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***DEVELOPMENTAL DYSLEXIA  
AND FOREIGN LANGUAGE LEARNING  
DURING EARLY STAGES OF LITERACY***

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*to three very special children  
Alfio, Emma and Gaia,  
and their wonderful teachers*

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## ***INTRODUCTION***

Nowadays, more and more children are diagnosed with a language or a reading disorder during early stages of education. It is unknown whether the increase of this phenomenon is somehow linked to a greater emotional stress that children experience in their day-to-day routines or if available data from international associations appear more alarming simply because they are more accurate than they have ever been in the past. All the same, the increase in the amount of children affected by specific learning disorders or language-related difficulties has led educators and teachers of all grades and subjects to pay more attention to these pathologies in order to elaborate new teaching methods that better suit the needs of their students. In order to acquaint the reader with how developmental dyslexia can affect foreign language learning, the present study will provide a thorough analysis of this specific learning

disorder, in particular of the *phonological deficit* which compromises reading acquisition and of anxiety-related issues, smoothing the path to the observations proposed in the final chapter on dyslexic-friendly foreign language teaching approaches and methods.

Linguistic instruction is likely to be a less pleasurable experience for children with a phonological deficit, whether it will be a matter of learning to read and write in their native language or in a foreign language. *A priori*, one can expect that learning a foreign language will be an even more demanding, if not impossible task for the language or reading-impaired child. However, this prejudice has led too many schools and institutions to unfairly exclude students with language disorders from foreign language activities, without taking into account the psychological as well as the emotional implications that this would imply. Fortunately, in the light of recent research findings, educators and school teachers can access a wider number of teaching resources that better suit the needs of dyslexic children, making foreign language learning a more enjoyable, gratifying experience.

The first chapter will try to provide an overview on current definitions of developmental dyslexia and the evaluation criteria that are today available to identify it during early stages of literacy. This part will also investigate the possibilities of hypothesised implications of specific language impairments during preschool education and the onset of reading impairments in subsequent stages. In order to be able to elaborate effective foreign language teaching methods for reading-impaired children, the second chapter will offer

an analysis on the different theories and hypothesis on the causes of dyslexia, namely the *phonological coding deficit hypothesis*, and possible correlations with psycho-motor deficits - *the cerebellar deficit hypothesis*. Particular attention will be paid to the pivotal role played by phonological awareness and phonological instruction during acquisition and mastering of the phonological processing abilities connected with reading abilities.

However, when dealing with specific learning disorders and foreign language teaching, it is important to have a clear picture of the differences existing between languages' writing systems and the role they play in shaping the way in which children learn to read. The alphabetic principle at the basis of reading acquisition is founded on correspondences between phonemes and graphemes, whose degree of consistency can vary across languages. For this reason, the third chapter will analyse reading strategies with regard to the *orthographic depth hypothesis* and languages' *phonological structures* as well as Goswami's (2010) *psycholinguistic grain size view of reading acquisition across languages*.

Finally, once the first three chapters have acquainted the reader with the issues associated with language- and reading-impairments, the fourth chapter, the main body of this study, will provide an overview on the current foreign language teaching methods and teaching resources available to teach foreign languages to dyslexic children. In particular, in the light of internationally recognised theories on *Second Language Acquisition* (Krashen, 1982, 1983), a *ludic experience-centred multisensory teaching*

*approach* will be proposed to suit the needs of dyslexic children during foreign language learning. This kind of approach will prove effective in guiding language- and reading-impaired children (but also unimpaired children in general) through an enjoyable language learning experience that will help them overcome *language-specific anxiety* engendered by their phonological deficit.



## **Chapter 1**

# **Defining developmental dyslexia**

### **1.1 Towards a thorough definition**

In the attempt to identify adequate strategies for teaching foreign languages to dyslexic children, the first step towards a successful teaching approach is to achieve a thorough awareness of this disorder and its peculiarities. Too often, in fact, educators and teachers of all grades lack sufficient knowledge and experience in how to deal with students suffering from this learning disability. For this reason, they generally have no chance but to rely entirely on professional aids that families find outside the school environment. Yet, teachers should be the first actors in helping children profit from the learning process itself and guarantee a feeling of happiness and satisfaction for their own achievements, even in the foreign language classroom. In order to understand what the needs of dyslexic children are and which teaching strategies should be adopted to help them overcome their reading

impairments, this chapter will try to provide an overview of dyslexia and its subtypes in the light of the most recent studies.

The number of children affected by this learning disability is greater than what is generally thought. It is therefore important to understand what the incidence is on the global school population. Estimations on the number of people suffering from dyslexia vary across countries and most importantly they differ in languages that have fundamentally different writing systems, such as the alphabetic and the logographic families. Even among the alphabetic systems, estimations on the dyslexic population varies significantly. According to the AID (*Associazione Italiana Dislessia*) - the Italian Dyslexia Association, 3-4% of the population in Italy is affected by dyslexia whereas, according to the DRI - the Dyslexia Research Institute, in the USA the number rises up to 10-15% (Daloiso: 2009). The DSM IV TR<sup>1</sup> shows that about 4% of school-age children has reading disorders and that approximately four of every five cases of learning disorders are actually reading disorders, alone or in combination with other learning disorders, such as mathematics disorder or disorders of written expression. Cornoldi (1999: 62) explains that in reality only less than 1% of the DSM's estimation is actually affected by dyslexia. Joanna Nijakowska (2010: 9) reveals that certain studies reckon the incidence of dyslexics to be even up to 30% of the entire population. Furthermore, other investigations (Stein: 2001, DSM IV TR) suggest that dyslexia is more likely to affect males rather than females<sup>2</sup>

<sup>1</sup> *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, text revision.

<sup>2</sup> According to the DSM IV TR, from 60% to 80% of individuals diagnosed with a reading disorder are males.

and is more prevalent among first-degree biological relatives of individuals with learning disorders.

Assuming that all these researches were carried out for a common purpose, that is to produce accurate estimations concerning the actual incidence of dyslexia, they can leave whoever is faced with the subject doubtful about their reliability. However, these data are indeed the results of authentic researches but when collated, they clearly leave room for further observations. On the one hand, the discrepancies in estimations arise several questions on what kinds of criteria are used to identify this learning disorder and whether they are applied with the same strictness in every country; on the other hand, they reveal a lack of a commonly accepted definition of this learning disorder which is also the cause of the misleading use of the term “dyslexia”, often used incorrectly to refer to other kinds of milder learning disorders.

Liliane Sprenger-Charolles *et al.* (2006) trace back the first attempt for an internationally recognised definition of dyslexia in 1968, during a meeting of the World Federation of Neurologists. In that occasion specific developmental dyslexia was described as:

*“a disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence, and socio-cultural opportunity. It is also dependent upon cognitive disabilities which are frequently of constitutional origin”* (Sprenger-Charolles *et al.*, 2006).

Nevertheless, this definition was later criticised by practitioners for its clearly

exclusionary nature and for the ambiguity surrounding it (Nijakowska, 2010). In the following years, more definitions have been proposed, eventually arriving at an agreement which takes into account behavioral indicators of the dyslexic reading deficit and which identifies its most clear outcome in the failure to develop the ability to automatically recognise isolated written words out of context. The International Dyslexia Association<sup>3</sup> – in particular a working group under the leadership of G.Reid Lyon, during a meeting in Washington in August 2002, developed a more accurate definition which identified developmental dyslexia as one of several distinct learning disabilities:

*“Dyslexia is a specific learning disability that is neurobiological in origin. It is characterised by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction; they are not the result of generalised developmental disability or sensory impairment”* (Sprenger-Charolles *et al.*, 2006; Nijakowska, 2010; Shaywitz, 2003).

This definition differs from earlier ones for introducing what have been identified as the prerequisites for the onset of this specific learning disorder, namely a difficulty in language processing from the written code to the oral code which is usually due to underdeveloped phonological awareness. *Language processing* and *phonological awareness* are in fact key terms that

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<sup>3</sup> In the past, also known as *The Orton Dyslexia Association*.

are used to explain in a more neuro-linguistic perspective how developmental dyslexia compromises reading abilities and they will be analysed in depth later on in the following chapters.

Let us not forget though that dyslexia, and especially developmental dyslexia, has different degrees of severity and its symptoms can undergo several changes during its course due to a variation of teaching strategies or learning compensation strategies. Moreover, if the language family – whether orthographic or logographic - deeply influences the incidence of dyslexia, the degree of difficulty, namely the phonological contrast and articulatory effort<sup>4</sup>, and children responses to it will also change, depending on the level of orthographic transparency of the language involved. Dyslexic children's performances in reading, in fact, change significantly from deep orthographies to shallow orthographies (Sprenger-Charolles *et al.*: 2006) and this could also explain the existing discrepancies in statistical data on the incidence of dyslexic students on the entire school population of every country which was mentioned at the beginning of this chapter.

## **1.2 Specific learning disabilities and comorbidities<sup>5</sup>: developmental dyslexia, dysgraphia, dysorthography and dyscalculia.**

'Specific learning disabilities' is a broad term which groups together different kinds of learning disabilities that affect specific skills. As it was previously

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4 Kirchner, Robert. *Phonological Contrast and Articulatory Effort*. University of Alberta, 2002.

5 *Comorbidity* is a medical term which describes the coexistence of conditions or disease processes that are additional to an initial diagnosis.

described, *developmental dyslexia* is just one of the many existing learning disabilities. In order to become able to identify it, it is important to be aware of the variety of specific learning disabilities and how they can be interrelated in the occurrence of comorbid disorders.

If developmental dyslexia is supposed to affect reading abilities due to a difficulty in language processing with regard to the decoding process, *dysgraphia* and *dysorthography* involve the opposite route of language processing, namely the encoding ability which implies the conversion of the spoken language to its written code. In particular, a *dysgraphic* student will show a lower degree of fluency and formal quality in writing. In this case the deficit responsible for the lower writing standard is generally imputable to a pre-existing psycho-motor dysfunction. *Dysorthography* instead affects central components of the writing process which are responsible for the *transcoding* of the oral code into its written form. It is a specific disorder of spelling which accompanies dyslexia; the cognitive dysfunction at the basis of the two disorders is probably common to both. *Dysorthography* is a condition that affects the ability to acquire spelling skills and causes difficulties in the visual memory recalling of words. This learning disability is characterized by an important and durable difficulty in assimilating grammatical rules (deterioration of spontaneous writing or under dictation). Symptoms of *dysorthography* can appear in the following forms and in varied proportions: slowness, hesitations and poverty of the writing; grammar, conjugation and spelling mistakes; difficulties with writing that appear

similar to the dyslexic; copy errors and arbitrary cuts of words; savings in syllables, omissions and merged words. This disorder often follows up an initial dyslexic condition; however, this does not occur systematically and, depending on its origins, it can take a developmental or acquired form.

*Dyscalculia* is a specific learning disability affecting mathematical abilities such as calculation, both in its basic numerical awareness and intelligence and in its pragmatic procedure in carrying out calculations. With regard to numerical awareness, dyscalculia compromises basic mathematical abilities, such as *subitizing*<sup>6</sup>, quantification mechanisms, seriation skills and comparing abilities, quantities' composition and decomposition and finally, mental calculation strategies. For what concerns pragmatic mathematical procedures, dyscalculia negatively affects predominantly written mathematical abilities including reading and writing of numbers, aligning skills and retrieval of numerical calculations and algorithms.<sup>7</sup>

Specific learning disabilities can occur independently, or can develop in combination with other specific learning disabilities, or with other developmental disorders, such as specific language disorders, attention disorders or psycho-motor deficits. Of course, the coexistence of more than one disability in the same individual - usually described in medical terms as *comorbidity* - makes the effects of each single disorder even more debilitating because of the negative influence they have on one another.

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6 *Subitizing* usually refers to the ability to perceive the number of a group of items at a glance and without counting.

7 Ministero dell'Istruzione, dell'Università e della Ricerca, *Linee Guida per il Diritto allo Studio degli alunni e degli studenti con disturbi specifici di apprendimento*, DM 12 Luglio 2011 (allegati)

However, in the event of concomitant diseases, the diagnosis of specific reading disorder predominates over the other specific disorders (arithmetic and writing disorders) as it is suggested by the ICD-10<sup>8</sup>, whereas the DSM-IV enables several diagnoses to be formulated. This may explain the existing discrepancies in the assessment of these disorders in different countries.

### **1.3 *Developmental Dyslexia and Acquired Dyslexia.***

In order to trace a more accurate profile of the specific learning disorder analysed by the present study, first of all, it is important to distinguish what is generally referred to as *developmental* dyslexia and *acquired* dyslexia. In order to make this distinction clearer, it is useful to linger on “developmental” as a fundamental trait of this disorder and its meaning. In medicine, the term *developmental* refers to one of several disorders that interrupt normal development in childhood. They may affect a single area of development (specific developmental disorders) or several areas (pervasive developmental disorders). According to this definition, developmental dyslexia is a specific developmental disorder; however, it tends to be erroneously considered as a transitory condition which will disappear with maturity. On the contrary, 'it is related to a *developmental* process which has never been completed'<sup>9</sup> (Cornoldi, 1999:51). It is a deficit that shows its first manifestations at a very early stage in life and persists into

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8 *International Classification of Diseases*

9 My translation



adulthood. More precisely, it is a decoding disorder which affects basic reading abilities that are usually developed during the first years of primary school and which allow to recognise words - even unfamiliar words - within a written text (Cornoldi, 1999). In *developmental dyslexia* the *phonological weakness* is primary while other components of the language system are intact, and the reading impairment is at the level of decoding single words and their sub-lexical components, initially *accurately* and later *fluently*<sup>10</sup>. Intelligence is not affected and may be in the superior or gifted range. Finally, the distinctive feature is that although the causes are still being investigated, developmental dyslexia is a congenital disorder, present from birth.

In *acquired dyslexia*, also referred to as *acquired alexia* (Shaywitz, 2003) there is a loss or diminution of reading ability which can emerge later in life, usually as a consequence of brain damage or trauma, a tumor, or a stroke affecting the brain systems that are necessary for reading. What is crucial in acquired dyslexia is that its symptoms appear *after* reading abilities have been learnt. Also, other symptoms may occur in acquired dyslexia, and these may include loss of speech or weakness of the right side of the body, depending on the specific brain region that have been affected by the injury.

#### **1.4 How is dyslexia identified? Evaluation criteria**

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<sup>10</sup> *Accuracy* is critical early on while *fluency* is an ability which gains in importance as the child matures.

Moving on from the International Dyslexia Association's definition of developmental dyslexia, a few words must be spent on how dyslexia is identified and what kind of tests are used to certify it. Recent studies have focused on the diverse symptoms of this language-specific learning disorder and on the language processing route it affects, suggesting the existence of different kinds and subtypes of dyslexia. Identifying the cases of dyslexia among the multitude of poor readers, however, remains a difficult task.

The most fundamental and primary behavioral symptom of dyslexia seems to be an evident, persistent difficulty in the acquisition of skilful word decoding (reading) and encoding (spelling) which causes a delay in a child's literacy development, compared with same-age children. Because of the academic skills it affects, dyslexia is routinely diagnosed no sooner than a child starts learning to read and spell, which is during the first years of primary school. Although it has been largely proved that an early diagnosis is of paramount importance for a successful recovery of compensatory learning strategies. T

Too often children's school careers are compromised because their reading impairment is not identified in time, due to country- and language-specific factors, such as the lack of commonly agreed evaluation criteria and standardised diagnostic measures. Hence the reason why teachers should pay extra attention while observing and monitoring the development of children's reading and spelling abilities by following a three-step evaluation process before moving on to seek professional aid for further investigation and

diagnosis, which are in any case beyond the scope of teaching. The three suggested steps of the evaluation process are (Shaywitz, 2003):

- Establish a reading problem according to age and education, for example through a comparison of reading achievements with same-age peers.
- Gather evidence supporting its “unexpectedness”; a discrepancy between high learning capability and underdeveloped reading abilities;
- Demonstrate evidence of an isolated phonologic weakness, which is in clear contrast with other unaffected language functions.

It is possible to follow these three steps through a battery of tests which aim to produce an overall picture of a child's reading and cognitive abilities. Some tests focus on the supposed relationship between IQ and reading abilities, others on specific language processing abilities.

#### *The IQ discrepancy criterion*

Traditionally, the onset of dyslexia is revealed by a discrepancy between IQ and reading capacity. In other words there exists a significant correlation between IQ and reading which makes it possible to predict the reading level of any given child, from his or her chronological age. According to this criterion, a child with high IQ scores is likely to perform well in reading abilities tests; conversely, when IQ is low, reading abilities are also expected to be low. When the correlation principle is not satisfied, and reading abilities scores are far below the expected level suggested by IQ scores, a child is

considered to have a reading disability and it gains him eligibility for special education programs in public schools.

Nevertheless, there is an intense debate over the real usefulness of the discrepancy criterion. In the light of the most recent studies<sup>11</sup> and discoveries on the phonological basis of reading and dyslexia, this evaluative criterion appears to be insufficient in that it does not take into account other cognitive abilities that concur in language processing and reading acquisition. The IQ discrepancy criterion is therefore taking a less prominent role in dyslexia assessment procedures, unless its results are analysed conjunctively with other cognitive abilities tests, which can provide a more detailed picture of the children's cognitive abilities and difficulties without overshadowing their potentials.

*Reading tests criteria: accuracy, speed and comprehension*

The discovery of the phonological basis of reading abilities has drastically diminished the role of tests of intelligence (IQ) in the diagnosis of developmental dyslexia. Following an introductory stage of assessment process, the diagnostic procedure focuses on the evaluation of reading and spelling abilities through a battery of tests which evaluate *accuracy*, *speed* and level of *comprehension*. Each of these aspects helps identify the specific subtype of developmental dyslexia and the language processing route it

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<sup>11</sup> Sprenger-Charolles *et al.* (2006: 73) cite a review of nearly fifty studies (Stuebing, Fletcher, LeDoux, Lyon, Shaywitz, 2002, etc.) which casts doubt on the validity of the discrepancy criterion, corroborating the idea that there are no great differences between IQ-discrepant and non-discrepant poor readers in measures of recoding skills.

affects. Especially the analysis of accuracy and speed of reading are useful to identify the source of the reading dysfunction. According to the “double deficit” hypothesis, there exist two independent deficits which affect reading abilities, one related to phonological processing (assessed by accuracy scores), the other related to lexical access (assessed by RAN<sup>12</sup> tasks of highly frequent words). The two independent routes at the basis of reading dysfunctions suggested by the double deficit hypothesis will be analysed in the following chapters.

More in general, reading tests will therefore include: verification of the letter knowledge with regard to their shape, name and sound, single word decoding, pseudo-word reading, reading text aloud, silent reading with comprehension, dictation, writing an essay and sometimes rewriting and writing from memory (Górniewicz, 1998; Jędrzejowska & Jurek, 2003; Krasowicz-Kupis, 2008; Turner, 2003)<sup>13</sup>.

### *Evaluation of the cognitive functions*

The evaluation of the cognitive functions also play a pivotal role in the diagnosis of developmental dyslexia because it provides an analysis of the three main symptoms which can be related to a phonological deficit. These will include *poor phonological awareness* (a weakness in the ability to manipulate speech sounds), *slow lexical retrieval* (difficulty in rapid serial

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12 RAN, rapid automatic naming.

13 In Nijakowska, 2010: 103

naming for example) and *poor short-term verbal memory*, particularly evident in pseudo-words repetition and digit span tasks (Nijakowska, 2010).

Given the central role of the phonological weakness as the primary cause of developmental dyslexia, most tests will therefore focus on the cognitive deficit which might be at the basis of the poor phonological processing ability. Phonologic skills can be directly and reliably measured in a school-age child through comprehensive tests of phonological processing which assess a child's ability to manipulate words and phonemes (an example is the phoneme deletion or elision test). Other tests will also analyse other cognitive abilities that are apparently indirectly related to phonological processing but which might also be at the basis of the reading dysfunction. These tests focus on the analysis of morphological and syntactic processing (when the child struggles to recognise the words structure within a sentence) and lexical-semantic processing (when the child cannot grasp the meaning of words).

In conclusion, most tests will assess the origin of the reading dysfunction which can appear in the following forms:

- Difficulty reading single words
- Particular difficulty in decoding nonsense or unfamiliar words
- Reading comprehension often superior to decoding individual words
- Inaccurate and labored oral reading of passages
- Trouble reading small “function” words, such as *that, is, an, for...*

- Slow reading
- Poor spelling

(Shaywitz, 2003)

### **1.5 Early symptoms in at-risk children: specific language impairments and developmental dyslexia.**

Recent studies suggest that early warning signs of poor reading performance can be quite accurately identified at the first stages of literacy, particularly as early as preschool age. Nijakowska (2010:86) explains that areas of weakness identified in post-infantile and preschool stages, such as late development of speech, poor phonological skills or late development of motor ability, represent early symptoms of learning difficulties, including developmental dyslexia. As a matter of fact, reading tests on dyslexic children often identifies deficits which were evident well before school age.

The plausible relationship between developmental dyslexia and early specific language impairments (SLI) has drawn much attention on the possibility that the onset of developmental dyslexia might be due to earlier potential language disorders. According to this theory, the beginning of formal literacy education simply highlights language processing abilities which could be previously identified. Since language processing abilities such as rapid automatic naming (RAN), pseudo-words repetition, phoneme-manipulating abilities are developed well before school age, more attention has been paid to the cognitive process involved in the passage from spoken

language to its written form and in the mastering of basic phonological abilities. By far, the best developed theory of dyslexia states that phonological problems occurring prior to reading instruction constitute a cause of later reading impairment. Scientific research corroborates this theory (Bishop and Snowling, 2004)<sup>14</sup> with a number of studies which confirm that at least half of the cases that were diagnosed with SLI (Specific Language Impairments) has later on developed a specific learning disorder, such as developmental dyslexia, related to written language abilities, including comprehension, decoding and encoding abilities or poor lexical retrieval (Cornoldi, 1999: 55). These results have shown that in most cases a dyslexic child is also likely to get below-average scores in one or more language tests<sup>15</sup> which are usually submitted to children with SLI. However, this does not mean that all children with specific language impairments will definitely become dyslexic while approaching literacy stages. As a matter of fact, specific language impairments can either assume even more specific features, merely related to the spoken language or, in the case of dyslexia, they can develop into a specific learning disorder, when more advanced cognitive skills are required. Furthermore, IQ tests prove that the dyslexic children's scores are usually higher than the language-impaired children's.

What seems to be the cause of dyslexia in at-risk children is a late or incomplete phonological development, which can result in a low degree of

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14 in Aglioti, 2006: 161

15 According to the International Classification of Diseases (ICD-10), in order to be diagnosed with SLI, a child's scores in language tests must be two deviations standard below average. (Inserm, 2007: 19)



accuracy, especially in pseudo-word processing tasks. In other words, these children struggle to form specified phonological representations which are far below average standards. For this reason they are disadvantaged in comparison to same-age children when they are asked to carry out simple phonological tasks and, as a result, their performance will be much worse than their peers. This deficit has 'a debilitating effect on the ability to map orthography on phonology' (Nijakowska, 2010: 87), smoothing the way for the onset of dyslexia in later stages. It is therefore important to be able to identify early symptoms of specific language impairments inside and outside the school environment, especially before children start formal education.

Specific language impairments' manifestations occur in different ways, such as late development of speech, word-naming problems, word mispronunciations, jumbling words, difficulties with rhymes and alliteration, and also inadequate syntax with inappropriate word order and ungrammatical forms. Simple language-related nursery school activities might become difficult to learn for children with SLI who will perform poorly in the memorisation of nursery rhymes, short poems and songs, also showing a below-standard aptitude to repeat messages and follow a series of instructions, as well as a tendency to use circumlocutions and periphrasis (Nijakowska, 2010: 87). Occasionally, there may be a correlation between poor language processing skills and low psycho-motor performances, often occurring in children diagnosed with *dysgnosia*<sup>16</sup> (Simonetta: 2004).

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<sup>16</sup> "Dysgnosia" is a neologism coined by Elena Simonetta, psychologist, psychotherapist and psychomotility therapist, and author of several scientific studies on developmental dyslexia in

Moreover, according to the DSM IV tr, there exists a familial pattern in developmental dyslexia which is more prevalent among first-degree biological relatives of individuals with learning disorders and that can show its first symptoms well before school age. The genetic basis of dyslexia has been verified in population genetic studies (Nijakowska, 2010: 35). For this reason children coming from families with a history of developmental dyslexia are also considered to be at risk and teachers - both at primary school and nursery school - should be informed so that they can analyse their performances more closely and be able to intervene when necessary.

Given the importance of speech therapy especially during first stages of literacy, an early diagnosis of specific learning disorders and specific language impairments in at-risk children becomes of paramount importance for rehabilitation as it can give children the chance to activate adequate compensatory strategies.

### **1.6 Anxiety in students with symptoms of developmental dyslexia.**

Developmental dyslexia negatively influence students academic performance, especially in school subjects related to the use of linguistic skills. The study of a foreign language, which should be an enjoyable experience, often results in overwhelming difficulties with orthographic/phonological, syntactic-

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Italy. The term describes a “difficulty in knowing” which is a severe disorder supposedly due to an infantile mental trauma. In *La Dislessia* (2004), she highlights the interrelation existing between psychomotor dysfunctions affecting specific abilities, such as ocular-manual coordination and orientation abilities, and psycholinguistic problems related to a phonological deficit in individuals with learning disorders, such as dyslexia, dysgraphia and dyscalculia.

grammatical and semantic processing which dyslexic students struggle to overcome (Schneider, Crombie 2003). As a matter of fact, the first emotional symptoms of developmental dyslexia with regard to foreign language acquisition are above-average anxiety, emotional insecurity and depression (McNulty, 2003; Piechurska-Kuciel, 2008), as well as frustration. Feelings of anxiety especially affect foreign language acquisition in students with specific learning disorders precisely because it enhances the already negative effect of the *emotional filter* activated by the learner in anxiety-provoking situations.

Traditional psychology, identifies two kinds of anxiety: *state* and *trait* anxiety. *State anxiety* regards subjective and conscious feelings of apprehension and tension, accompanied by stimulation and activation of the autonomous nervous system (Spielberger, 1966). *Trait anxiety*, as it is suggested by the noun, refers to a relatively stable personality characteristic that is connected with the general vulnerability of an individual (Eysenck, 1979). With regard to the foreign language learning context, a special kind of *language anxiety* has been identified as a form of *trait anxiety* that is situation-specific, for example linked to test taking or public speaking situations (MacIntyre, 1999). Needless to say that, especially in the language- or reading-impaired student, this kind of anxiety produces *social* (unwillingness to speak in a foreign language), *personal* (low individual self-esteem, ego and interests and self-deprecating thoughts), *academic* (low academic performance) and *cognitive* effects (interference with students'

cognitive performance in language processing).

Unfortunately, anxiety compromises all three stages of language processing. The model proposed by Tobias (1985) to show the functioning of test anxiety in cognitive processing and quoted by Piechurska-Kuciel (2008) highlights that language anxiety interferes at the *input stage*, *processing stage*, and *output stage* during the language learning phase. In the input stage, anxiety causes attention deficits and poor initial information processing, making the student prone to distraction. At the processing stage, anxiety will compromise speed and accuracy skills because the cognitive task is being limited by intrusive thoughts. At the output stage, anxiety interferes with information retrieval, making the student unable to recall necessary linguistic items.

It follows that language anxiety drastically compromises all stages of the language learning process due to the lower cognitive efficiency that it causes. Research has shown that students with dyslexic symptoms generally suffer from greater anxiety than students without this kind of symptoms. Especially for this reason, when planning classroom activities, language facilitators should avoid any situation that might generate anxiety in the student.

### ***Summary***

At the end of this chapter it is possible to identify prerequisite notions which

play a key role in understanding developmental dyslexia and that will be essential in the present survey on developmental dyslexia and foreign language teaching:

1. The International Dyslexia Association (2002) defines developmental dyslexia as one of several distinct learning disabilities, which is neurobiological in origin and characterised by a deficit in the phonological component of language which causes difficulties with accurate and/or fluent word recognition, and by poor spelling and decoding abilities.

2. In *developmental dyslexia*, the term *developmental* suggests a process which has never been completed and is therefore to be distinguished from acquired dyslexia, which instead can be a consequence of a brain damage. Developmental dyslexia can occur on its own or in combination with other specific learning disorders (in cases of comorbidity) such as dysgraphia, dysorthography or dyscalculia.

3. There is great difficulty in establishing the incidence of developmental dyslexia in the school population because of the lack of shared measures testing the severity of the disorders and also because of the strong influence of the language family (alphabetic, logographic, etc.) and of the different phonological contrast and articulatory effort involved have on reading acquisition.

4. Many studies have highlighted the strong relationship existing between the occurrence of specific language impairments (SLI) at preschool age and the onset of developmental dyslexia during early literacy stages. For this

reason, more attention has been drawn to the importance of early identification and adequate speech therapies for the development of phonological abilities during preschool age. Simple phonological activities such as memorisation of nursery rhymes, short poems and songs, words and pseudo-words naming, rhyming and alliterations<sup>17</sup> and syllables manipulation are highly revealing about the development of children's phonological skills at preschool age.

5. Anxiety usually generating in situations that imply taking part to a foreign language activity is even greater for the dyslexic or language-impaired child.

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<sup>17</sup> For example, “*around the rock the ragged rascal ran*”.

## Chapter 2

# The phonological coding deficit at the basis of developmental dyslexia

### 2.1 Phonological explanations of dyslexia: *phonological awareness* and its role in reading acquisition.

As it has been described in the previous chapter, the phonological deficit hypothesis on the causes of dyslexia is based on the assumption that the early expertise of phonological abilities is an essential prerequisite for the development of reading abilities. A phonological impairment present in preschool years and persisting after formal reading instruction is a characteristic feature of dyslexia which affects cognitive abilities through a delay or difficulty in forming segmental phonological representations. But what do “phonological abilities” actually refer to and what role do they play in reading acquisition?

First of all, it may be useful to distinguish between *implicit*

phonological abilities and *explicit* phonological abilities. Implicit phonological abilities usually refer to early phonological processing abilities which are used by preliterate children in oral language without reflecting on the structure of spoken words. They represent what is generally referred to as the *epilinguistic phonological competence* (Nijakowska, 2010: 45) which involves intuitive judgments on similarities between words, syllables, onsets and rhymes. Usually they include simple tasks such as naming, repeating words and pseudo-words and tasks which draw on short-term verbal memory (STM).

Conversely, explicit phonological abilities are represented by *phonological awareness* which is the ability to perform explicit judgments on the structure of spoken words through intentional operations on speech sounds which involve memory, analysis and synthesis of phonological elements. Phonological awareness therefore implies the ability to identify, discriminate from, and manipulate the sound structure of words. It represents the knowledge that the *speech stream* can be segmented into smaller parts – words, syllables and phonemes, and infra-syllabic units such as onsets and rhymes – and that these elements can be manipulated and processed. Consequently, phonological awareness is a *metalinguistic competence* which enables beginning readers to realise that spoken words are composed of sound sequences and that the most basic sounds (phonemes) - at least for alphabetic writing systems – correspond to written symbols such as letters or groups of letters (such as digraphs and consonant blends). For this reason,



*phonological awareness* is a fundamental prerequisite for the understanding of the written language system and it is also an essential component of the *alphabetic principle* which is crucial for the acquisition of reading abilities.

Moreover, *phonological awareness* comprises different sizes of phonological units, from entire words to syllables and infra-syllabic units and must not be confused with *phonemic awareness* which is instead only related to the identification and manipulation of individual phonemes. However, the ability to distinguish single phonemes is not less important for the acquisition of reading abilities as phonemes are the smallest functional units of sound in a given language and are distinctive in meaning (for example /p/ and /b/ are distinctive in meaning in the words 'pan' and 'ban'). Phonemic awareness allows us to distinguish and identify individual sounds and segments that constitute the utterances (*speech stream*) we hear, and provides the basis for the understanding of the correspondences between phonemes and graphemes.

In the course of the development of phonological awareness, young children progress from larger to smaller sound units (Nijakowska, 2010), which means from words, to syllables, onsets and rhymes, and finally, to phonemes and they learn that all these elements can be separated, blended and manipulated. In addition, phonemic awareness is a more demanding task for children than syllabic awareness - the latter usually developing at around the early age of four. This may be due to the fact that phonemic awareness requires a higher degree of abstraction of elements of spoken language that are rarely available as discrete units (Sprengr-Charolles *et al.*, 2006).

Phonemes are not pronounced one at the time, but altogether in single articulatory gestures within each syllable. Therefore, it is difficult for children to spontaneously identify phonemes in spoken words before reading acquisition<sup>18</sup>. The ability to recognise onsets and rhymes within syllables allows children to categorise words according to sound similarities, so that they can subsequently map them onto letters and letter clusters, eventually becoming able to read confidently unfamiliar words through analogy, by recognising the chunks they already know. In other words, this operation represents the transition from implicit phonological knowledge to explicit phonological knowledge. It follows that the more practice and proficiency children have in identifying syllables, infra-syllabic elements, phonemes and phoneme-grapheme correspondences, the easier the acquisition of reading abilities will be.

It goes without saying that children diagnosed with a phonological deficit at preschool age are therefore likely to encounter great difficulties in reading acquisition when they enter formal education. Research findings confirm that children at risk for dyslexia fail to create mental phonological representations *before* school age and are subsequently unable to establish phonemes-graphemes correspondences in the following stages. A phonological deficit in fact is a lifelong condition which persists before and

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<sup>18</sup> It can be relatively easy to understand why children perform better in tasks involving syllabic awareness instead of phonemic awareness. Fabbro (2004:31) explains that during first language acquisition, children begin to utter their first syllables when they are six months old and began to recognise and memorise syllable forms of the “word” type with clearly defined consonant-vowel sequences when they are seven-eight months old (Inserm:2007), during what is generally referred to as the *lallation phase*. For this reason we can assume that children approaching literacy age are much more familiar with manipulating syllables than phonemes.

after literacy age. However, its early identification and adequate speech therapies can reduce the effects of this deficit, and they are therefore decisive in restoring compensatory cognitive strategies which allow children to develop normal reading abilities when they reach school age.

According to the phonological coding deficit theory, the deficit usually comprises three main elements: phonemic awareness, slow lexical retrieval and poor short-term memory, STM (Nijakowska, 2010). These elements appear through a range of typical symptoms of phonological processing deficiency which are easily identifiable during simple classroom activities. Children can struggle to segment words into phonemes, keep linguistic material (strings of sounds) in short-term memory, read, repeat and spell short and long pseudo-words, as well as slow naming of colours, numbers, letters and objects in pictures. Sometimes the deficit is assimilated to a specific language impairment producing a slower rate of speech, with indistinct pronunciation. Slow, as well as inadequate phonological coding and poorly developed phonological representations are in fact a common characteristic feature of children and adults affected by dyslexia. In addition, poor and slow phonological processing not only makes it increasingly hard to instantly recognise words, but it can also significantly compromise access to higher levels of language processing (syntactic and semantic processing).

## **2.2 Developmental dyslexia profiles: surface, phonological and mixed dyslexia.**

Varying severity of impairment within phonological processing also produces different kinds of symptoms; consequently, developmental dyslexia may assume different forms and affect different language processing routes. As mentioned before, classical explanations of dyslexia identify its cause in poor phonological skills, especially phonemic awareness and phonological short-term memory. These deficiencies may constitute a hindrance to the acquisition of the sub-lexical reading procedure which implies the ability to connect sub-lexical writing units (graphemes) to sub-lexical speaking units (phonemes) and then bring together what results from the phonemic decoding process. However, the phonological processing ability may be affected differently.

The standard model proposed by cognitive neuropsychology identifies three kinds of dyslexia in relationship to the specific language processing route it affects. A first distinction is between what is generally referred to as *phonological dyslexia* and *surface dyslexia*. As the word itself suggests, *phonological dyslexia* refers to the difficulty in using the phonological or sub-lexical route which allows immediate correspondences between words' sub-lexical units, such as graphemes, and their corresponding phonemes. Children affected by phonological dyslexia will have a low level of phonological awareness. Consequently, they will struggle to read pseudo- and

unfamiliar words, and accuracy level will be particularly low.

Surface dyslexia, instead, predominantly affect the lexical route, which implies the ability to readily recognise an entire word by its whole sound (Cornoldi, 1999: 65). In other words it compromises the ability to immediately associate a word's written form, with its semantic and phonological form through a mnemonic operation which allows children to identify words within a range of previously memorized lexical items. Children who cannot use the lexical route, will therefore rely entirely on the sub-lexical phonological route, which will make their reading rate particularly slow.

Another kind of dyslexia is perhaps the most severe one as it affects both the lexical and the sub-lexical route with debilitating effects on the basic abilities involved in the reading process. This kind of dyslexia is usually identified as deep dyslexia or mixed dyslexia and in addition to common symptoms of other kinds of dyslexia, it is characterised by higher levels of processing difficulties, involving the semantic route. This classification differs from others for it focuses on the specific phonological deficits and the consequent language processing routes they affect.

A further distinction is the one proposed by Bakker (1990), a Dutch neuropsychologist, who distinguished three kinds of developmental dyslexia according to the dysfunctional brain hemisphere involved:

- *Linguistic dyslexia*. (30% of diagnosis). It is characterised by normal reading speed, high level of inaccuracy, often due to letters or even words

substitutions or omissions. This kind of dyslexia supposedly presume a dysfunctional development of the left brain hemisphere also responsible for the poor language processing abilities.

- *Perceptive dyslexia* (30% of diagnosis) In this case children will read very slowly with an average level of accuracy and only very few mistakes. The dysfunction appears to be in the right hemisphere, therefore compromising the visual processing of letters and words.
- *Mixed dyslexia*. (40% of diagnosis). This kind of dyslexia appears to be a consequence of a dysfunction in both right and left hemisphere and children's affected by it are characterised by a slow reading rate and low level of accuracy (Aglioti, 2006: 160-161).

Both classifications are necessary for the identification of the language processing deficits involved and allow a higher effectiveness of rehabilitation therapies which aims to selectively stimulate specific brain activities to compensate the neurological deficits.

### **2.3 Correlations between the phonological and the psycho-motor deficits in cases of specific learning disabilities such as developmental dyslexia – the cerebellar deficit hypothesis.**

The influence of the phonological deficit on language acquisition and reading abilities has been largely investigated. However, only recently the hypothesis of the interrelation between the psycholinguistic deficit at the basis of

dyslexia and psycho-motor abilities has been corroborated by a number of scientific studies. A central role in the interpretation of specific learning disabilities and the relationship between neurolinguistic and psycho-motor aspects is played by the psychological assumption about the unitarity and indivisibility of the *self*. In this perspective, the analysis of psycho-motor abilities should be taken primarily as a landmark for further investigations on the causes of dyslexia, and also as an important contribution to the prevention and rehabilitation in cases of specific learning disabilities.

Current research in psycholinguistics and psychotherapy in the treatment of language-related disorders suggests that the *body* should be placed at the centre of the therapeutic approach. This is due to the apparent correlation between a non-established or delayed right-left *dominance* and developmental dyslexia<sup>19</sup> which produces its early symptoms during early stages of alphabetization. According to recent findings in fact, the development of dyslexia may be a consequence of identity modification which causes in the individual an effect that is similar to an inversion of the nervous circuits responsible for the functioning of the ocular system. It appears that when a child's innate dominance is for example left-oriented, both in terms of manual motor abilities and ocular motor abilities, the adaptation to the less dominant part (right in this case) to perform simple daily tasks may produce a number of dysfunctions, namely a lack of control of and coordination between ocular and manual *praxias*<sup>20</sup> that are carried out

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19 Simonetta, Elena. *La Dislessia*. Rome: Carlo Amore ed., 2004.

20 *Praxia* is a term used to describe the execution of voluntary motor movements. The lack of or a

with the less dominant hand.

The same kind of dysfunction will later reappear during preliteracy and literacy stages in writing and reading activities. The most significant fact, however, is that the modified manual dominance causes an ocular-manual discordance which interferes with the vestibular system, causing an altered, irregular organisation of grapheme-phoneme conversions, ultimately compromising *automatisms* necessary for reading and comprehension of written texts.

A possible explanation of the correlation between the phonological deficit and deficiencies in motor skills is given by the *cerebellar deficit hypothesis*, which supports the idea that problems suffered by children with dyslexia may be attributed to the more generally perceived *automatisation deficit* supposedly due to a cerebellar malfunction<sup>21</sup>. The cerebellum, in fact, is involved in learning and automatisation of any skill - whether motor or cognitive - including reading, and is important for language-related cognitive tasks, so called *language dexterity*<sup>22</sup>. A delay in the stages of motor development, sequential and temporal disorders and, above all, the presence of motor coordination and balance disorders, all suggest dysfunctions of the cerebellum. The cerebellum is also involved in control of eye movements, visual and spatial attention and peripheral vision, all essential components of

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delay in the normal development of this function can lead to the onset of specific speech pathologies, such as *Apraxia* - totally unintelligible speech, and *Dyspraxia* - partial intelligibility of speech utterances.

21 Nijakowska, Joanna. *Dyslexia in the Foreign Language Classroom*. Bristol: Multilingual Matters, 2010. p.61

22 *Language dexterity* is the ability to readily perform language-related tasks.



reading. A cerebellar deficit occurs very early and interferes with the normal setup of auditory and articulatory skills necessary for constitution of the phonological system<sup>23</sup>. Therefore, children with dyslexia find it abnormally difficult to make any phonological skill automatic, regardless of whether the skill is cognitive or motor and, as a consequence, they usually also produce poor quality handwriting.

The cerebellar deficit first manifests by mild motor difficulty in sitting, walking, muscle control and articulation, also causing a delay in talking abilities. It is responsible for the phonological processing deficit that, according to the cerebellar deficit hypothesis, together with the learning and automatization deficit, lead to reading and spelling difficulties. In this sense, it is possible to assert that psycho-motor deficits, such as the lack of coordination between ocular and manual dominance and a cerebellum malfunction, may be one of the causes of writing and reading disorders. More precisely, it is possible to assert that a strong relationship exists between developmental dyslexia, in particular phonological dyslexia, and an unestablished spontaneous ocular *dominance* as the consequence of a global vestibular dysfunction (Simonetta: 2004) and automatization deficit. For this reason, a therapeutic approach that takes into account the psycho-motor dimension plays a pivotal role not only in the rehabilitation of the linguistic system at the basis of the phoneme-grapheme conversion and its automatic

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<sup>23</sup> Inserm (Institut National de la Santé et de la Recherche Médicale). *Dyslexia Dysorthography Dyscalculia. Review of Scientific Data*. Collective Expert Review. Paris: Collective Expert Review, 2007. p.37

retrieval, but also in the re-organisation of the functioning of the vestibular system. Moreover, it is usually believed by speech therapists that major improvements in reading and comprehension are not to be achieved by dyslexic or dysorthographic patients unless due attention is paid to the rehabilitation of the global vestibular activity as well as the re-establishment of motor and psycholinguistic automatisms during writing, reading and comprehension activities.

### ***Summary***

This chapter has highlighted the phonological deficit at the basis of developmental dyslexia and the hypothesis and subtypes deriving from this assumption. Here are the key concepts analysed in the chapter which provide a more accurate framework of dyslexia and its subtypes as well as a thorough description of this disorder and its plausible interrelation with other kinds of dysfunctions.

1. *Phonological abilities* play a fundamental role in reading acquisition. They are represented by the epilinguistic phonological competence (implicit phonological knowledge) and the metalinguistic phonological competence (explicit phonological knowledge). Together, they make what it is generally referred to as phonological awareness.
2. *Phonological awareness* is the knowledge that the speech stream can be segmented into smaller parts - words, syllables and phonemes and infra-

syllabic units, such as onsets and rhymes – and that these elements can be manipulated and processed. Phonological awareness therefore develops from basic implicit judgments in early stages of literacy to more explicit judgments as phonological abilities increase.

3. *Phonemic awareness* is the ability to identify individual sounds and segments we hear. Phonemic awareness is more demanding than syllabic awareness, which is instead spontaneously acquired by children as they learn their first language.

4. *The alphabetic principle* is crucial for the understanding of grapheme-phoneme correspondences and therefore for the acquisition of reading abilities.

5. A *phonological deficit* is a lifelong condition which persists before and after literacy age. It usually comprises three main elements: weak phonemic awareness, slow lexical retrieval and poor short-term memory.

6. Depending on the way the phonological processing ability is affected, cognitive neuro-psychology proposes a model which identifies three different kinds of dyslexia: *phonological dyslexia* (the deficit compromises the use of the phonological or sublexical route, resulting in low reading accuracy), *surface dyslexia* (the deficit involves the lexical route and the ability to readily recognise whole words, therefore compromising the reading rate) and *mixed dyslexia* (a combination of the two, also affecting the semantic route).

Other largely diffused classifications include Bakker's theory, according to which there are three kinds of dyslexia: linguistic dyslexia, involving the left

brain hemisphere, perceptive dyslexia, affecting the right brain hemisphere, and mixed dyslexia, when the linguistic deficit regards right and left brain hemisphere simultaneously.

7. Recent research in rehabilitation strategies and in the cerebellum deficit hypothesis highlights the existing correlations between the phonological deficit and the psycho-motor deficit, namely the lack of coordination between *ocular and manual dominance*, in cases of specific learning disabilities, such as developmental dyslexia.

## Chapter 3

# Reading Acquisition and Developmental Dyslexia in Different Orthographies

As it has been mentioned in the previous chapters, reading acquisition is a process which can vary significantly depending on the language's orthographic system that is taken into consideration. Research has shown that children perform differently and encounter varying degrees of difficulty during the decoding/encoding processes according to the degree of orthographic complexity of a given language. Readers of different European languages (all using the same alphabet), for example, show remarkable differences in the rate at which they acquire their reading and writing skills. This chapter will try to draw parallels and contrasts among reading acquisition in different orthographic systems and will show how symptoms of dyslexia can vary as a result of differences between orthographies.

### 3.1 Development of reading skills in different orthographic systems.

Decoding and encoding a particular language implies the mastering of orthographic abilities, visual processing abilities and morphemic skills to map the language onto the orthography that we must use. In order to understand how a writing system can influence the rate and trajectory of reading skills acquisition, it is important to provide a clear picture of how writing systems are generally classified and what their peculiarities are, with regard to their phonological and morphological structure, as well as their orthography.

World's orthographies are commonly divided into three main groups. They include: *logographic* writing systems, *syllabic* writing systems and *alphabetic* writing systems. A *logographic* writing system is an orthography mostly based on logograms - single written characters representing complete grammatical words or morphemes. Ancient logographic writing systems include, for example, the Sumerian cuneiform writing system. Today, Chinese is the most important surviving logographic writing system and has preserved its initial form, although 80-90% (McDougall *et al.*, 2010)<sup>24</sup> of characters are often semantic-phonetic compounds. If each character in a logographic system therefore represents a single word or morpheme, this orthographic system will have to provide a large number of logograms to write all the language's words. This implies a great effort to memorise all logograms and what they mean, making it the major disadvantage of a logographic system over alphabetic systems.

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<sup>24</sup> In *Reading and Dyslexia in Different Orthographies*. Hove: Psychology Press, 2010 (p. 9)

A syllabic writing system, instead, is based on a syllabic script made of written symbols that represents syllables. Today, there still exist many existing syllabic scripts, including Japanese, Korean, Hindi and Cherokee<sup>25</sup>. Syllabaries are usually best suited for languages with a relatively simple syllabic structure, such as CV syllables (consonant followed by a vowel). Languages with more complex syllabic structure such as the English language, which also present a large inventory of vowels and complex consonant clusters, are less easy to transcribe into a syllabary because of their orthographic complexity.

The last type of writing system is the most common among Western languages. The alphabetic writing system is the simplest and most straightforward orthographic writing system and is characterised by a relatively transparent orthography because each written symbol (grapheme) represents a single sound (phoneme) (McDougall *et al.*, 2009: 9). However, this assumption is challenged by a variety of alphabetic languages whose letter-sound relationship is more intricate and unpredictable, therefore less transparent. As a matter of fact, some languages can be characterised by complex graphemes representing a single phoneme and the letter-sound relationship may even depend on the context in which they appear, sometimes producing a different spelling. The extent to which such variations occur in a language and the degree of consistency of letter-sound mappings establish its *orthographic depth* which will be analysed in the following

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25 Cherokee is one of the most famous American Indian writing systems.

paragraph.

### **3.2 Orthographic depth hypothesis in alphabetic orthographic systems.**

The basic unit of alphabetical writing is not the letter but the grapheme which refers to the phoneme, the basic unit of the phonological system. Research on reading acquisition has shown that the ease of learning depends on the degree of transparency of the grapheme-phoneme correspondences (Inserm, 2007: 13). Compared to other writing systems, alphabetic writing systems are linguistically transparent and are easy to teach and reproduce because of the letter – sound relationships they imply. However, each alphabetic orthography can have a varying degree of transparency resulting from the consistency of their grapheme-phoneme mappings. As a matter of fact, the ease of reading acquisition supposedly depend on the degree of orthographic consistency between graphemes and phonemes, which varies across languages, some of them having a more transparent writing system than others.

Variations on the sound-letter correspondences and degree to which such variations occur in an alphabetic writing system reflects its orthographic depth among alphabetic writing systems. These variations may include: several-letter, complex graphemes for a single phoneme; words with the same orthographic roots; a large number of lexical items presenting different spellings for homophones, like in the words *pear*, *pair*, *pare*, all



pronounced /peəʳ/ in the English language.

More in general, *orthographic transparency* refers to the predictability of the pronunciation of words (their phonology) from their written forms (orthography) (Brunswick *et al.*,2010)<sup>26</sup> With regard to this property, languages are usually divided into *deep* (or opaque) orthographies, and *shallow* (or transparent) orthographies. A deep orthography will therefore refer to a language whose orthography is largely inconsistent with its phonic representation and reveals little about its pronunciation, whereas in a shallow orthography graphemes and phonemes supposedly have a nearly one-to-one relationship.

Orthographies with a high grapheme-to-phoneme correspondence – therefore highly transparent - include those of many East European languages, such as: Albanian, Bosnian, Bulgarian, Croatian, Czech, Estonian, Hungarian, Macedonian, Polish, Romanian and Serbian. Other examples of transparent orthographies are Armenian, Dutch, Korean, Kurdish, Sanskrit, Somali and Turkish. Among European languages, however, the most quoted among transparent orthographies are Finnish, Spanish and Italian. In Italian, for example, each of the five vowels has only one orthographic rendition, while consonants have only one graphemic rendition and vice versa, except for a few consonants and affricates.

A recent cross-linguistic comparison among different European orthographies (Seymour *et al.*, 2003), has confirmed that in languages with

<sup>26</sup> in *Reading and Dyslexia in different Orthographies*.

shallow (transparent) orthographies, children become accurate and fluent both in reading simple words and pseudo-words by the end of the first Grade, differently from children who must learn to read in deep (opaque) orthographies such as French, Danish and particularly English.

The difference between a 'deep' orthography like English and a 'shallow' one like Italian has been also documented by Paulesu *et al* (2000) using a PET study<sup>27</sup>. The study presented 'behavioral and anatomical evidence for a multi-component reading system in which different components are differentially weighted depending on culture specific demands of orthography'. According to this study, Italian orthography is consistent because it enables reliable conversion of graphemes to phonemes 'to yield correct pronunciation of the word'. English orthography, on the other hand, is inconsistent, complicating mapping of letters to word sounds. Behavioral studies showed that Italian students are much faster in word and non-word reading than English students. Italians also showed greater activation in left superior temporal regions associated with phoneme processing. On the other hand, English readers showed greater activations, particularly for non- words, in left posterior inferior temporal gyrus, areas associated with word retrieval during both reading and naming tasks (Paulesu *et al.*, 2000)<sup>28</sup>.

The development of phonological awareness will therefore be greatly

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<sup>27</sup>PET is an abbreviation for *positron emission tomography*. A PET scan uses radiation, or nuclear medicine imaging, to produce three-dimensional, color images of the functional processes within the human body. PET scans can be used to diagnose a health condition, as well as for finding out how an existing condition is developing and if its treatment is effective.

<sup>28</sup> In *Nature Neuroscience*. January 2000, Volume 3, Number 1

influenced by the orthographic depth of a given language. As a consequence, the reading strategies that children develop for decoding will also show systematic differences across orthographies (Ziegler & Goswami, 2005; Goswami, 2010: 35)<sup>29</sup>. The degree of transparency of a given language has therefore clear effects on children's phonological development and reading acquisition, and thus it is closely related to the concept of the *grain size* of languages which will be later described in the following paragraphs.

### **3.3 Phonological development from a cross-linguistic perspective.**

Phonological skills are good predictors of reading abilities in both opaque (deep) and transparent (shallow) orthographies. Prior to the teaching of reading, phonological awareness develops as a natural part of language acquisition. However, only language specific factors explain why some words are more difficult to represent phonologically than others. Such factors can affect the development of phonological awareness as early as during the pre-school period. These factors may include the *language sonority profile*<sup>30</sup> and the *phonological neighborhood density*<sup>31</sup> (dense versus sparse neighborhood density). Children develop better phonological awareness of words in dense neighborhoods and retain words in dense neighborhoods

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29 in *Reading and Dyslexia in Different Orthographies*.

30 For example, French is a more sonorant language than English.

31 *Phonological neighborhood density* refers to the ratio of similar-sounding words in a given language. Dense phonological neighborhood apparently helps increase the child's mental lexicon. Phonological neighbourhood is established by similarities among sub-lexical units such as syllables, phonemes and most of all rhymes. It therefore plays a pivotal role in languages which require advanced rhyme awareness, like English (De Cara, Goswami, 2002).

better in phonological memory tasks.

The development of phonological awareness follows a hierarchical sequence across languages. Each syllable in a word in fact can be decomposed into onsets, rhymes and phonemes in a hierarchical fashion. As a consequence, the progression in phonological awareness in most languages apparently takes a similar uniform pathway from large to small phonemic units. The progression results as follows:

- *Syllabic awareness* develops by around age 3. Babies can distinguish syllables such as /ba/ and /ga/ within the first month of life. By the time they approach literacy stages, children have already mastered their syllabic awareness. In particular, compared to opaque orthographies, children learning to read in more transparent languages such as Italian, Turkish and Norwegian show similar proficiency with syllables.

- *Rhyme awareness* concerns rimes and word-onsets, and plays a crucial role in acquiring reading strategies in shallow and deep orthographies. It usually develops by around the age of 3-4 years. While rhyme awareness may become important in opaque languages such as English<sup>32</sup> during early stages of literacy (Goswami: 1991), in more transparent languages, rhyme awareness plays a pivotal role in achieving reading fluency and higher levels of orthographic skills during later stages of reading acquisition (Wimmer *et al.*, 1994). Rhyme awareness is a very important aspect of phonological

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32 For example, in words like /s/eat, /sw/eet, /str/eet, *eet* is their rhyme pattern. In a set of experimental studies, it has been shown that, especially in English, children, to a certain extent, spontaneously base their reading of new words on rhyme and word-onset-based analogies of known words.

awareness and contributes to the establishment of mental representations of written words by allowing connections of recurring grapheme clusters in written words with phonology. Moreover, the importance of rhyme awareness, especially in opaque orthographies, is demonstrated by the importance attributed to the teaching of *nursery rhymes* in English prior to schooling and during early stages of literacy. Moreover, onset-rime awareness, like syllabic awareness, appears to be universally present prior to children receiving instruction in literacy (Goswami, 2010)<sup>33</sup>.

- *Phonemic awareness* represents the most demanding task in phonological awareness as it implies the ability to recognise the smallest units or “grains”<sup>34</sup>. For this reason, it is usually developed in later stages, when basic reading skills are already mastered. Because of the varying degree of orthographic depth among languages, phonemic awareness can emerge at different ages, also depending on the language's syllabic structure, and morphemic complexity.

However, a recent study (Duncan: 2010)<sup>35</sup> suggests that 'rather than there being a universal large-to-small progression, learning paths in phonological development are shaped by native language, orthography and reading instruction. This means that each orthography entails a configuration which is language specific; in Italian, for example, the configuration will be of sound-to-letter mapping, as the grapheme-phoneme correspondence is

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33 In *Reading and Dyslexia in Different Orthographies*, 2010. p. 31

34 The term *grain* has been used by Usha Goswami (2010) to describe the smallest unit used during language processing. The size of the grain depends on the kind of orthography and is therefore language-specific.

35 In *Reading and Dyslexia in Different Orthographies*, 2010.

highly consistent; in English, instead, the configuration will be modified to larger units, and therefore, it will be based on word-to-meaning mapping. Learning to read in the different languages therefore implies a re-configuration that is not always easy to achieve. Transparency and orthographic complexity based on syllabic and morphemic structure also influences not only phonological development and the rate at which children learn to read but also accuracy and speed of reading.

Moreover, there exists a strong positive correlation between phonological skills in L1 and L2. With regard to reading disorders, core phonological processing impairments responsible for the specific reading disability in the native language may similarly impede the acquisition of foreign languages; in other words, the phonological deficit at the basis of reading disorders is believed to be transferred from L1 to L2. The cross-language transfer in fact involves phonemic awareness and is reflected in all languages acquired by a given child. Therefore, poor native language reading skills will generalise to poor reading in a foreign language, which in turn negatively influences listening and reading comprehension, oral expression, syntax, general knowledge and verbal memory (Nijakowska, 2010: 31-32).

### **3.4 The influence of syllabic structure on phonological development.**

As it has been previously mentioned, the development of phonological

awareness is strongly connected to the complexity, both phonological and orthographic, of a specific language. Among alphabetic orthographies, Romance languages and Germanic languages for example, present a large number of variations, for example in syllabic structure. Romance languages are usually characterised by simple open syllables (CV) with very few initial or final consonant clusters (such as *lista*, *spesa* in Italian). On the other hand, Germanic languages predominantly have numerous closed syllables (CVC), complex consonant clusters (like *throttled* in English or *du forschst*<sup>36</sup> in German), complex sounds that are not easily represented in an alphabetic script, and in general more complex letter combinations. Most of the differences between the phonological and orthographic structures of English, German, French and Spanish, are related to vowels, not consonants.

The differences regarding consonants between the four languages are not great compared to those of vowels. It is important though to take into account the phonological and orthographic structures of syllables, vowels and consonants in each language when we analyse how children develop their reading abilities, and most importantly, how orthographic complexity can determine the rate of reading acquisition in dyslexic children.

For many of the world languages, the most frequent syllable type, especially in transparent orthographies, is CV (C=consonant; V=vowel). However, in some languages, like English and German, syllable structure is more complex, even though in the German orthography there is a higher

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36 'You seek' in English

degree of consistency between phonemes and graphemes. In English, the most frequent syllable structure is CVC, although more complex types such as CCVC, CVCC, CCVCC are also frequent. Also, the complex orthographic and phonological structure of syllables in English and their unpredictable spelling - the forty phonemes existing in English can be spelt in 1120 ways - also explains why rhyme awareness become so important during encoding-decoding processes (Goswami: 2010)<sup>37</sup>.

It can be hypothesised that the development of phonological awareness should be easier in languages with a relatively simple syllabic structure (CV), such as Italian, Spanish, Turkish or Finnish. However, cross-language studies show more similarities than differences in the development of phonological awareness (Goswami: 2010)<sup>38</sup> because of the universal three-level development of phonological awareness, which proceeds, as it has been previously described, from a larger grain size – the syllable – to the grain size of onset-rime, to conclude with the smaller unit, that is the phoneme.

#### *Phonological and orthographic structure of consonant*

Most of the differences between the phonological and the orthographic structures of English, French, German and Spanish are related to vowels, not consonants. However, with regard to consonants, all four of these languages have similar inconsistencies with more than one pronunciation for one

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37 in *Reading and Dyslexia in Different Orthographies*, 2010. p. 26-27

38 *Ibid.* p. 27



grapheme or more than one spelling for one phoneme, some of which are context dependent (Sprenger-Charolles *et al*, 2006: 24). A spelling difficulty shared by English and French, for example, is that many written consonants are silent. In English, *kn*, *ps*, and *wr* when they are at the beginning of a word become /n/, /s/, and /r/ (as in *know*, *psychology*, and *write*); the grapheme *gh* is silent before *t* (as in *fight*) and at the end of a word (as in *high*).

Another particularity of English and French written consonants causing problems during the encoding process is that they can be doubled without clear phonological properties except in some cases. In both languages *ss* corresponds to /s/, whereas the intervocalic *s* corresponds to /z/ in French, not in English (Sprenger-Charolles *et al.*, 2006: 25). In French though, a double consonant can modify the pronunciation of a preceding *e*, like in *dette* /det/. Other examples include the letter *g* that can become /ʒ/ or /g/ in German, French or English and /g/ or /X/ in Spanish.

In conclusion, concerning consonants structure, grapheme-phoneme correspondences (GPC) and phoneme-grapheme correspondences (PGC) are more complex in English than in other alphabetic languages. The differences between the four languages for consonants, however, are not as great as for vowels.

### *Phonological and orthographic structure of vowels*

The reading of vowels in English causes major problems, in comparison to

other orthographies. In Spanish, the five monophthongs are easily represented by the letters *a*, *e*, *i*, *o* and *u*; the same is in Italian. In German, the 14 monophthongs are grouped into pairs (/a/a/, /e/ɛ/, /i/I/, /o/O/, /y/Y/, /u/U/, /ø/œ/). The spelling of French vowels, instead, is characterised by a high number of digraphs and by the presence of allographs (for example, *o* also spelt *au*, *eau*...). Apart from few exceptions (*e* and *en*), the French vocalic graphemes, however, mainly correspond to only one phoneme (Catach, 1980; Véronis, 1986). Therefore, grapheme-phoneme correspondences are highly predictable in French (Sprenger-Charolles *et al*, 2006: 2) while phoneme-grapheme correspondences are more difficult to encode because many alternative spellings can exist for a particular vocalic phoneme.

When we analyse English vowels in syllables, we must also take into account the consonants that follow, the number of syllables in a particular word, and word stress. For example, in one-syllable words, short vowel GPCs (grapheme-phoneme correspondences) present few exceptions and can be read quite easily, if one knows that they cannot be found at the end of a word, that they are followed by a non-silent consonant, and that the post-vocalic *r* influences the pronunciation of some of the preceding vowels. Long vowels spelling is instead more complex because they can have different spellings; /i:/ for example can be spelt in different ways: *thEme*, *machIne*, *nIEce*, *cAEsar*, *sEE*, *etc.*

In addition, word stress pattern plays a pivotal role in syllabic – but also vocalic – structure. In English, German, and Spanish, words have some

degree of phonetic independence, since every full word has its own stress pattern (Sprenger-Charolles et al., 2006: 27). Also, word stress can be more variable in some languages than it is in others. English, for example, has a greatly variable word stress pattern making vowels reading harder. Word stress, in fact, affects vowels phonetic rendition – the *schwa*<sup>39</sup> sound often replacing vowels in unstressed positions in words, like in *worker* /'wɜ:kəʀ/ or *general* /'dʒenəʀəl/, or in unstressed vowels in connected speech, like in *does he ever listen?* /dəzhi:vərlɪsən/.

Opaque languages such as French and even more so English, all presenting deep orthographies, are perfect examples of how complex phonological and orthographic structure of syllables, as well as consonants and vowels, can influence phonological awareness. The differences in rates of reading acquisition therefore results from orthographic variations. Children whose native language has a transparent orthography (Italian, Spanish, Finnish Welsh etc.) perform better on phonemic awareness tasks, and learn to read more quickly. As a consequence, it goes without saying that children already presenting a phonological deficit will encounter even more difficulties in the development of reading skills in deep orthographies. This may be at the basis of the discrepancies between estimations of dyslexic children in different

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39 The *schwa* [ə] represents the sound of a neutral vowel and is the most common sound of the English language. This neutral vowel is also found in German and French, but it usually finds its graphemic correspondence exclusively in the letter *e*, whereas in English most vowels – over 50% of the vowels in connected speech (Delattre, 1965) - take this neutral sound in unstressed position. The variety of graphemic representations of this vocalic sound therefore adds to the complexity of English vocalic and syllabic structure.

linguistic realities.

### **3.5 The psycholinguistic grain size theory and the different reading acquisition strategies across languages.**

Orthographies are visual codes for the spoken language and when we read, the brain establishes links between the visual form of a word and its spoken sound. These links can have a holistic approach – they are formed at the whole-word level, or can take into consideration smaller units (smaller grain sizes) at a sub-lexical level. In all languages, however, beginning readers are faced with three problems. The first problem is *availability* as not all phonological units are consciously (explicitly) accessible to children prior to reading instruction. Another problem, as it has been previously described, is related to *consistency*, since some orthographic units can have multiple pronunciations while some phonological units can have multiple spellings. The last problem is *granularity* which regards the variety of orthographic units that must be learnt when access to the phonological system is based on bigger grain sizes as opposed to smaller grain sizes.

The efficiency with which these problems can be solved seems to vary across languages, and should predict reading acquisition across languages (Ziegler *et al.*, 2005). Readers of different European languages (all using the alphabet) show remarkable differences in the speed with which they acquire their reading and writing skills. In transparent orthographies such as Italian or

Spanish, there are one-to-one mappings between graphemes and phonemes. This implies that children are able to develop phonological skills much faster than children whose language presents a high degree of inconsistency between graphemes and phonemes.

The concept of the grain size of processing units in languages predominantly highlights the differences among different languages' rate of reading acquisition (Sprenger-Charolles *et al.*, 2006: 176) and is useful to analyse what is children's response in each linguistic context. Transparent orthographies are usually characterised by small grains consisting of small units such as phonemes or simple syllables (la/ba/ga); complex orthographies are instead characterised by larger grains which can consist in onsets or rimes or even bigger orthographic units.

Being a grain size the psycholinguistic unit of a given orthography, it is the tenet around which reading strategies are developed. It is important, however, to be aware that inconsistency does not affect all psycholinguistic units (grains) to a similar extent. For example, smaller grain sizes tend to be more inconsistent than larger grain sizes, at least in English (Treiman, Mullennix, Bijeljac-Babic, Richmond-Welty, 1995). This explains why in English, like in all other opaque languages, children tend to develop a reading strategy that is based on larger grains (using the so-called lexical route) rather than relying on a reading strategy based on smaller grains (sub-lexical route).

It follows that the rate at which children acquire reading skills vary

according to the grain size of the language. Therefore, reading instruction in alphabetic orthographies must take into account the grain size problem. English children tend to encounter more problems in this task and as a consequence, they achieve reading fluency and accuracy much later than readers of more consistent languages (Goswami, 2010)<sup>40</sup>. For this reason, they need a direct teaching of reading from the age of 5 years which begins with a phoneme-based strategy<sup>41</sup>.

The grain size theory, however, takes into account alphabetic writing systems only, leaving room to the dangers of a purely alphabetic-centric perspective (Sprenger-Charolles, 2006: 85). In non-alphabetic orthographies (e.g., Chinese) children have no choice but to learn the large number of characters (logographic units) by rote, instead of smaller orthographic units, and this can take even 5 years (Ziegler, Goswami, 2005)<sup>42</sup>.

All in all, it appears that at least three factors related to the concept of grains size are crucial for explaining the cross-language differences in reading acquisition. These include the *consistency* of spelling-to-sound relations, the *granularity* (the variety of grains size) of orthographic and phonological representations, and, finally, teaching methods that must conform to the children's needs in relationship with the level of orthographic complexity.

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40 in *Reading and Dyslexia in Different Orthographies*. Hove: Psychology Press, 2010. pp. 23-42.

41 In England, the Department for Education and Employment (1998), has formalized a *National Literacy Strategy* which has brought forward the teaching of reading from the age of 5 years. Nevertheless, English children learn to read more slowly than children from other countries, who although beginning formal education later (at 7-8 years), they reach higher levels of accuracy much sooner. (Ziegler, Goswami, 2005)

42in *Psychological Bulletin*, vol. 131, No.1, 3-29. American Psychological Association, 2005

### 3.6 Sub-lexical and lexical reading strategies in alphabetic orthographies

As it has been previously described, children develop an awareness of the larger grains of words first (for example syllables and rhymes) and then progressively of smaller grains (i.e. phonemes and individual letter sounds). Depending on the language's orthography, they can proceed from *holistic*<sup>43</sup> to *detailed* analytical phonological processing, which means from an implicit to explicit phonological understanding. A holistic reading strategy is based on the processing of lexical units (via a lexical route), and will be more likely to be applied to deep orthographies, where word processing is based on larger units (for example rimes and onsets in English). It also relies predominantly on lexical memory to identify words. On the other hand, the analytical phonological reading strategy is centred on smaller sub-lexical units, especially with grapheme-phoneme correspondences (Sprenger-Charolles, 2006:30) and it is frequent among readers of more transparent, shallow orthographies, such as Italian or Finnish.

The reading of unknown words (pseudowords) is mainly used to assess the efficiency of the sub-lexical reading route - both in opaque and shallow orthographies, which in turn depends on the degree to which the writing system represents the spoken language it encodes (the efficiency of the sub-lexical reading route will therefore be language specific). It derives that according to the degree of transparency, children acquire reading strategies

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43 A holistic phonological understanding takes into account lexical items as a whole

that takes into account different sizes of units, therefore conforming their reading skills to the phonotactics of a given language. Phonotactic rules govern the sequences of phonemes used to make words in a particular language and, thanks to prosodic cues<sup>44</sup>, phonotactic learning contributes to the development of reading abilities, especially in deep orthographies, where children are more likely to use holistic reading strategies.

Initially, the orthographic depth hypothesis suggested that readers of transparent orthographies such as Spanish or Italian rely primarily on sub-lexical phonological recoding to read words, while readers of opaque languages such as Danish or English are much more likely to use whole-word lexical strategies. However, recent research findings challenge this assumption by showing that all readers, irrespective of orthography, tend to use – in different proportions - a combination of lexical and sub-lexical processing strategies.

### **3.7 Orthographic depth and developmental dyslexia**

Orthographic depth therefore appears to deeply influence the course of reading acquisition in children. Children with a phonological deficit seem to face even greater difficulties in acquiring compensatory reading strategies, especially in languages with a high degree of inconsistency in their graphemes-phonemes correspondences. As a matter of fact, the symptoms

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<sup>44</sup> *Prosodic cues*: various acoustic properties of speech such as tone, pitch, accent, etc. (collectively known as prosody), which all provide non-verbal cues to help the listener identify the meaning of an utterance.



and aetiology of dyslexia vary as a result of differences between orthographies. In particular, the deficiency in the sub-lexical reading route is more severe when the children are confronted with deep orthographies, whereas in transparent orthographies the deficiency in the sub-lexical reading procedure is mainly observed in processing speed, and not in accuracy score (Inserm, 2007: 23)<sup>45</sup>.

Although the context may induce compensatory strategies to identify written words, a phonological deficit in the sub-lexical route still causes major problems in those orthographies (e.g. English) that imply a greater use of the lexical route. This is because, as shown in some studies (Inserm: 2007, 23) the setup of the lexical procedure depends on the efficiency of the sub-lexical reading procedure, hence the reason why the deficit of the sub-lexical decoding ability is generally reckoned to be more severe than the deficit of the lexical reading procedure. Moreover, when grapheme-phoneme correspondences are transparent, deficits in phonemic awareness are only found in the very beginning of reading acquisition whereas in deeper orthographies dyslexics do less well on phonological tasks when they cannot rely on their lexical knowledge, i.e when the tasks involve pseudo-words or rare words (Sprenger-Charolles *et al.*, 2006: 136).

Developmental dyslexia affects children differently, not only for the varying nature of the phonological deficit, but also in relationship with the specific kind of orthographic system they are learning. Hence why any

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<sup>45</sup> Inserm (Institut National de la Santé et de la Recherche Médicale). *Dyslexia Dysorthography Dyscalculia. Review of Scientific Data.*

analysis on the onset of specific kinds of developmental dyslexia and their course must take into account the degree of transparency of the language involved as well as its orthographic depth.

*Phonological dyslexia* (chapter 2) affects the sub-lexical reading route and is associated with a deficiency in short-term memory. Children with this kind of dyslexia will struggle particularly in languages whose orthographies are largely transparent, precisely because these will entail the mastering of skills in decoding sub-lexical units. On the other hand, *surface dyslexia* (chapter 2) affects the lexical route, and is often associated with an even more severe form of dysorthography and lack of memory of words' written form. Children affected by this kind of dyslexia will encounter more difficulties in decoding languages with opaque orthographic systems as their deficit involves the use of the lexical reading route which is a prerequisite condition to be able to process larger units (grains).

It derives that the acquisition of the alphabetic principle, essential for the development of adequate reading strategies, will be generally more problematic in languages with opaque orthographies, especially for children suffering from surface dyslexia. However, if due attention is paid to the dynamics of the specific kinds of dyslexia with regard to a given language orthographic depth, compensatory strategies may be employed to ease the acquisition of sufficient reading strategies. For this reason, the influence of instructional methods on the cross-linguistic manifestations of dyslexia must not be overlooked.

The majority of languages with shallow, transparent and consistent orthographies are taught using highly structured phonics methods that explicitly teach letter-sound mappings and consonant-vowel (CV) syllables that can be combined into familiar words. Thanks to the high reliability of the mappings, this kind of teaching method is extremely effective because learners receive positive feedback throughout the learning process (Goulandris, 2003) and can be encouraging even for children presenting a phonological deficit. Opaque orthographies instead will require the teaching of reading strategies based on larger phonological units in order to provide children with adequate measures to master the holistic reading route.

However, tests have showed that while poor readers may encounter greater difficulties with less consistent and more complex orthographies, these difficulties can at least be partially overcome by adequate teaching strategies which focus on intensive phonics instruction (McDougall *et al.*, 2010).

### **3.8 Developmental dyslexia in alphabetic and non-alphabetic orthographies.**

As it has been described in the previous paragraphs, the grain size theory can only be applied to orthographies based on an alphabetic script and as a consequence, the onset and etiology of developmental dyslexia will have a different course, in comparison with non-alphabetic orthographies. With

regard to logographic languages, (e.g. Chinese), some issues arise as to whether the same reading system and brain areas are used in this writing system as in alphabetic systems. Can *grains* still be considered as basic units when we deal with logographic writing systems such as Chinese?

In Chinese, the basic units are not sounds of speech, but meaning units and this entails a huge set of symbols. Skilled readers in Chinese will face huge demands on visual and sensori-motor memory. Due to the semantic and phonetic traits embedded in each logogram, reading Chinese implies high standards for total accuracy which means that readers must remember the exact sound and meaning of the whole character in order to reproduce the exact form of the character. Moreover, all Chinese children learn *pinyin*<sup>46</sup> for the first eight weeks of literacy instruction before they are introduced to Chinese characters. It derives, that learning Chinese can be highly demanding, especially for children with a phonological deficit both in the lexical and sub-lexical route.

Incidence of dyslexia depends upon a combination of the degree of granularity (grain size theory) and the transparency of the language orthography. The balance from the two elements (granularity and transparency) is also likely to be different for the reading of logographic scripts such as Chinese, especially because in these kinds of languages the sheer complexity of the mappings required between language and

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<sup>46</sup> *Pinyin* is an alphabetic writing system, especially used in mainland China, which uses alphabetic symbols to denote the “initial” and “final” in Chinese syllables. Initials are usually single consonants (there are no consonant clusters in Chinese), and finals are usually vowels (plus a few nasals). Given the simple syllabic structure of Chinese, *pinyin* is therefore a system for coding onsets and rimes (Ziegler, Goswami, 2005).

orthography is bewildering (Brunswick *et al.*, 2010). However, while there are similarities between dyslexia in Chinese and in alphabetic languages, the difficulties experienced by these two groups of dyslexic readers cannot be identical because the orthographies are so different.

Moreover, neuroimaging studies of skilled reading and dyslexia across languages show that several areas of the brain support reading. This multi-component reading system appears to be similar across languages although the extent to which different brain areas are implicated depends on the transparency of the orthography (Paulesu, Brunswick & Paganelli, 2010)<sup>47</sup>. For example, a study on Italian and English readers (Paulesu *et al.*, 2000) has revealed that Italian readers showed greater activation of the areas of the left hemisphere which are involved in phonological processing. English readers, instead, showed greater activation of areas associated with word retrieval during reading and naming, therefore proving that readers of opaque orthographies tend to apply holistic (lexical) reading strategies, while readers of more transparent languages such as Italian use sub-lexical strategies to process words.

Findings from a number of studies have provided encouraging results which reveal that improved reading performance produces in any case an increased activation of brain areas associated with reading. This explains why intense phonics instruction is usually suggested in children with reading impairments across languages.

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<sup>47</sup> in *Reading and Dyslexia in Different Orthographies*, 2010.

## **Summary**

This chapter has highlighted the main differences among alphabetic and non-alphabetic orthographies and what criteria are used to establish the level of difficulty in reading acquisition:

**1. *The consistency problem.*** The consistency problem comes from the multiple pronunciations of some orthographic units and the multiple spellings of some phonological units. The level of inconsistency varies across languages and across different types of orthographic units.

**2. *The granularity problem*** is based on the psycholinguistic grain size theory and refers to the size of the processing unit. According to the *orthographic depth* of a given language, there seems to be many differences in the cost of learning to read using small versus large units (grains). The use of small number of graphemes and their corresponding phonemes gives children the opportunity to gain access to thousands of words they have heard but have never seen before. The problem is that there are many more orthographic units to learn when access to the phonological system is based on larger grain sizes as opposed to smaller ones.

**3. *The lexical and sub-lexical reading route.*** The main characteristic of all writing systems, except Chinese, is that two reading strategies can be used to grasp written words: a *lexical reading route* (which relies on a large set of meaningful units), and a *sub-lexical reading route* (which relies on a small

set of meaningless units).

**4. Orthographic depth and its influence on developmental dyslexia.** The different kind of dyslexia may have a different development, depending on the language orthographic depth and complexity, especially with regard to the specific phonological deficit affecting children. As a consequence, compensatory teaching strategies will vary in deep or shallow orthographies.

## Chapter 4

# Foreign Language Teaching Methods for Reading-Impaired Children

Linguistic instruction is likely to be a less pleasurable experience for children with a phonological deficit, whether it will be a matter of learning to read and write in their native language or even more so in a foreign language. However, this prejudice has led too many schools and institutions to unfairly exclude students with language disorders from foreign language activities, without taking into account the psychological as well as the emotional implications that this would imply. Fortunately, in the light of recent research findings, educators and school teachers can access a wider number of teaching resources that better suit the needs of dyslexic children, making foreign language learning a more enjoyable, gratifying experience. Before proceeding to an analysis of the dynamics involved in foreign language teaching and learning in children with specific learning disorders, let us start



with a few considerations on mainstream theories on foreign language acquisition and teaching methods, and their relevance in teaching languages to language- and reading-impaired children.

#### **4.1 Krashen's *Second Language Acquisition* theory and the communicative approach.**

Among the existing theories on foreign language acquisition, the most influential one is Krashen's "Second Language Acquisition Theory", which was elaborated during the 1980's and that combines Noam Chomsky's nativist theory with psychological theories on the role of emotional and motivational aspects in the learning process (Daloiso, 2011). The Second Language Acquisition theory is based on five hypothesis which are at the centre of current foreign language teaching approaches and methods.

a. The language *acquisition* versus language *learning* hypothesis on foreign language learning process, the former being an implicit process of the native language acquisition, typical of children before they enter formal education, the latter being an explicit language learning process, which develops during formal education. Foreign language *learning* involves more advanced competences, such as meta-linguistic abilities, which are practiced with the help of a teacher, especially during early years of primary school. The main distinction between the two language learning processes is that the first leads to a natural, pragmatic use of the language, while thanks to the

second process, students can achieve an analytical, formal knowledge of the phonological, orthographic and grammar rules of the language.

b. The *monitor* hypothesis. The foreign language learning process involves a monitoring mechanism which has the function of checking on the accuracy and communicative effectiveness of linguistic utterances. This monitoring mechanism will be applied especially during language *learning* stages. Its use won't be needed when the language is *acquired*, because the student will be able to fluently and accurately convey messages without monitoring the language.

c. Hypothesis on the *natural order* of language acquisition. According to this hypothesis there exists a predetermined order in the acquisition of a language morphology and syntax which cannot be subverted (Daloiso, 2011).

d. The *input* hypothesis. According to this theory, language acquisition is only possible when the student receive intelligible linguistic inputs, that are given in a  $i+1$  sequence which means that the last input must imply a slightly higher degree of linguistic competence – in other words, it must be linguistically speaking more demanding than the previous one, with respect to the natural order principle of language acquisition.

e. The *emotional filter* hypothesis. In order for the natural language acquisition process to take place, a prerequisite condition is a favourable emotional situation. Any stress or anxiety occurring during the learning process due to internal or external causes may provoke in the student the establishment of an emotional barrier which works as a mechanism of self-

defense against situations that are somehow perceived as dangerous or hazardous (Daloiso, 2011). This mechanism severely compromises language acquisition as well as language-related information retrieval. For this reason, it is of paramount importance that the teacher makes the language acquisition and language learning process as enjoyable and relaxed an experience as possible.

These assumptions on the language acquisition and language learning processes have been developed on the basis of the *communicative teaching approach*. This kind of approach predominantly emphasises the pragmatic functions of foreign language acquisition and foreign language learning, therefore producing teaching strategies that excluded more formal instruction. In the foreign language classroom, the communicative approach therefore comes in the form of intensive pragmatic activities, which are student-oriented, and see the actual use of the language and its communicative purpose as the ultimate experience of the learning process. In other words, the foreign language becomes “the environment” in which the student learn by practicing his language skills. In this sense the student is responsible for the success of his learning process. However, one can easily understand that a merely communicative approach, although appearing enjoyable and rather useful for the average student, can imply a lot of stress and anxiety especially in the language- or reading-impaired student.

As a matter of fact, during the last decades this approach has been revised, offering more balanced teaching strategies that combine formal

linguistic knowledge with language communicative pragmatic purposes, conceiving foreign language learning as a process which enhances communication skills in a foreign language as well as behavioural, formative skills, such as cognitive, cultural, inter-relational and semiotic, extra-linguistic abilities.

With regard to the case of specific learning disorders, it derives that a teaching approach which exclusively takes into account the pragmatic, communicative function of foreign language learning cannot suit the needs of language-impaired and reading-impaired children, as it would immediately cause a perception of one's own deficit and limits, worsened by a loss of self-esteem and the establishment of an emotional filter which will be hardly removed in later stages of literacy. In the communicative approach, the aspect of inferring meaning from the context is highlighted, while the direct teaching of sound, sound-symbol and grammatical rule system is de-emphasised (Nijakowska, 2010). This also explains why a merely communicative approach cannot meet the needs of children with learning difficulties, who instead require early direct and explicit instruction in the phonemic and orthographic (sound-symbol) systems of a foreign language as well as increased exposure to print.

As we have seen, Krashen's theory on second-language acquisition seems to add a much more psychological dimension to the communicative approach in that it does not merely analyse input and output processes involved in language acquisition; his theory provides a range of hypothesis

which aims to consider not only the language acquisition process alone, but also the student as the subject of the learning process. When dealing with students affected by specific learning disorders, the hypotheses offered by Krashen's theory assume even greater relevance. How do reading-impaired children activate their Language Acquisition Device<sup>48</sup> when their *device* is highly “unreliable”? And to what extent can their learning strategy be supported by Krashen's principles? Let us go through Krashen's key notions on second-language acquisition that were mentioned at the beginning of the paragraph and let us analyse them in the light of what has been described in the previous chapters about dyslexic children's difficulties in foreign language learning.

a. with regard to the language *acquisition* and language *learning* hypothesis, it clearly appears that for dyslexic children with a phonological deficit, the processes involved in foreign language learning become more demanding since they cannot entirely rely on their “imperfect” linguistic skills acquired during early stages of literacy; instead, they will need to receive more analytical and metalinguistic instruction. For this reason, regarding the first hypothesis in Krashen's theory on second-language acquisition, it is possible to argue that when referring to dyslexic children, the language process that they are more likely to activate since the very beginning of literacy stages is the language *learning* process. This process will be for them even more demanding than for other children as it involves

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48 According to Chomsky's nativist theory, the LAD (Language Acquisition Device) is an innate capacity which enables infants to instinctively produce language.

more analytical competences, such as meta-linguistic abilities as well as continuous monitoring activities from the very beginning of their learning experience.

b. If the *monitor* hypothesis is true for the average student who is learning a foreign language, especially during early language learning stages, it follows that the dyslexic student will have an even greater need to continuously monitor language processing mechanisms and their output. This kind of activity entails a high degree of stress by the student. It will be therefore important to train students in activities implying explicit phonological tasks, such as grapheme/phoneme conversions, in order to reach a satisfying level of *automatism* which will allow them to reduce overly activated monitoring mechanisms.

c. The hypothesis on the *natural order* of language acquisition which supports the idea of a predetermined order in the acquisition of a language morphology and therefore phonology as well as syntax, which cannot be altered. Although this can be true for human beings in general, this hypothesis is challenged by the way language-impaired and dyslexic children actually acquire language (or it would perhaps be more accurate to say how they “incorrectly” acquire language) whether it is their native language or a foreign language they are dealing with. As it has been described in the previous chapters, there are many theories on the origins of dyslexia and on the possible deficits at the basis of this learning disorder. As a consequence, given the diversity of the existing language and reading impairments, it is

difficult to establish how the *natural order* of language acquisition is subverted in these children.

d. The *input hypothesis* implies that in order to attain language acquisition, linguistic inputs should be provided in a  $i+1$  sequence, the last input supposed to be linguistically more challenging than the previous one. This can work as an incentive to progressively become more proficient in the foreign language. However, dyslexic students who are already struggling to compensate for their supposed phonological deficit are likely to find a more demanding input more frustrating rather than challenging. Their progression in language skills acquisition will therefore be much slower, and will need extra effort to firstly consolidate basic language skills before venturing into more difficult activities. Exposure to more demanding inputs will highlight their language deficit, causing anxiety which generates from the incapability of performing well in more difficult language tasks or of processing less readily intelligible linguistic inputs. Moreover, linguistic inputs should always be presented in a simplified, straightforward way as to facilitate the learning process, and in the specific case of phonological tasks, inputs should be provided in a way which conforms to the degree of *orthographic transparency* of a given language (Goswami's *psycholinguistic grain size theory*, chapter 3).

e. The *emotional filter* hypothesis assumes considerable significance when dealing with language- and reading-impaired children. As it was described at the beginning of the paragraph, the emotional filter may function as a barrier

to spontaneous language acquisition for language- and reading-*unimpaired* students in situations that are somehow perceived as dangerous or that cause emotional stress to the student. It derives that the emotional filter is even more likely to be activated by students with language or reading disorders, who will normally try to avoid any language-related activity, especially during early stages of literacy, showing reluctance to learning and performing poorly in language activities. This attitude may appear as the result of a lack of attention or interest; in reality, it constitutes the evidence of an emotional barrier due to the student's perception of any language activity as a danger to their self-esteem, enhanced by the awareness of their linguistic deficit.

#### **4.2 Overcoming anxiety during foreign language learning: the role of ludic activities for language- and reading-impaired children.**

As we have seen, anxiety is one of the major problems of all foreign language students. Providing them with adequate instruments that can help overcome anxiety during language-related performances is not an easy task, and it is even harder especially when dealing with language-impaired and reading-impaired students. As it has been described in the first chapter of this work, feelings of anxiety as well as frustration especially affect foreign language acquisition in students with specific learning disorders, precisely because it enhances the already negative effect of the *emotional filter* (Krashen, 1982) activated by the learner in anxiety-provoking situations.



With regard to the foreign language learning context, a special kind of *language anxiety* (Piechurska-Kuciel, 2008) has been identified as a form of *trait anxiety* that is linked to particularly stressful activities like test taking or public speaking situations. It goes without saying that in the language- or reading-impaired child this kind of anxiety will be overwhelming, further worsening the learning process due to a general unwillingness to perform in a foreign language as well as interfering with the student's cognitive performance in language processing. Anxiety in the language- and reading-impaired child can therefore drastically compromise all levels of the language learning process (input, processing, and output stages). For this reason, a *ludic foreign teaching approach* that diminishes the level of anxiety during class activities plays a pivotal role in making the language learning process as enjoyable an experience as possible.

It is in this perspective that foreign language teaching and a ludic teaching approach can both converge in a teaching method which focuses on the emotional as well as educational value of the learning experience, especially in language- and reading-impaired children. A teaching approach that stimulates a *multi-sensory learning process* without causing anxiety, which therefore means without inhibiting linguistic, cognitive and relational abilities, is the realization of what is generally referred to as the *ludic foreign language teaching method* (Freddi, 1990). A playful atmosphere with game-based learning activities is the answer to the needs of children with specific learning disorders, and should be the benchmark of any language-activity

during early stages of literacy. Game-based language activities carried out in a cooperative manner are seen as the basis of a successful, enjoyable language learning experience (Caon, Rutka, 2004) which aims to overcome student's anxiety. A *ludic foreign language teaching method* will therefore realise the following principles (Freddi, 1990):

<i>multisensoriality</i>	Children must be able to use all senses while learning a new language in order to create stable mental and neurological representations
<i>motility</i>	Language is a pragmatic, functional means of communication which can be associated with heterogeneous kinds of movements. A ludic approach must therefore include a relevant space to the motility dimension. This principle is also applied in what is generally referred to as the <i>Total Physical Response</i> (Asher, 1969) which is the realisation of the functional purpose of language communication of making someone “do something”
<i>Semiotic function</i>	The foreign language is a verbal code, which is just one of the many codes available to the student. Therefore it must be integrated with them
<i>Interrelational function</i>	A playful language activity should encourage students' interpersonal skills
<i>Pragmatic function</i>	The functional purpose of a language is “to make someone do something”. In the ludic approach, children should be able to use the foreign language to play a game
<i>Emotional function</i>	Language games must be associated with positive emotions
<i>Authenticity</i>	A game is altogether an authentic communicative situation

Anxiety is usually caused by a fear of failing to carry out specific language-related activities which can lower students' self-esteem while activating the emotional filter that functions as a barrier to the learning process. Hence the reason why a constant *positive feedback* will be vital for the student as it can increase or at least maintain a high, profound *motivation* (Titone, 1973) while promoting language acquisition through a general feeling of fulfillment, even in simple language activities. In the ludic teaching method, motivation derives from *the will to find enjoyment* in the game activity itself. This strong self-motivation leads to a spontaneous formulation of learning strategies which will ease the language acquisition process while reducing the level of anxiety.

Krashen (1983) explained the realisation of this learning strategy through what he called *the rule of forgetting*, which he added to the five hypothesis on second language acquisition. According to this *rule* one can only learn when he/she actually forgets about having to learn another language and concentrates on the pragmatic contents while trying to transfer meaning (which is the purpose of the communicative event). However, typical playful activities such as *role play* or *memorisation* of nursery rhymes as well as *dramatization* of short stories that are usually perceived by children as enjoyable activities are instead very difficult, if not impossible, to be performed by children with a phonological deficit. The anxiety that they

will associate with this kind of language games will be overwhelming and will make them reluctant to any language game which will implicitly highlight their phonological deficit. However, this does not mean that they should be excluded from playful language activities; on the contrary, if *the rule of forgetting* is applied to foreign language teaching to language- and reading-impaired children, one should be able to structure ludic activities that avoid emotionally stressful situations and unnecessary strains while still putting the student at the centre of the language learning process.

The language- and reading-impaired children will always show unenthusiastic attitude towards language activities, because they are aware of their disadvantage when they relate to their classmates. It is therefore important to keep their enthusiasm and motivation high through simplified language games which imply a multi-sensory approach, only apparently relegating merely phonological activities to a minor role. A ludic foreign language teaching method based on experience acquired through all senses supports the *learning by doing* approach which focuses on activities involving manual dexterity, motility and pragmatic realisations through the use of all senses, in order to gradually arrive to a more abstract analysis of language.

Concerning ludic phonological activities, it is also interesting to examine how *songs* may help even the language- and reading- impaired child in their language learning process through the reiteration of linguistic inputs that are associated with positive feelings. The purpose of songs is to convey

emotions and messages through the combination of language and sounds. They are examples of authentic communication which are taken directly from reality. Especially when language-related activities are based on songs and mimicry as well as motility, they assume a greater degree of pragmatism that is fundamental for children during early stages of language acquisition

Moreover, songs improve memorisation abilities through the reiteration and repetition of same sounds, same lexical items as well as entire sentences, and the very same act of singing implies exercises on words enunciation which will highlight the prosody, the syllabic structures and sonority as well as rhyming patterns of the language in which the song is performed. Songs can also be repeated as many times as children need, and they may be presented after propaedeutic activities which provide children with most lexical items that they can later hear in the song. This kind of activity seems to support Krashen's theory (1983), *the din in the head*, which sees the involuntary repetition of sounds, words and syntactic structures as resulting from stimulations of the Language Acquisition Device (LAD), presumably activated after children have received continuous reiteration of the same linguistic inputs contained in the song. Since it represents authentic linguistic material within an enjoyable activity, a song can easily feature Krashen's *rule of forgetting*, which fosters the actual activation of the learning process while happily singing a song, and therefore “forgetting about learning”.

Song-based activities are important not only because they can make

language activities a more pleasurable experience, but also because they can encourage cooperative learning which is so important during early stages of school education. Children, in fact, tend to learn from one another, and especially the ones affected by language or reading impairments can find comfort in letting themselves be guided by their classmates during song-based language activities. Let us not forget though, that songs are most of all multi-sensory and polysemous stimuli (Caon, 2010) that can be analysed in a meta-cognitive approach at different levels, from its more pragmatic function - to convey a message through its semantic contents - to its merely linguistic aspects (syllabic structure, rhyming patterns, word stress, etc.) as well as its cultural reference.

Song-based activities involving all senses can therefore be an example of ludic activities that can be performed during class activities or that can be subsequently reproduced in independent self-directed learning activities, outside the school environment.

#### **4.3 The role of the experiential teaching method in the foreign language classroom**

Experiential learning in the foreign language classroom is defined by the inclusion of phases of reflection designed to help the learner relate a current learning experience to past and future experience (Knutson, 2003). In other words, it represents the empirical realization of the communicative-

formative approach within foreign language education and somehow resumes the old Confucian motto, today so cherished by foreign language teaching scholars (Balboni, 2008; Knutson, 2003):

*'I hear and I forget, I see and I remember, I do and I understand'*  
(Confucius)

The foreign language experiential method places the educational *experience* at the centre of the foreign language learning and acquisition process. The student therefore learns through perception, observation, action and interaction with others thanks to experiential inputs that must guarantee *continuity* with past, present and future experiences, developmental *progression* of experiences, and a *positive interaction* with the surrounding environment, and should aim to combine linguistic knowledge with extra-linguistic skills (Daloiso, 2009).

An experiential foreign language teaching method unites the centrality of the educational experience with the concept of the language as a “learning environment” which becomes a means for integrated educational activities in the native and foreign language, in order to achieve a global learning experience. In this perspective, a foreign language teacher who bases its teaching method on experiential learning, leaves the role of traditional teacher-as-expert, to take on the role of *facilitator*, guide and helper (Spruck-Wringley, 1998 in Knutson, 2003). Teaching strategies should therefore be built around the *experiential fields* involved in the learning process that

correspond to specific learning skills and abilities:

<b>Experiential fields</b>	<b>Abilities</b>
• <i>The Self and the Other</i>	Personal, interpersonal and cultural skills
• <i>The Body in Movement</i>	Sensory-motor skills
• <i>Languages, Creativity, Expression</i>	Semiotic Skills
• <i>Knowledge of the World</i>	Cognitive Skills
• <i>Speech and Words</i>	Language and communication skills

Especially during early literacy stages, the teaching of these skills are structured according to educational purposes respective of the age group they are referred to. They can be summarized as follows:

- |                           |  |
|---------------------------|--|
| • <i>Emotional goals</i>  | Learning a foreign language is a pleasurable experience                        |
| • <i>Cognitive goals</i>  | Knowledge of the world through a foreign language                              |
| • <i>Relational goals</i> | Development of a positive inter-relational skills towards others               |
| • <i>Semiotic goals</i>   | Awareness and knowledge of the different expressive codes (languages, body...) |
| • <i>Cultural goals</i>   | Development of own personality in relationship with other cultures.            |

(Daloiso, 2011)

With regard to experiential teaching techniques, the foreign language



facilitator plans activities in which, through collaboration on a project, students can use and manipulate language in a natural language environment. Thus, experiential learning in the foreign language classroom becomes an activity in which language learning is facilitated when students are cooperatively involved in working on a project or task that is realised in the following four phases:

<i>Exposure phase</i>	Activation of background knowledge, past experiences, and previous knowledge about the subject
<i>Participation phase</i>	The actual activity or experience, through a collaborative, holistic approach to language-learning
<i>Internalization phase</i>	The reflection on the experience that seeks to involve the emotions and identity of the learner
<i>Dissemination phase</i>	The transferring of the classroom experiences into the day-to-day contexts.

(Knutson, 2003)

The experiential teaching method aims to promote the student's self-esteem and self-realization through motivation, usually very low in the dyslexic child, as well as improving communicative skills in the foreign language which are instead challenged by the language processing deficit at the basis of the specific learning disorder. As we have seen in the previous paragraph, especially with students with language-related learning disorders, the facilitator must be extra careful to avoid all sorts of situations that may cause anxiety or frustration.

A learner-centred experiential teaching method, based on a *multi-*

*sensory learning by doing approach*, should always implicitly encourage, especially in the dyslexic children, the improvement of compensatory learning strategies through the use of preferred learning styles and natural learning preferences, using methods which they find most comfortable and therefore more enjoyable.

#### **4.4 Metacognition and the multi-sensory structured learning approach in foreign language study.**

##### *Metacognitive learning strategies*

In addition to the phonological deficit, dyslexic students struggle not only with the processing of oral or written language, but also they are not able to implicitly identify language patterns. Moreover, they have difficulties in storing and memorizing information due to poor short-term or working memory. A metacognitive teaching approach provide the student with compensatory learning strategies which allow a better performance thanks to a continuous monitoring of the language patterns. Metacognitive learning is therefore important in the foreign language classroom, especially for dyslexic students, because they can overcome their difficulties through a rewarding, enjoyable experience.

The purpose of metacognitive teaching is to put the learner's cognitive abilities at the centre of the learning process. In the foreign language classroom, this implies that teachers should encourage students to *observe* the

language dynamics. In other words, they involve them in 'metalinguistic thinking' (Schneider, Crombie, 2003), which includes the ability to identify a problem, be aware of potential strategies to solve it and choose the most appropriate one. It derives that the foreign language teacher will have to model a variety of metalinguistic strategies available to the students for effective self-reflection and self-correction on the part of the foreign language learner.

It is important though, especially during early literacy stages, that opportunities for the practice of metalinguistic strategies are provided in a non-threatening activity, preferably in a small group setting, without running the risk of increasing anxiety in the dyslexic student. This teaching strategy has many advantages, especially in the foreign language classroom. First of all, all students can profit because they acquire a higher degree of independence in their learning process, becoming more proficient at a much faster rate (Borokowski, 1992; Ganschow and Scheider, 1997; Mastropieri, Scruggs, 1991). With regard to dyslexic students, metalinguistic strategies are 'lifesavers' (Schneider, Crombie, 2003) because they make them more active in the foreign language classroom, providing them with explicit models and over-practice of language patterns. Moreover, a metalinguistic thinking allows dyslexic students to process the foreign language in multi-sensory ways thanks to the activation of their sensory receptiveness while compensating for their phonological, auditory or ocular deficits through their cognitive abilities.

In order to achieve this, the foreign language teacher will have to schedule activities for the learning process deriving from the linguistic input, through a number of steps that will lead to a correct (and therefore rewarding as well as motivating) response. For this reason, the teaching material must be adequately designed and made interesting to the student, and should come in the form of tidy, colourful visual inputs, like card sets or laminated sentence strips to work with vocabulary, grammar, pronunciation, morphology, and sentences.

Moreover, in order to enhance metalinguistic skills in the foreign language as well as memorisation and information retrieval, a number of studies (Sperber, 1989, for the German as foreign language, Mastropieri and Scruggs, 1991, for English, and Sparks and Miller for Spanish, 2000) have produced some successful teaching strategies, suggesting the use of sound clues, letter-shape clues, crazy stories, picture clues, acronyms, keywords, songs and sounds, gesture and motion clues and personalisations.

The role of the foreign language teachers in metalinguistic learning strategies is therefore of paramount importance in that they become the class' tutors and coordinate the learning process through thought-provoking questions and non-verbal gestures, in a pleasant learning atmosphere that invites students to recognise important patterns within new information and how to organise them for study purposes (Schneider, Crombie, 2003).

### *The multi-sensory learning approach*

Perceptual experiences are at the basis of the learning process and through these experiences we can learn. In this perspective, the direct multi-sensory approach is advocated for teaching reading and spelling in the native language to children with dyslexia (Nijakowska, 2010). However, research findings have proved the multi-sensory structured learning (MSL) to be a successful learning strategy even for foreign language learning (Crombie, McColl, 2000; Jameson, 2000; Miller, Bussman Gillis, 2000). Based on this learning approach, many remedial programmes for teaching reading and writing, especially in the native language, have been developed.

The most recognised examples of multi-sensory teaching method within early education in the English-speaking world, are *Alpha to Omega, the A-Z of Teaching Reading Writing and Spelling* (Hornsby et al., 1999) for early literacy instruction, and *Before Alpha, Learning Games for the Under Fives* (Hornsby, 1999) for language-impaired children at nursery school, and a long list of other tailored-made programmes. Bogdanowicz has realised *the Method of the Good Start* in Poland for teaching English as a Second Language. This method is based on the visual-auditory-kinaesthetic-tactile approach, and is used both in prevention and in speech therapies. Another example of multi-sensory teaching method has been proposed by Schneider (1999) to teach German as a foreign/second language to at-risk learners, and went as far as uniting the multi-sensory learning strategy to the metalinguistic

teaching strategy, resulting in the *multi-sensory structured metacognitive language instruction* (MSMLI). According to Schneider (2003), the above-mentioned multi-sensory approach implies the training of metacognitive skills that are necessary for students with language learning disabilities because of their poor ability to recognise and understand the rule system of a foreign/second language.

A multi-sensory approach, as we have seen, basically consists in the activation of the auditory, tactile, visual and kinaesthetic pathways, which support compensatory unaffected routes that allow the development of written language skills. As a matter of fact, a learning process which simultaneously involves the use of as many sensory channels as possible, can be even more beneficial for dyslexic children.

A multi-sensory teaching method should therefore provide integrated visual, auditory, kinaesthetic and tactile stimuli which allow the student to manipulate linguistic items through their senses. The more modalities involved in the learning process, the more effective it appears to be (Nijakowska, 2010). The success of this method relies predominantly on teachers' creativity and their ability to plan activities that give the dyslexic student the possibility of forming associations between the graphic (visual) and phonological aspects of a word as well as its meaning. These activities may even include apparently less conventional learning strategies, such as making models of plasticine, forming them from wooden, sponge or plastic letters, tracing them on various surfaces, such as paper, carpet, floor, sand

and by writing them (Nijakowska, 2010). The higher the number of multi-sensory activities, the more the chances for the dyslexic child to establish automatic associations between the graphic (visual) and the phonological (auditory) aspects of a word as well as its meaning. This explains why, a multi-sensory structured learning approach can be effective even in an intensive instruction of the orthographic (sound-symbol) system of the native language as well as of a foreign language, especially with at-risk learners.

Moreover, this idea is supported by a great number of research findings (Schneider, 1999; Ganschow, Sparks, 1995; Sparks *et al.*, 1997a) that prove the effectiveness of direct multi-sensory instruction in the phonology/orthography of foreign languages to students with dyslexia. As a matter of fact, there is evidence that the difficulties experienced by a great majority of poor foreign language learners are of phonological nature. It follows that dyslexic students who cannot benefit from the communicative language teaching approach, will most probably take advantage of the early direct and explicit instruction in the orthography and phonology of the target language, as well as increased multi-sensory exposure to print.

#### **4.5 The role of intensive phonics instruction in foreign language learning for language and reading-impaired children and its multi-sensory perspective.**

As it has been described in the previous chapters, phonological

awareness is a prerequisite to the mastering of language-related skills, such as encoding and decoding, especially during early stages of literacy. As we have seen, phonological abilities are transferred from L1 to L2, and it follows that intensive phonological activities will play a pivotal role not only in restoring phonological awareness in the native language, but also in the foreign language. Overcoming reading difficulties heavily depends on intensive and specialist speech teaching and therapy, often extending over long periods of time.

Findings of several imaging studies investigating brain activation after phonologically driven reading training show the increased activation of areas typically employed by regular readers. This proves that *intensive phonics instruction* plays a vital role in creating brain activation patterns, allowing successful reading in children with dyslexia (Nijakowska, 2010). A multi-sensory approach to the teaching of phonological/orthographic aspects of a foreign language also improves skills in the native language, and can be beneficial not only for the at-risk student, but also for the average student. It is important, though, that the phonology and orthography-based instruction conforms not only to the specific need of the reading-impaired student, but also to the specific characteristic of the language. Activities, should therefore be structured, for example, according to the *orthographic depth* of the language, and as a consequence, to the *orthographic grain sizes* as well as the the phonological and syllabic structures that can be better manipulated and processed by the student, all in a multi-sensory perspective.



Pamela Kvilekval (2007) proposes a method of writing and reading instruction of English - a deep orthography - for Italian dyslexic students, whose native language has instead a shallow orthography with high graphemic-phonemic correspondence. The method proposes an intensive phonics instruction, which proceeds from small grain-based activities to larger grain-based activities, via grids of regular and irregular consonant clusters, simple and complex syllables, digraphs and vowel pairs, all through a combination of merely phonological and metalinguistic exercises, which aims to develop a certain degree of automatism in reading and writing as well as mistake-spotting abilities. This approach is based on explicit phonemic awareness training and letter-sound training. The method proposes the development of a phonological awareness in English through a contrastive, reiterative multi-sensory approach. For example, Kvilekval proposes in the following way a possible multi-sensory strategy to learn letters in first stages of literacy at primary school:

<b>To learn a letter</b>	<b>Sensory response</b>
• Visualize letter from others	<i>Visual response</i>
• Listen to its phonic rendition from others	<i>Auditory response</i>
• Listen to own phonic rendition	<i>Auditory response</i>

- Utter the sound of the letter while feeling the movements of the articulatory organs involved and the tactile sensations of tongue, teeth, palate, etc. *Motor, tactile and auditory response*
- Draw the letter while feeling the hand movement *Kinetics and visual response*

(Kvilekval, 2007)

Although appearing rather straightforward, planning activities focused on the development of phonological abilities that involve a multi-sensory experience is not always simple, and must be adequate to the degree of literacy of the student. However, although thought for children who have already entered formal education, Kvilekval's programme may result a little too formal for children, especially for those in the early literacy stages who still need a more experiential, ludic and perhaps more motivating approach.

For what concerns early phonics instruction before formal education, *Before Alpha* (Hornsby, 1999) represents a very popular example of multi-sensory approach. This learning programme is structured in a modular way, and is subdivided into different stages, at the end of which the children should attain a certain degree of confidence and proficiency in language skills. This programme was originally devised for use of English-speaking children with delayed language development, between the age of five to six years, to monitor their development through the course year. However, the effectiveness of this programme and its startling results have made it a benchmark for all educators involved in the early stages of literacy of all

children in the English-speaking world, and its methodology should be extended to all teachers of English as a Foreign Language for small children<sup>49</sup>. The activities featured in the *Alpha programme* aim to train the skills that provide the basis for the development of the coding-encoding process in later stages of education and their interrelationships with one another. The types of skills involved in the activities are:

a. *Motor skills*, both fine and gross: manual dexterity for fine motor control, for examples in mimicry activities in finger play rhymes<sup>50</sup> and action rhymes.

b. *Visual perception and discrimination*: visual sequencing, visual categorisation, visual memory, appreciation of the relationship between shapes, knowledge of left and right, up and down, backwards and forwards, knowledge of colour and numbers.

c. *Auditory perception and discrimination – phonological awareness*: auditory sequencing of sounds, auditory awareness of rhyme and rhythm, auditory memory of sentences which can be improved by the aid of hand clapping to stress syllabic rhythm which is usually readily available to children.

d. *Full spoken language competence*: correct use of tense and concord, correct use of pronouns, correct sentence construction, ability to follow instructions and to organise thoughts so that instructions can be given.

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49 The idea of extending the *Alpha Programme* to the teaching of foreign languages also at primary school is supported by my own experience in using the multi-sensory approach proposed in the programme to teach English as a Second Language to Italian language-impaired and unimpaired children at nursery-school

50 A *finger play rhyme* involves the use of the hands and finger to mimic a rhymed short story.

In the light of the experiential teaching method, simple games and activities involving the above-mentioned competences help children making the first link of associating pleasurable experience with verbalisation (Hornsby, 1999), which is a prerequisite to the acquisition of the alphabetic principle. This kind of programme is therefore an example of a successful phonological multi-sensory integrated learning strategy, which involves *phonological training*, *binocular control* and *balance training*, in accordance with the hypothesised interrelation between phonological deficit and the cerebellar deficit in dyslexic children (chapter 2).

The importance attributed by the *Before Alpha* programme to the role of nursery rhymes highlights that, especially in the English language in which rhyme awareness is crucial (chapter 3), reading starts with *nursery rhymes*, where the child learns to enjoy the rhythm and rhyming of words without bothering too much about meaning. The association of *nursery rhymes* with *finger play rhymes*, thanks to which the child learns to integrate the senses of sight, hearing, touch and movement, is a perfect example of a successful multi-sensory learning strategy. Moreover, especially because of the malleability of children phonological abilities during preschool education, this programme – initially designed for developing language skills in English to native speakers, has proven an outstanding resource for teaching English as a foreign language to Italian children of same age group with and without language delays<sup>51</sup>.

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51 My current experience in teaching English as a foreign language to children aged five to six, during last year of nursery school in Italy.

Let us not forget that, because of the interrelation between phonological abilities in L1 and L2, the multi-sensory approach to teaching phonological and orthographic aspects of a foreign language has resulted in the improvement in the native language performance (Ganschow, Sparks, 1995; Nijakowska, 2010), thus allowing at-risk foreign language learners to partly catch up with unimpaired learners in phonological and orthographic abilities. This means that not only does the intense phonics instruction improve phonological skills in the foreign language, but it can also greatly contribute to phonological improvements in the native language. However, phonological training, although its empirically supported effectiveness with regard to general average improvements in reading skills, tends not to be equally effective for all at-risk learners.

#### **4.6 Technology and its benefits for dyslexic students.**

Students affected by developmental dyslexia require plenty of reinforcement, repetition, over-learning activities which have the purpose of eventually lead to a satisfying level of automaticity in language processing activities. Nowadays, modern teaching resources offer a large number of learning activities and inputs, that are much more appealing for the student as they involve the use of technological devices and programmes. In addition to traditional technological resources, such as tape recorders, audio-CDs and video tapes for classroom language activities, today dyslexic students and

teachers can benefit from a long list of softwares especially designed for them in a multi-sensory perspective.

According to Schneider & Crombie (2003), some of the main features of technological resources that can make a positive difference in learning a foreign language for dyslexic students are the following:

- *independent access* to a resource at a time that is convenient for the student, for example outside school hours;
- *limitless repetitions* of the linguistic input;
- as much overlearning as the student need through a variety of technological and other resources as the student wishes;
- possibility of *changing the speed* of the spoken linguistic input, especially when presented in an auditory resource.
- integration of as many *learning channels* as the student wishes, especially the kinaesthetic-tactile channel, so that the dyslexic student can accommodate for possible weak auditory and/or visual processing skills.

The foreign language educator should combine available technological resources to prepare activities that are accommodating for the dyslexic student, for example by strengthening the kinaesthetic-tactile learning component, designing activities with repeated practicing opportunities that integrate multi-sensory exercises, ensuring that the dyslexic student have free

access to computer-based and CD-ROM-based activities as alternatives to normal classroom activities, and eventually by allowing extended time for the dyslexic students to complete computer-based or even web-based assignments, especially when they involve mnemonic study devices. Moreover, digital language instruction may include pre-programmed activities that will enhance listening comprehension; reading practice and memorisation of graphic correspondence of speech through the continuous exposition to the print form; model imitation such as phone conversations; paired and group discussions; simultaneous and consecutive interpreting, as well as the memorisation of recorded responses as pragmatic linguistic models.

Finally, many dyslexia-sensitive computer software have been designed to help language-impaired student overcome their difficulties, while learning in a enjoyable way. Computer software from 'Kurzweil', originally designed as learning tools for students with visual and reading disabilities are now available for the foreign language students. These kinds of programs can read texts in a number of European languages, providing learning tools for dyslexic foreign language learners, especially those who struggle with decoding written texts. Other examples of such kind of programs are the "ViaVoice", offering different language version, or "Dragon Naturally Speaking" which allows students to hear the language being read aloud to them by native speakers of the foreign language. Moreover, the Optical Character Recognition (OCR) give students the possibility to scan in a

specific language and to have it read back accurately, therefore improving foreign language pronunciation and giving pupils access to more challenging sentence and word patterns than they would otherwise be able to master. In addition, some companies have designed dyslexia-sensitive dictionaries, translators and spellcheckers which can become supportive tools for the reading-impaired student. In any case, the foreign language teachers should always refer to their country Dyslexia Association, and well as the European or International Dyslexia Association for constantly updated resources for teaching languages to dyslexic students.

### **Summary**

This chapter has provided an overview on current foreign language teaching approaches, strategies and resources that are more suitable for the language- or reading-impaired student. Here are the key concepts that have been highlighted:

1. *The Second Language Acquisition Theory*. It is based on the proposition of five hypothesis on language acquisition. It distinguishes *language acquisition*, an implicit process which is activated during yearly stages of life, from *language learning*, a more advanced process which develops during formal education. With regard to language- and reading-impaired children, the *emotional filter*, the *i+1 hypothesis* as well as the *monitoring hypothesis* arise important issues to the analysis dyslexic children's *anxiety* in



language-related activities.

2. A *multi-sensory learning approach* is focused on the role of *experience* as the centre of the learning process, and especially in language- and reading-impaired children it can help overcome *language anxiety*, making the learning process a more enjoyable experience.

3. A *metacognitive learning approach* and *intensive phonics instruction* appear to be useful tools to encourage, on the one hand, metalinguistic skills to create compensatory learning strategies and, on the other hand, to attain a certain degree of automatism in phonological activities

4. Students affected by developmental dyslexia require plenty of reinforcement, repetition, over-learning activities which have the purpose of eventually lead to a satisfying level of automaticity in language processing activities. Modern teaching resources offer a vast range of technology-based dyslexic-friendly activities especially designed for both independent or guided learning.

## ***CONCLUSION***

This work has tried to provide an overview on the onset of developmental dyslexia during early stages of literacy and the way it can affect foreign language learning, with special attention to the phonological coding deficit which characterises most children affected by this kind of specific learning disorder. Being phonological skills so important in foreign language learning, how can we help these children overcome their learning difficulties? This study has tried to answer this question, firstly, by analysing available theories on the neuro-biological origins of dyslexia and how they can compromise reading acquisition with regard to the different orthographic systems, and finally, by formulating hypotheses on the psychological, and relational implications that this learning disorder may carry. This provides a valuable source of information through which it is possible to draw a clearer picture of reading-impaired children's needs when it comes to foreign language learning. However, understanding dyslexia is an extremely difficult

task, which should be supported by an interdisciplinary approach of different subject areas, such as cognitive psychology, genetics, linguistics and pedagogy, which should all converge in a shared definition of developmental dyslexia.

The complexity of this specific learning disorder makes it hard to define a unique teaching model that can promote the acquisition of compensatory learning strategies and that, at the same time, can suit the needs of all kinds of reading-impaired children. It has been observed how multi-sensory learning activities can be a lifesaver for children who are willing to overcome their language-related difficulties, and therefore language-related anxieties, while using all senses in playful, enjoyable activities. The role of phonological activities, in particular continuous phonics instruction, remains somehow crucial for the acquisition of language and reading abilities, both in the native as well as in the foreign language. Educators and teaching staff should be prepared to plan their classes with enjoyable activities without worrying about slowing down the learning process of the class. If this kind of activities can help dyslexic children in their learning process, the rest of the children will also benefit from being given extra chances to consolidate the language abilities they have previously acquired.

More should be done though to provide foreign language teachers, as well as teacher of all subjects, with adequate theoretical and practical training in dealing with this kind of children in order to dismantle old

prejudices concerning foreign language learning for the language- or reading-impaired children. Most of all, because it is their right to enjoy learning another language, and it is our responsibility to satisfy their need to happily share with their schoolmates stimulating experiences that learning a new language can bring.

## GLOSSARY

<i>ACQUIRED DYSLEXIA</i>	A kind of dyslexia resulting from brain damage or neurological disease, usually after basic reading skills have already been acquired.
<i>AETIOLOGY</i>	The study of the causes of a disease
<i>ALPHABETIC WRITING SYSTEM</i>	A writing system in which individual sounds of the spoken language (phonemes) are represented by written letters (graphemes)
<i>ALPHABETIC PRINCIPLE</i>	The alphabetic principle is the knowledge that letters represent the sounds in the languages
<i>AVAILABILITY</i>	Degree to which phonological units are consciously accessible to children prior to reading instruction
<i>CODA</i>	The final consonant (s) of a syllable
<i>COMORBIDITY</i>	Two or more coexisting medical conditions or disease processes that are additional to an initial diagnosis. (Mosby's Medical Dictionary, 2009, Elsevier)
<i>CONSISTENCY</i>	The degree of coherence between phonemes and graphemes (some orthographic units can have multiple pronunciations while some phonological units can have multiple spellings)
<i>CONSONANT CLUSTER</i>	A group of consonants that has no intervening vowel. In English, <i>spr</i> is a consonant cluster in the word <i>spread</i>
<i>CV-UNITS</i>	Consonant – Vowel units representing a syllable
<i>DECODING</i>	Applying grapheme – phoneme correspondence rules when reading
<i>DEEP DYSLEXIA</i>	Form of dyslexia characterised by semantic errors in reading (e.g. reading <i>home</i> as <i>house</i> ) as well as visual errors. There is also a deficit in the sub-lexical reading route which makes pseudo-words reading almost impossible

<i>DEVELOPMENTAL DISORDERS:</i>	they can be specific or general disorders/difficulties. In the UK, developmental disorders are distinguished between specific learning difficulties and global learning difficulties while in the USA, the distinction is between learning disorders and mental retardation. IQ test are used to distinguish between the two (IQ scores below 70 denotes a likelihood of a global learning difficulty)
<i>DECODING/ ENCODING</i>	Decoding: to convert letters into sounds (grapheme → phoneme) Encoding: to transcribe a text into a code
<i>DEEP ORTHOGRAPHY</i>	See <i>opaque orthography</i>
<i>DEVELOPMENTAL</i>	A trait that refers to one of several disorders that interrupt normal development in childhood. They may affect a single area of development (specific developmental disorders) or several areas (pervasive developmental disorders)
<i>DIGRAPH</i>	A pair of letters representing a single speech sound, such as the <i>ph</i> in <i>pheasant</i> or <i>ea</i> in <i>sweat</i>
<i>DYSCALCULIA</i>	It is a specific learning disability affecting mathematical abilities
<i>DYSGRAFIA</i>	A <i>dysgraphic</i> student shows a lower degree of fluency and formal quality in writing. The deficit responsible for the lower writing standard is generally imputable to a pre-existing psycho-motor dysfunction.
<i>DYSORTHOGRAPHY</i>	It is a specific disorder of spelling which usually accompanies dyslexia
<i>EPILINGUISTIC PHONOLOGICAL COMPETENCE</i>	Implicit phonological ability which involve intuitive judgments on similarities between words, syllables, onsets and rhymes.
<i>EXPERIENTIAL TEACHING METHOD</i>	A teaching method which emphasises the role of experience in the learning process
<i>EXPLICIT PHONOLOGICAL</i>	Advanced phonological abilities which develops during early literacy stages through phonological awareness.

## *ABILITIES*

<i>GRAPHEME</i>	A written letter, or cluster of letters, that corresponds to a spoken phoneme
<i>GRAPHEME-TO-PHONEME CONVERSION</i>	The process of converting strings of written letters (graphemes) into their spoken equivalents (phonemes)
<i>GRANULARITY</i>	Regards the variety of orthographic units that must be learnt when access to the phonological system is based on bigger grain sizes as opposed to smaller grain sizes
<i>HOLISTIC READING APPROACH</i>	Reading strategy which is based on links between the visual form of a word and its spoken sound that are formed at the whole-word level. A holistic reading strategy is based on the processing of lexical units (via a lexical route)
<i>IMPLICIT PHONOLOGICAL ABILITIES</i>	Early phonological processing abilities which are used by preliterate children in oral language without reflecting on the structure of spoken words
<i>LANGUAGE ACQUISITION</i>	According to Krashen's second-language acquisition theory, it is an implicit process of the native language acquisition, typical in children before they enter formal education
<i>LANGUAGE LEARNING</i>	According to Krashen's second-language acquisition theory, it is an explicit language learning process, which develops during formal education, and which implies more analytical competences
<i>LANGUAGE PROCESSING</i>	The cognitive processing of spoken or written language, ranging from the construction to the abstraction of meaning from language
<i>LEXICAL READING STRATEGY</i>	Reading strategy based on the processing of large grains such as whole lexical items (holistic reading strategy)
<i>LOGOGRAPHIC WRITING SYSTEM</i>	A writing system in which each symbol represents one word or concept. This is in contrast to alphabetic writing systems, where each symbol is combined with others to form meaningful words

<i>METALINGUISTIC COMPETENCE</i>	The ability to consciously reflect on the nature of language
<i>MORPHEME</i>	The smallest meaningful unit of a language: for example, the word <i>untidiness</i> contains three morphemes: un + happy + ness
<i>MULTISENSORY LEARNING APPROACH</i>	A learning approach based on activities that involve all senses.
<i>NEIGHBOURHOOD DENSITY</i>	Words that share the majority of their constituent phonemes are referred to as phonological neighbours, while words that share their constituent graphemes are referred to as orthographic neighbours. Words with many neighbours are said to be from a dense neighbourhood
<i>NON-LEXICAL READING</i>	Sub-lexical reading strategy based on grapheme-to-phoneme conversion. This is the only way to read non-words
<i>ONSET</i>	The initial consonant cluster of a word, e.g. <i>sw</i> in <i>sweet</i>
<i>OPAQUE ORTHOGRAPHY</i>	An orthography whose graphemes-phonemes correspondences are relatively inconsistent
<i>ORTHOGRAPHIC TRANSPARENCY</i>	The predictability of the pronunciation of words from their written form as opposed to orthographic depth, which is instead the degree of inconsistency in graphemes and phonemes correspondences in a given language
<i>PHONEME</i>	The smallest linguistic unit, or sound, that distinguishes meaning: for example, /f/ in <i>fan</i> distinguish it from <i>pan</i>
<i>PHONEMIC AWARENESS</i>	Identification and manipulation of individual phonemes. It allows to distinguish and identify individual sounds and segments that constitute the utterances (speech stream) we hear. Provides the basis for the understanding of the correspondences between phonemes and graphemes, also crucial for the understanding of the alphabet principle
<i>PHONICS INSTRUCTION</i>	Teaching method based on the teaching of reading by training people to associate letters with their phonetic



values

<i>PHONOLOGICAL AWARENESS</i>	Phonological awareness is defined as a skill that enables one to identify the phonological components of a language and to manipulate them. The components in question are meaningless segments: syllables, phonemes, and infrasyllabic units such as the onset and the rhyme of a word. Phonological awareness is thought to be what enables beginning readers to realize that spoken words are composed of sound sequences which in turn could enable them to understand that - at least for alphabetic writing systems - the most basic sounds (phonemes) correspond to written symbols such as letters (a, t) and letter groups (ou, ch). The ability to segment spoken words into their most elementary units thus seems indispensable to make appropriate use of grapho-phonemic correspondences. Different levels of phonological awareness are: syllabic, infrasyllabic, and phonemic. Phonemic awareness is more difficult for children than syllabic awareness, which develops at around the early age of four. (Sprenger-Charolles, 2006)
<i>PHONOLOGICAL DEFICIT</i>	A weakness of the abilities linked to phonological awareness. It is a lifelong condition which persists before and after literacy age. It usually comprises phonemic awareness, slow lexical retrieval and poor short-term memory
<i>PHONOLOGICAL DYSLEXIA</i>	A kind of dyslexia affecting the sub-lexical reading route. It is also associated with a deficiency in short-term memory
<i>PHONOLOGICAL NEIGHBOURHOOD DENSITY</i>	It refers to the ratio of similar-sounding words in a given language. Phonological neighbourhood is established by similarities among sub-lexical units such as syllables, phonemes and most of all rhymes
<i>PHONOLOGY</i>	The study of the speech sounds in a language
<i>PHONOTACTICS</i>	Phonotactic rules that govern the sequences of phonemes used to make words in a particular language
<i>PRAXIA</i>	Execution of voluntary motor movements
<i>PROSODIC CUES</i>	Various acoustic properties of speech such as tone, pitch,

accent, etc. (collectively known as prosody), which all provide non-verbal cues to help the listener identify the meaning of an utterance

<i>PSEUDOWORDS</i>	Unknown words that are used to assess the efficiency of the sub-lexical reading route
<i>GRAIN SIZE OF LANGUAGES</i>	The term “grain” describes the smallest unit used during language processing. The size of the grain depends on the kind of orthography and is therefore language specific
<i>RHYME AWARENESS</i>	It concerns the ability to distinguish rimes and word-onsets. It is particularly important for the acquisition of reading skills in deep orthographies. It appears to be universally present prior to receiving literacy instruction
<i>RIME</i>	The end part of a word, including the first vowel and succeeding consonants. In the word <i>fat</i> , <i>at</i> is the rime. Two words can have the same rime, but not necessarily the same sound. In this case, they do not rhyme. (e.g. <i>bear</i> and <i>gear</i> have the same rime, <i>ear</i> , but do not rhyme)
<i>RULE OF FORGETTING</i>	According to Krashen (1982), the learning process is actually activated when we “forget about having to learn”.
<i>SHALLOW ORTHOGRAPHY</i>	See <i>transparent orthography</i>
<i>SONORITY PROFILE</i>	The extent to which the vocal tract is constricted during articulation. In general terms, vowels like /a/ have the highest sonority, because the vocal tract is open, while plosive like /p/ have the lowest sonority, because the vocal tract closes
<i>SPEECH STREAM</i>	Stream of sounds (phonemes) as perceived by the listener
<i>STRESS PATTERN</i>	The relative emphasis given to the phonemes within words characterised by changes in loudness, pitch or duration. For example, <i>present</i> can either be a noun or a verb, according to whether the stress is on the first or second syllable
<i>SUBITIZING</i>	The ability to perceive the number of a group of items at a glance and without counting

*SUB-LEXICAL  
READING  
STRATEGY* Reading strategy based on the processing of smaller grains, therefore using the sub-lexical reading route

*SURFACE DYSLEXIA* A kind of dyslexia affecting the lexical route often associated with severe forms of dysorthography and lack of memory of words' written form

*SYLLABIC  
AWARENESS* Ability to distinguish syllabic units which develops in children during early stages of life

*TRANSPARENT  
ORTHOGRAPHY* A kind of language orthography with a high degree of consistency between graphemes and phonemes, usually consisting in one-to-one mappings

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