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# Dyslexia development in the schoolchild and some treatment programs

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**Abstract:**

Nowadays, the written word has become a common means of communication. Thus, for the apprentice reader-writer, it is important to develop the skills related to this complex activity. In recent years, some research has been are lingering over the description of learning to write as well as teaching this skill from the perspective of planning, writing or revision. The reflection on the origin of the work is due to the interest given to the subject of reading and its disorders such as dyslexia, which prevents the child from fulfilling its school career and its social and professional integration.

In order to fight against the difficulties of reading, we presented in this article an overview of the processes of learning to read and the explanatory psycholinguistic model and the intervention programs adapted to dyslexic children according to the nature of the deficiency (phonological or morphological).

**Keywords:** Reading, dyslexia, models, diagnosis, treatment programs.

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## 1. Introduction

Dyslexia is a specific learning disorder that specifically relates to the development of reading. This reading acquisition disorder, which is an obstacle to academic success, is the learning disorder, which has been the subject of most research and definitions. Before defining the concept of dyslexia it seems obvious to clarify it that essential point it is absence of a single and common definition it is a question of the definitions which it's varied according to the linguistic characteristic and the nature of the mother tongue and its linguistic and cultural and even family economic environment of the children in school so that the educational program adapts by each population and country; despite these specificities and even others we will cite that the definition of this language pathology which is called “dyslexia” is a specific reading disorder which covers two kinds of very different ailments. The first is acquired dyslexia, sometimes called adult dyslexia or Alexia. Now, there is a consensus around the definition of dyslexia set out by Rutter (1978), which is based on the World Federation of Neurology. Dyslexia is “a disorder manifested by a severe difficulty in learning to read despite normal intelligence, conventional teaching and adequate sociocultural opportunities”. An operational definition of dyslexia is advanced by “World Federation of Neurology “(1968): a learning disability that occurs in despite normal intelligence, the absence of sensory or neurological disturbances, adequate school education, sociocultural opportunities sufficient; moreover, it depends on a disturbance in cognitive skills often fundamental of constitutional origins This definition can be criticized because it defines the disorder by negative criteria. Therefore, we do not really define what the dyslexia but rather what it should not be. Critchley will add positive criteria for this definition. He talks about the fact that dyslexia persist into adulthood, as well as associated disorders (such as orthography), that it is predominant in boys, that the errors produced are specific to the disorder and finally, that there is a family incidence. In addition, he opposes developmental dyslexia to other reading disorders (Critchley M., 1970). Debray-Ritzen and Mélékian define dyslexia as “a specific and lasting learning difficulty of reading and writing, and acquiring their

automatism, in normally intelligent children, normally in school, free from sensory disturbances" (Debray-Ritzen P., Mélékian B., 1970). Here we see the notion of writing disorder, so for these authors, orthography part of dyslexia. It is an acquired reading disorder, secondary to a focused neurological condition or degenerative condition, in someone who was a good reader before (Habib & Robichon, 1996). The second is dyslexia development of which many definitions have been proposed. Most frequently used suggests that developmental dyslexia or specific reading disorder, be defined as a disruption in reading skills. The realization of the reading, as assessed by standardized tests measuring accuracy and reading comprehension, is significantly lower than expected, considering the child's chronological age, intellectual potential and schooling adequate. The reading disorder significantly interferes with academic success where daily activities involve reading. If the child has a sensory deficit, reading gaps exceed those usually associated with reading (DSM-IV-TR, 2004). The definition provided by the classification of the Organization World Health (WHO) partially responds to this criticism. Here are the criteria allowing, according to the WHO, to make the diagnosis of dyslexia: One of the following two points must be present:

— (1) a reading and / or comprehension score at minus 2 standard errors below the expected level based on age chronological and general intelligence of the child, reading skills as well as the IQ being assessed on an individually administered test and standardized with respect to the child's cultural level and educational system.

— (2) a history of severe reading difficulties, or test scores meet criterion A (1) at a younger age, plus a score on a spelling test at least two standard errors below the level expected based on the child's chronological age and IQ.

B/ The disorder described in criterion A significantly interferes with academic success or activities of daily living that require reading skills.

C/ The disorder are not a direct result of a visual or hearing impairment, or a neurological condition.

D/ School experiences are in the middle of what you would expect (there was no major mismatch in schooling).

E/ Exclusion criteria very commonly used. IQ less than 70 on a standardized test administered individually.

The main criterion is therefore based on previously validated reading tests, which the child must perform below two standard deviations of the average of the population of the same age and same intelligence. In other challenges notions, this criterion is replaced by "a reading age at least 18 months lower at real age "which, in practice, is pretty much the same. Notice by elsewhere, that no reference is made to possible psychiatric disorders such as exclusion criteria. This means that in theory, the term dyslexia would apply also to children with reading difficulties as part of a serious affective pathology. Some researchers prefer to eliminate definitions all cases of "proven psychological or psychiatric disorders" (Seymour, 1990). However, these definitions remain rather imprecise and therefore make it particularly difficult epidemiological studies.

**2. Prevalence of Dyslexia:**

Dyslexia is conceded as the most common neurological condition of the child (Habib, 2004). However, its prevalence remains imprecise, varying from 5 to 17.5% according to studies (Shaywitz, 1998). This variability in prevalence may be the cause many factors and the most important would be the imprecise definition of dyslexia. The incidence of this disorder in the siblings of an affected subject would be 40% and 25% to 49% of first-degree ascendants (Shaywitz, 2003). Ladjal (2015) shows a rate of 6% to 17% of dyslexic children on the population of children educated in CE1 of the tranche age between [7, 10] year and that the ration of girls represents 1 in 3 boys affected by dyslexia (Ladjal, 2015).

## 3. Explanatory theories for dyslexia

### 3.2 Phonological theories:

The hypothesis of a deficit in phonological representations in dyslexia is the one that brings together the largest number of scientists working on this pathology. The basis of this theory is that reading is a language activity, which takes place after the oral language in the development of the individual. Of more, even if the perception of the written word depends on the vision while that of the oral depends on the hearing, the reader can always have access to the sound form of the words he reads. Finally, the phonological theory is based on the definition of dyslexia, which is a specific learning disability that does not result, among others, proven sensorimotor deficiencies. These different explanations allow us to understand why reading activity mainly involves networks neurons used to process oral language. As we have already mentioned, the acquisition of reading goes through a stage learning and using grapho-phonemic conversion rules. Gold, what characterizes most dyslexics is a severe difficulty in work and automation of this decoding. We know that the procedural deficit phonological reading is robust and prevail. According to phonological theory classical, it is mainly explained by deficiencies in phonemic analysis and short-term phonological memory, or even by difficulties in accuracy and speed of access to the oral lexicon. Other phonological hypotheses attribute these deficits to an underlying hearing loss or perception faulty phonemes. Manipulation of several phonemes in long segments (Démonet & al., 2004).

### 3.2 Theory of temporal processing deficit

The theory of the temporal treatment deficit postulates a deficiency in the rapid treatment of sounds (language or not) that cause dyslexia. The brevity of the information and its rapid transitions mean that they would not be identified correctly. This hypothesis has been tested with temporal processing tests in which the participant must discriminate heard sounds and determine the order of appearance of these sounds. Tallal and al. (1996) proposed this Comorbidity and neurodevelopmental disorders' hypothesis to explain the linguistic and cognitive difficulties in children with various language disorders. The temporal processing deficit hypothesis has been extended to other dimensions such as perception of the duration or the reproduction of a rhythm synchronously. For example, studies show, for dyslexic subjects, difficulties in adapting the rhythm of the motor gesture at speeds proposed by a metronome (Wolf, 2002). This theory of the temporal processing deficit is challenged by the lack of results in studies replicating the task of discrimination of the Tallal team in dyslexics. Some studies find that only a minority of individuals are affected, or that Difficulties with this task are not the cause of the phonological deficit. Share, Form, Maclean and Mathews (2002) observe phonological difficulties when writing pseudo words in dyslexic children but not in the temporal judgment test. Other teams, again, show that during repetitive sequences with or without lengthening the presentation of stimuli, training does not lead to differences between conditions in dyslexics (Habib & al., 2002).

### 3.3. Visual theories or Magnocellular system:

Pringle Morgan was the first to describe a case of dyslexia then mentioned like “congenital blindness” to read. Since then, numerous studies evaluating the visual processing capacities of dyslexic children tend to show that many of them are visually impaired independently any sensory (or peripheral) impairment. Fairly wide diversity visual processing disorders has been described in dyslexic individuals, the crucial question of course being to what extent these disorders are related to the reading activity and can be held responsible for difficulties learning to read these children. The causal link is not yet established but several types of visual deficits have been observed in dyslexics and studies tend to circumscribe the diversity of visual treatments' deficit in

these children and their real impact on learning to read. The hypothesis that gave rise to the largest number of searches in the visual domain is the hypothesis of an attack on the magnocellular visual system. It has been strongly criticized and is still widely debated. Systems magnocellular and parvocellular correspond to the two layers of cells of the lateral geniculate body (link between the optic tract and the primary visual area of the occipital cortex). The magnocellular system is made up of ten percent of ganglion cells noticeably larger than the others make, more myelinated and provided with axons allowing a fast transmission of information (Shapley & Perry, 1986). These cells whose receptive field is wider than that of parvocellular cells respond primarily to weak stimuli spatial frequency and high temporal frequency. This system is special- involved in the treatment of weak contrasts allowing an analysis coarse stimulus rather than analyzing the subtle details of an object for purposes identification. Another important feature of the magnocellular visual system is its ability to process movement and rapid change; the magnocellular cells thus respond to any new event appearing in the visual field, whether it's bright flashes or a moving target. Mainly involved in the treatment of coarse forms, peripheral information, brief and moving stimuli, the magnocellular system seems a priori poorly suited to the reading activity which, on the contrary, requires analyze in detail stable information presented in central vision. In this activity, the parvocellular system manages the information taken during fixation ocular while the magnocellular system is activated during the cascade by the apparent movement of the image. Its activation would have an inhibitory effect on the Purcell system thus preventing the effect of retinal tracking or tracking, favoring the processing of new information by successive "jumps". Many behavioral data have been published and argue in favor damage to the magnocellular visual system in dyslexics (adults or children) (Livingstone & al., 1991; Stein & Walsh, 1997). It has thus been shown that dyslexics have less sensitivity to low spatial frequencies and at high temporal frequencies (Lovegrove & al., 1986) as well as sensitivity reduced to moving points (Cornelissen & al., 1995). However, how Magnocellular system disorders explain reading difficulties. According to this magnocellular hypothesis, during reading, the magnocellular system dyslexics would not be able to inhibit during the cascade the "created" image by the parvocellular system during the previous fixation. Thus, a scrambling, which compromises the recognition of letters and words. That would explain errors of type reversals of letters ("pal" read / pla /) or substitutions formally close letters ("b" and "d", "p" and "q"). Despite its success and its undeniable interest, the magnocellular hypothesis is today controversial. **Dyslexia diagnostic and screening tools:**

There is great heterogeneity in the assessment tools for written language (Ecalle, 2010). In their practices, professionals — speech therapists - select from the various test batteries, the exercises that provide them with the most information depending on the age and level of the child. In this way, they create their own evaluation instrument themselves. In addition to the written language assessments, during the diagnosis, an oral language assessment is necessary in order to compare the levels in the two areas of language.

**4. Dyslexia rehabilitation:**

The dyslexia rehabilitation market is huge and occupied by a wide variety of rehabilitation and training methods. A part of these methods flows directly from the different theories of dyslexia. They were generally proposed by scientists working on the corresponding theories and have often been scientifically evaluated. However, a very large number of treatments recommended for dyslexia have not been the subject of any scientific study, nor of a point of view theoretical, nor from the point of view of the evaluation of the effectiveness of the treatment. If we seek the nature of the research work effected about dyslexia in general, we find that there are very few studies or article on the reeducation of dyslexia by cons studies on etiology are very important and numerous

at the present time. A multiplicity of rehabilitative approaches to dyslexia, but very few have demonstrated scientifically their effectiveness (Dirk, & Bakker, 2006). The current trend regarding the management of dyslexic children is mainly oriented towards phonological and very few programs are designed for visual dyslexia (dyseidetic).

We present, in this section, a passage from the reeducation of dyslexia, as well as a brief overview of the avenues of intervention. In one first, you will be presented with some intervention programs that have subject of scientific studies.

### 5.1. Scientifically verified programs.

#### 5.1.1 The study by Simons et al.

Simons and al. (2002) offered training phonological to eight dyslexic children. Children had an imaging test by magnetic resonance (MRI) before and after training. The control group was composed of non-dyslexic subjects matched in age and sex to the experimental group. The control group received the same imaging protocol, twice and 8 times. Weeks apart. The experimental group benefited from intensive rehabilitation (1 to 2 hours a day for 8 weeks). MRI was obtained during rhyme and judgment on written pseudo-words, thus calling upon systems involved in the phonological processing. The results demonstrated very significant progress in dyslexic subjects who participated in the treatment. Study found before intervention a lack of activation, in dyslexic children, compared to children of control group, in the upper left temporal region, with in some cases an abnormally large activation of the symmetrical region on the right hemisphere. A Once the training program is completed, dyslexic children have demonstrated normalization with the control group, i.e. reactivation of the temporal gyrus supper left and decreased activity in the right hemisphere (Simons & al., 2002).

#### 5.1.2 The study of Kujala and Naatanen:

Kujala and Naatanen's research (2001) consisted of developing a program audio — graphic training in a population of dyslexic children, all aged 7 years old. The researchers selected 48 dyslexic children. The subjects were divided equally at random into two groups: the experimental group and the group control. The training of the experimental group consisted in the exercise of a video game lasting 10 minutes, twice a week, for a period of 7 weeks. This video game allowed the learning of an association between sounds having various characteristics (of height, intensity or duration), and a graphic representation of these sounds (in the form of lines, size, thickness and different position). Thus, this re-education program promoted transcription training auditive-graphical without using a linguistic, auditory or visual element. Children who participated in this program were subject to a recording of potentials hearing evoked (MMN). The results of this research have shown that the group significantly differed from the control group in reading activities of words, and this, only after auditory-visual training. The study also revealed, in the experimental group, an increase in the amplitude of the potential evoked between the first and the second recording. These data suggest that this training has changed the brain organization underlying the processes, possibly cortical, hearing discrimination (Kujala &Naatanen, 2001).

#### 5.1.3 The study by Temple et al:

During the same period, a study using magnetic resonance imaging (lRM) has experienced time-based training. Temple et al. (2003) have proposed to 20 dyslexic children aged 8 to 12 years and to 10 control children of the same age a phonological training. The proposed task was to say, if two letters rhyme, like “b” and “d” or do not rhyme, like “f” and “j”. According to these authors, the initial analysis confirms (1) that this phonological task mobilizes, in children “Normal reader”, areas close to those used for reading, mainly a posterior frontal area (Broca area) and an upper temporal area (area of Wernicke), specifically in the left hemisphere and, (2) that these two areas

are under activated in dyslexic children. Dyslexic children have an MRI after a few weeks of rehabilitation with Fast-For-word. The results have demonstrated reactivation of the left hemispherical areas originally under activated. In addition, the study revealed activation of the right hemispherical area, so that she was not there before the reeducation program, just like for the children witnesses. The authors concluded (1) that entrainment of a phonological process the deficit restored the functioning of areas in the hemispherical area left of the language, and (2) that the recovery of the deficit favored the establishment of compensatory right hemispherical zones (Temple & al., 2003).

### 5.1.4 Simultaneous Multisensory Education (E.M.S.):

Simultaneous multisensory teaching (E.M.s) is based on Orton's thinking. This program was developed by the Canadian Center for Dyslexia. The E.M.S. is a language rehabilitation method for dyslexic children of all ages. The E.M.S. method aims to teach reading, writing and spelling in advocating the accuracy of reading. It was developed from direct experiences in the classroom. Brazeau Ward (2003) summarizes Orton's program. This method includes lessons with related objectives. The material is presented in the form of stages short and sequential. Tables 4 and 5 provide an overview of the proposed activities as part of this program. The E.M.S. method has many advantages. It is intended for children of all ages and various grades. This rehabilitative approach allows a rapid intervention with dyslexic children, as it can be offered as soon as first school year. The E.M.S method can be taught to children not First-year dyslexics as a preventive measure for academic failure in reading. He is possible for the clinician to obtain this program, which includes all the material rehabilitation.

**Touzin's program:**

The program designed by Touzin (2000) has developed a rehabilitation program adapted according to the type of dyslexia in children: dysphonetic dyslexia, dyseidetic dyslexia and visual-attention dyslexia. According to Touzin (2000), rehabilitation can be design from two possible avenues. The first avenue is to improve the phonological awareness in order to work on grapheme-phoneme conversions, and so strengthen reading by the assembly route. The second avenue is to develop the visual orthographic lexicon, to perfect the rapid recognition of words. These two avenues must be worked together and cannot be mutually exclusive mutually. According to the researcher, the re-education of the grapheme-phoneme conversion must be considered during phonological processing disorders. Indeed, a portion of the phonological awareness and phonological segmentation skills and manipulation is considered a prerequisite for acquiring the rules of grapheme-phoneme correspondence in alphabetical code. Rehabilitation of learning a visual vocabulary is also important. Some children dyslexics have a deficit in creating an orthographic image or a deficit in the ability to find a name code (evocation) which can hinder learning a visual vocabulary. This program has some advantages, here is an overview. This approach rehabilitation stems from clinical experiences of speech-language pathologists working with children struggling with a written language disorder. Rehabilitation is adapted according to the type of dyslexia that the child presents. The activities are varied and aim to improve the phonological awareness and allow developing the visual orthographic lexicon, two essential elements for learning to read. However, Touzin (2000) does not specify the age of dyslexic children who can benefit from this re-education. We also do not know if it is possible to obtain the activities used in this program to experiment with other dyslexic children. For research advances, it would be interesting to assess the effectiveness of this rehabilitative approach through standardized tests recognized by the community scientist. (Touzin, 2000)

### 5.1.5 Valdois and Launay program:

Valdois and Launay (2004) developed a program for struggling children with surface dyslexia or dysorthography. Their program is based on the theoretical two-way model of reading. The authors have divided their program into five separate parts: (l) processing capacities visuo-attentional, (2) orthographic knowledge, (3) sequence analysis of letters, (4) spelling, and (5) specific activities at the end of rehabilitation. The first part of this program offers a training of visuo-attentive treatment. Some research has shown that children with experiencing surface dyslexia frequently had trouble in target finding tasks among distracters (test: Treisman's Paradigm) when the condition is said to be "attention" (Valdois S., 2004). So, the as soon as the target is indistinguishable from the distracters by an obvious visual trait when searching. As part of the rehabilitation program, authors have created visual tracking exercises. It is about looking for a target among distracters, which can be verbal or non-verbal. Material can be structured (presentation in rows or columns) or unstructured (random presentation). According to the authors of this program, an organized presentation of the material is not very facilitating for these children because they are not inclined to spontaneously use scanning by rows or by columns when locating a target among distracters. The training consists in asking the children to analyze the general organization of the drawing and trying to identify the most effective visual scanning strategy according to the material presented.

He authors of this program offer sequence-processing exercises. The objective of these exercises is to train children to find fixed sequences and predefined items appearing within a longer sequence. Writers claim that children with surface dyslexia usually have a window visuo-attentional reduced and fail to process a number in parallel enough consecutive items. Thus, these exercises would improve the capacities of children to process a greater number of letters of a word in parallel (Valdois & Launay, 1999).

**Conclusion:**

Dyslexia is that disability or defect in one of the processes or at a stage of that successive reading process, whether it comes to the phonemic or direct graphical transformation or in the indirect or lexical path of attention which depends on memory or the two tracks together or another path that has not been touched To him after this imbalance, he is permanently in an evolutionary situation, and in it, an ordinary intelligence greater or equal to 70 with normal learning and friction with reading is required for two years, that is, after the end of the second year of learning to read systematically. This definition remains in constant diligence and a change towards development, as it is accompanied by a change and development in diagnostic tools, treatment and rehabilitation programs. We say that the importance of reading is very great, as it is the key to science, learning, knowledge and development.

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