficulties and chromosome 15 (Ibid., 9), chromosome 2 (Fagerheim et al. 1999), and chromosome 18 (Fisher et al. 2002, in Beaton 2004).

1.2 Brain Anatomy

For the majority of people, languages are operated in the left hemisphere of the brain. Sometimes, however, language functions are located in the right hemisphere (in about 15% of the population) or bilaterally (in about 15% of the population) (Lishman 2006). Specifically, in each hemisphere there are four major lobes: frontal, occipital, parietal, and temporal. Each of these specialises in one of four different functions: vision, hearing, sensory impression, and movement. Wernicke's area is located in the left temporal lobe and specialises in the detection of language signals. Phonemes and sequences of phonemes are recognised in order to distinguish them from background noise, which helps listeners attach words to their meanings. If this area is impaired, sounds are not recognised

or classified properly, and meaning cannot be accessed. Broca's area is located in the frontal lobe and is responsible for producing fluent speech and organising words according to grammatical rules. When this area is deficient, speech is slow and ungrammatical. The angular gyrus lies at the junction of hearing, vision, and touch, and serves as a connector between these areas. Its role is to map the visual stimuli of printed words onto the phonological structure of language. When it is dysfunctional, reading and writing skills are hampered, but the ability to speak and understand spoken messages is retained. The area called BA 37 gives access to "word dictionaries" (Lishman 2006, 40), which allow words to be matched with the objects they represent.

1.3 Co-morbidity

The co-morbidity of dyslexia with other disorders refers to the fact that there is a probability that this developmental disorder will co-occur with another disorder (Pennington and Olson 2005; Snowling 2006). Dyspraxia, ADHD, mild depression (dysthymia), and anxiety frequently coexist with dyslexia. The coexistence of these disorders is seen in either shared dysfunctional brain mechanisms or shared hereditary risk factors. Longitudinal studies (Pennington and Olson 2005) show that children did not show signs of dysthymia before kindergarten, but they did when formal reading instruction started. Therefore, dysthymia was observed as secondary to dyslexia. A similar concurrence was observed with relation to ADHD.

1.4 Cognitive Symptoms of Dyslexia

Aaron (1989, 162) observes that, "because [dyslexia] is made up of many symptoms, [it] is considered a syndrome." Symptoms of dyslexia are variable as they can be influenced by age, sex, or educational background (Brunswick 2011). These symptoms are commonly described with reference to the areas of cognitive weakness: short-term memory, phonological skills, sequencing and structuring information, perception, and movement (Moody 2004; 2007; Fawcett and Roderick 1993; Snowling 2006).

Short-term memory provides for the temporary storage of information (Baddeley 1996; Levine 2002). It makes the short retention of information that we are currently working on possible, such as remembering a telephone number before writing it down, or the number of a page in the book we are about to open. Levine (2002, 94) describes it as "learning's

front entrance” for information that can be used either immediately and deleted or moved to the long-term memory for later use. In the educational context (Moody 2002), weak short-term memory causes the following problems:

- copying from the board correctly
- remembering messages
- keeping track of ideas when speaking, listening, reading, and writing
- taking notes when reading or listening
- saying long words
- remembering dates or names
- multi-tasking (listening and taking notes)

Phonological skills refer to our ability to distinguish and consciously manipulate the sounds of a language (Goswami and Bryant 1990; Gathercole and Baddeley 1993; Byrnes and Wasik 2009). Children with dyslexia are weak in recognising sounds in a word they want to spell as well as linking up the sounds to make a word. This ability is crucial in spelling both familiar and unfamiliar words. Westwood (2004, 105) observes that spelling an unfamiliar word by relating its sound values to another known word (spelling by analogy) requires adequate auditory skills and phonic knowledge. It also requires an efficient mechanism to rapidly retrieve relevant grapheme-phoneme information from long-term memory.

Deficient phonological skills (Moody 2002; 2007) are manifested in:

- low reading accuracy
- low reading speed
- poor spelling
- problems with saying long words
- comprehending long words

Sequencing and structuring information are vital in everyday life, as every action undertaken in life is structured to a certain degree. Structuring an essay, for example, requires the skills of deciding how to begin, continue, and conclude. Deficiencies in sequencing and structuring information cause this task to be laborious and rarely successful. Rainger (2003, 3) observes that the absence of sequencing skills:

can have a huge impact on the accessibility of information, and more broadly the accessibility of information architecture. The effect of short-term memory problems and sequencing can mean an increase in the likelihood of a dyslexic student becoming lost in a hypertext structure.

The ability to sequence and structure information (Moody 2002; 2007; Dechant 1991) is vital for:

- writing and copying accurately
- following and understanding instructions
- carrying out instructions in the correct sequence
- structuring an essay
- taking clear notes
- filling in a form

There is a consensus that a, “combination of visual and auditory perception deficits are causally related to reading problems in dyslexia” (Eleveld 2005, 19). The impairment in visual perception in dyslexia is largely attributed to attentional deficits (Lorusso et al. 2006). Despite the number of stimuli that attract our attention, normally we are able to focus on one item in order to process the relevant information. In that way, “focused spatial attention allows decisions to be based on the selected stimulus alone disregarding distracting stimuli” (Ibid., 155). Slow stimuli shifting has been observed in dyslexic learners and has been offered as the cause of their deficient processing of perceptual stimuli. Deficient visual and auditory perception (Moody 2002; 2007; Reid 1998) with reference to reading might result in:

- seeing letters back to front or upside-down (*m / w or p / b*)
- seeing letters in the wrong sequence (*was as saw*)
- missing out words or lines
- keeping track of letter sequences in long words (reading *conservation* as *conversation*)
- making sound substitutions in reading
- problems with making correct associations between printed symbols and sounds
- problems with left to right orientation

Dyslexic children are observed to have problems with performing fine motor skills (small movements) and gross motor skills (large movements) automatic (Doyle 2002). Reid and Fawcett (2004) report that up to 60% of

dyslexic children show deficient motor skills. These deficits (Moody 2002; 2007) result in:

- slow and untidy handwriting
- poor balance
- poor judgment of distance
- the tendency to fall or bump into objects

1.5 Diagnosis of Dyslexia

As observed by Reid (1998, 34):

the identification and assessment of specific learning difficulties is of crucial importance, since a full assessment will facilitate the planning of appropriate interventions.

Pumfrey (1990, in Reid 1998) stresses that diagnosis and treatment are based on a medical model and therefore not appropriate to the educational context. Diagnosis can trigger the classification escalator, “which he describes as moving from individual differences to deviations, disabilities or deficits” (Reid 1998, 68). Reid states that, in spite of the risk of hasty diagnosis, screening procedures at the educational level are beneficial for a student. With reference to reading, the early identification of reading strategies in children at risk of dyslexia is vital to the process of their modification. The role of informal assessment conducted by a class teacher prior assessment by a specialised teacher is directly linked to teaching and curriculum.

Reid (1998) postulates that assessment for learning difficulties should include three aspects: difficulties, discrepancies, and differences. The difficulties are related to reading and writing and caused by dysfunctional phonological processing, memory, weak organisational and sequencing skills, as well as dysfunctional motor coordination or perceptual difficulties. The discrepancies are the result of a comparison of reading and writing to listening skills, or a comparison between speaking and writing skills, in which the differences are observed with relation to individual learners. Reasons for assessment might differ:

- to identify the learner’s strengths and weaknesses
- to assess the learner’s current knowledge
- to explain the learner’s lack of progress

- to identify types of errors in the learner's reading, writing, and spelling skills
- to understand the learner's learning styles
- to indicate aspects of a curriculum that may interest and motivate the learners (Reid 1998, 31)

The cognitive symptoms of dyslexia manifest themselves differently at successive stages of reading development. In the pre-school period the symptoms of dyslexia may be observed by parents but tend to be largely attributed to individual differences in a child's development. Early detection of dyslexia in the pre-school period is still a challenge; however, attempts are being made to lower the age of diagnosis so, "that children likely to become dyslexic could be caught early" (Turner 2004, 219). Research shows that dyslexia can be tested as early as the age of four. The Dyslexia Early Screening Test (Nicolson and Fawcett 1996) was designed for children aged 4.5–6.5. It requires a pen and pencil and measures five areas within half an hour: literacy skills, phonological awareness, verbal memory, balance, and motor skills, and auditory processing. The materials used include: rapid automatized naming, bead threading, phonological discrimination, a balance tester and a blindfold, rhyme detection and alliteration, a digit span, the naming of printed digits and letters, and ordering sounds and shapes.

In Poland, the diagnosis for dyslexia is often administered at the end of key stage 1, when a child is 9 years old (Bogdanowicz 2002, 71). However, when the screening procedure is offered at the beginning of regular reading instruction, it provides a child with support in the process of learning to read and write. There are two reasons for the avoidance of early certification confirming dyslexia: the concurrence of dyslexia symptoms with other factors (e.g. individual differences, educational background), and an awareness of the psychological consequence of labelling a child with dyslexia. As observed by Bogdanowicz (2002), the diagnosis should be done when a child begins reading instruction, if not to clearly identify dyslexia then at least to identify a lack of readiness for reading and writing or the risk of dyslexia. This can be done with the use of the Skala Ryzyka Dysleksji [Scale of Risk of Dyslexia] (Ibid.). The scale is normed for children aged 6–7 and comprises 21 statements directed to the teacher or parent of a potentially dyslexic child. It measures fine and gross motor skills, visual perception, language perception and expression, and concentration. The statements refer to the skills of using scissors, running, jumping, or riding a bike, along with the ability to distinguish between similar sounds (g–k, z–s) and form grammatical

sentences. Table 1.1 below shows a comprehensive classification of the characteristics of dyslexia in reading based on the continuum of reading difficulties.

Table 1.1. Continuum classification of characteristics of dyslexia in reading (adapted from Reid 2004, 5–6; Brunswick 2011, 6)

| Pre-school years | Early school years | Persistent difficulties |
|--|--|---|
| <p>shows no interest in printed letters or words</p> <p>has difficulty remembering nursery rhymes</p> <p>confuses words that sound similar, e.g. <i>boat</i> and <i>bought</i></p> <p>mixes up sequences of sounds, e.g. <i>Jonathan</i> <i>Jothanan</i></p> | <p>avoids reading out loud</p> <p>has difficulty sounding out unknown words</p> <p>reads the same word correctly and incorrectly in the same text</p> <p>has difficulty recognising sounds, or the combinations <i>ph</i>, <i>th</i>, and using them correctly, e.g. <i>thing</i>, <i>elephant</i></p> <p>gets the sounds and letters in words out of sequence, e.g. <i>elephant</i> can be read as <i>ephelant</i></p> <p>substitutes words when reading out loud, e.g. <i>car</i> for <i>bus</i></p> <p>has difficulty rhyming and recognising the sequence of the rhyme</p> | <p>reads slowly</p> <p>hesitates when reading</p> <p>refuses to read for pleasure</p> <p>refuses to read out loud</p> <p>has difficulty pronouncing multisyllabic words</p> |

| | | |
|--|---|--|
| | <p>omits and repeats words</p> <p>exhibits poor reading comprehension</p> | |
|--|---|--|

These persistent difficulties are best summed up in the personal report of a dyslexic psychologist who, while attending a seminar for professionals, was asked to read a passage aloud as a part of the day's discussion:

I was amazed on that day to find out the same sense of fear pulsing through my body as I had felt as an 8-year-old child being asked to read aloud in class. Even as an adult with a Ph.D., I take my learning disability everywhere, every day of my life. (Frank and Livingston 2002, 9)

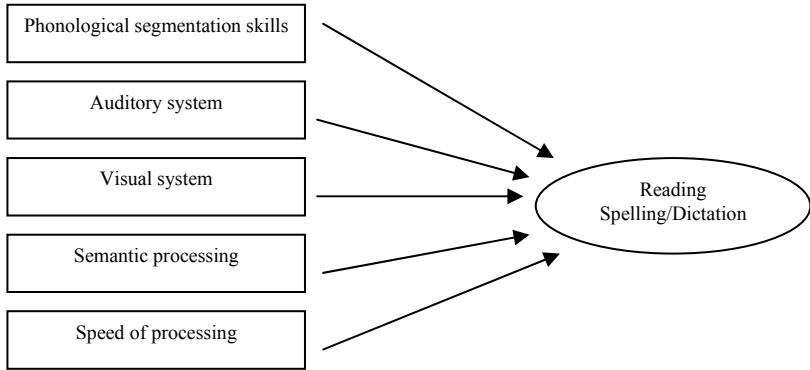
1.6 Diagnosis of Dyslexia in a Multilingual Context

As observed by Peer and Reid (2000, 2):

teachers and psychologists have tended to misdiagnose or ignore dyslexia especially by multilingual students because of the multiplicity of factors that seem to be causes for failure.

It is not only the multiplicity of factors but also the complexity of screening procedures that cause difficulties. The dyslexia screening tests that are conducted in a student's first language do not allow for a direct assessment of language skills in a foreign language. A framework for testing dyslexia in a multilingual context was proposed by Smythe and Everatt (2000, 14). This model (see Fig. 1.1 below) is derived from the research on reading, witting, and spelling in different language systems.

Fig. 1.1. Framework for testing dyslexia (adopted from Smythe and Everatt 2000, 14)



Phonological processing includes testing the ability to synthesise and decompose a word's elements at the level of phoneme, syllable, and rhyme/onset. Auditory system testing includes not only discrimination of sounds and their perception, but also sequential memory and auditory short-term memory. The visual system is tested with reference to visual discrimination and perception, sequential memory, and visual short-term memory. Semantic processing validates the semantic lexicon in relation to the speed of processing lexical items.

The rationale for constructing this model derives from the problems presented by dyslexic learners of different orthographies. The model takes into account the transparency dimension between sound and symbol in opaque languages like English. It also caters for the obstacles that learners of transparent orthographies, like Hungarian or Polish, encounter in writing, and which are the result of the visual complexity (the number of diacritic markers) of the language. This, if combined with a weak short-term memory, will affect the speed of reading and limit access to the meaning of words. Therefore, a test of literacy and cognitive skills would involve the set of sub-skills activated in reading transparent and opaque orthographies (see Table 1.2 below).

Table 1.2. Sub-tests of the International Dyslexia Test (in Smythe and Everatt 2000, 19)

| Literacy skills | Cognitive skills |
|---|--|
| basic knowledge (alphabet, number knowledge) | auditory short-term memory (digit span and rhythm) |
| spelling (single real and non-words) | visual short-term memory (sequential memory) |
| reading (single real and non-words) | visual perception |
| phonological manipulation (alliteration and rhyme) | sequencing (days of the week and counting) |
| phonological short-term memory (real word and non-word repetitions) | perception/fine motor skills (copying) |
| lexical access (rapid naming) | maths |
| auditory discrimination | visual IQ |
| | gross motor skills |

1.7 Prevention and Remedial Programmes

Given the centrality of instruction in the prevention of reading difficulties, the US National Research Council (Snow, Burns, and Griffin 1998, 6) recommended that attention should be given in primary school to reading principles, sight reading, and reading by applying symbol-to-sound mapping, while at the same time promoting reading comprehension and reading fluency. The panel recommended that the curricula in first to third grade should encompass:

- explicit instructions in phonics, sight reading, and spelling conventions
- promotion of fluency with the use of independent reading
- encouragement to sound out unfamiliar words
- the use of pictures and context to monitor word recognition
- promotion of comprehension strategies: summarising, predicting, and drawing inferences

- time, material, and resources to support daily independent reading (of texts which are of interest to a student) and provision of assistance in reading texts which are more complex in terms of vocabulary, structures, and concepts
- promotion of independent reading outside schools (summer reading lists, working with community groups, encouraging parents)

Teaching English reading to speakers of other languages should recognise the linguistic needs of students with limited proficiency in English by teaching them how to read in their first language. During that time, they should be allowed to acquire proficiency in spoken English and then, “subsequently ... extend their skills to reading in English” (Snow, Burns, and Griffin 1998, 11). The panel concludes that with reference to children who do not speak English:

the instructional priority should be to develop children’s proficiency in spoken English. Although print materials may be used to develop understanding of English speech sounds, vocabulary, and syntax, the postponement of formal reading instruction is appropriate until an adequate level of proficiency in spoken English has been achieved. (Ibid , 11)

The findings of the National Research Council are in line with the report of the National Reading Panel (2000), which specifies areas of special attention and concern that school authorities and teachers themselves should become aware of. The report investigates the areas of alphabeticity, fluency, comprehension, and reading in relation to teacher education and computer technology. The proposed strategies are validated against their scientific validity and reliability. Table 1.3 below summarises the strategies that promote reading accuracy, fluency, speed, and comprehension.