

# Diagnostic Assessment and Treatment of Reading Difficulties: A Case Study of Dyslexia

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Dyslexia is a specific learning disability in reading and writing, which requires adequate early intervention to prevent future school failure. We describe the diagnostic assessment of a 7-year-old boy labelled “dyslexic”, the evaluation of his family, social, medical, developmental, and academic status as a preliminary for the design and implementation of a personalized intervention programme. The diagnostic evaluation shows a poor performance in written language, especially in accuracy reading and spelling and reading fluency, making more mistakes in the tests of TALE than normal readers of first level of primary education, and needing consolidate and automate the most of graph-phoneme correspondences. The intervention program continued to be characterized by individual attention, structured and focused on written language, which aims to improve the educational needs that the student has in reading and writing. The teaching and learning experiences that take place following a multisensory approach, which combines the modalities visual, auditory, kinaesthetic, and tactile, in a context of written language as natural and meaningful as possible. After 30 weeks of thrice-weekly sessions, the student has achieved significant improvement in both reading and writing, reducing the number of errors in accuracy and fluency, and improved spelling and joints and fragmentation of words in their written compositions. This progress in the tasks in which previously the child experienced failure demonstrates the effectiveness of the program.

*Keywords:* intervention programme, dyslexia treatment, reading and writing recovery

## Introduction

Suárez (1995) and Outón (2004) recommended that the diagnostic assessment and treatment of pupils categorized as dyslexic be approached from a broad interdisciplinary perspective adapted to the resources typically available in schools. The treatment of dyslexia is thereby brought within the scope of curriculum adaptation. In this paper, we describe how the treatment of dyslexia in a 7-year-old boy, Pedro, was carried out by means of a personalized intervention programme designed on the basis of a broad preliminary evaluation of the boy’s family, social, medical, developmental, and academic situation.

## Diagnostic Assessment

### Initial Request for Aid

When Pedro was seven years old, his mother was referred to the Paediatric Psychiatry Section of a local hospital by the staff of the private school he attends, and at that time, he was in the second year of primary

education. She quoted his teacher as follows: "Pedro muddles letters and writes them backwards. I think he has dyslexia, because none of the other children in his class do what he does. For example, he writes *pader* instead of *padre* (father), *garbadina* instead of *gabardina* (raincoat)". The case was passed to one of the authors (Outón), a habitual collaborator of the Paediatric Psychiatry Section in question.

### **Background**

We first collected information on Pedro's medical and developmental status and his situation in his family and at school. He was the only son of a 27-year-old father (an electrician) and a 28-year-old mother (a home help), both of whom had completed primary education (i.e., up to 14-year-old). The family lived with the mother's parents in a peripheral area of their town until Pedro was five years old and in his second year of preschool education, when they moved to their own flat in the town centre. Pedro has his own room, but sometimes does his homework in the kitchen so that his mother can help him. Both Spanish and Galician are spoken at home. Pedro's parents are not habitual readers, and never buy books, magazines, or newspapers. Pedro is not addicted to television (he watches cartoons while having his breakfast, and from time to time, a film, but no more); he prefers to ride his bicycle, play video console games, or play football with the other boys of the neighbourhood. According to his mother, his parents neither practice corporal punishment nor give him presents in reward for any particular kind of behaviour.

Pedro was born by Caesarean section with a foetal age of almost nine months and a weight of 3.2 kg. He began to walk at age 10 months, and was toilet-trained by the age of two years. When he began to talk, at an age of about two and half years, only his parents understood him. At age of three, he underwent adenoidectomy following frequent colds that, according to his mother, were often accompanied by otitis. By age of five, he dressed and washed without help. At the time of our investigation, he had received all the standard vaccines, and the only common disease of childhood that he had had, apart from colds and/or influenza, was chickenpox. He was a fussy eater with a poor appetite. He is right-handed. His mother recalled that until the age of about two years, he had had difficulty in sleeping (having to be put to bed after falling asleep in his mother's arms, and often waking in the middle of the night), and had been very dependent on his mother, crying when left with strangers.

Pedro started preschool at age of four, and has always attended the same centre. He began to be taught reading and writing in Spanish at age of five, in his second and final year of preschool (it was impossible to ascertain the methods and materials used). According to his mother, his last preschool teacher was very strict and demanding. Whenever Pedro failed to finish a task, he was punished, and sometimes smacked. On occasions, his mother had joined him in the classroom after class to help him finish a task.

His school report at the end of his first year of primary education noted a need for improvement in language (taught using a book with worksheets and handwriting exercise books) and in mathematics. His mother recalled that his teacher for that year had said that he did not finish his tasks like the other children, that he often muddled letters, and that he might have some degree of dyslexia.

When our involvement with him began, Pedro was in his second year of primary education. Of his 25 classmates, two had learning difficulties, though in both cases these were different in kind from Pedro's. Teaching was carried out in Spanish with the help of standard commercial school books. In language classes, the children typically read to themselves and then read aloud and answered the teacher's questions. Often, they also acted out the text read, or drew pictures to illustrate it. Other activities included text copying, dictation, and

making up endings for a half-finished story. According to Pedro's teacher, he was very hard-working but took longer than others to complete his tasks, which he sometimes had to finish during playtime or at home. He also failed to express himself clearly, sometimes answering questions with unexpected or strange utterances; had difficulty with multiplication tables and elementary arithmetical operations; and found it hard to learn basic concepts. He liked drawing and physical education, attended class regularly, and got on well with his classmates.

Examination of his workbooks (the language class book, handwriting exercise books and a general exercise book usually used for dictations and copying) showed that his most frequent writing errors were repetition of the word "y" ("and") (when asked to describe small-town fiestas he wrote "vonitas ay churos y al gon ya niños yai bombillas" ("nice, there are 'churros' and candyfloss and boys and girls and there are lights")); omission and replacement of letters ("Migel copro unas cerezas y una gitara" for Miguel compró unas cerezas y una guitarra); word splicing and word splitting ("Padro y pablo en piesa la li breta. Eduardo ciereser campeón" for "Pedro y Pablo empiezan la libreta. Eduardo quiere ser campeón"), and ambiguous formation of small "s", "z", "a", and "o".

Pedro had received no specific psychopedagogical evaluation, and at the beginning of our study, had never been given any systematic recovery programme.

### Initial Test Results

**Reading and writing test results.** Pedro's reading speed, measured with EDIL-1 (Exploración de las dificultades individuales de lectura-Nivel/Exploring the individual reading difficulties-Level 1), was 52-53 words per minute (wpm). In TALE (Test de análisis de lectoescritura/Analysis test of the literacy) tests, he took considerably longer than normal for second-year primary school children. He appeared to have difficulty in comprehending texts, but not in comprehending written commands or isolated sentences. Reading accuracy errors included the followings:

(1) On identifying isolated letters aloud, he mistook "j" for "g", "w" for "m", "l" for "i", "ch" for "h", "v" for "b", "k" for "q", and "z" for "c". He also had to correct himself in identifying "y" (first confused with "i"), "x" (z), "r" (r), "c" (first pronounced "ka") and "f" (first pronounced "fe"), and was very slow in identifying letters belonging to symmetrically related pairs (b/d, p/q);

(2) Mistakes made on reading isolated syllables included reading "og" for op, "bin" for "din", "dor" for "bor", "od" for "ed", and "bru" for "pru". Consonant-vowel and vowel-consonant pairs were inverted (e.g., "tra" for "tar", "deir" for "dri"). "Ib" and "bra" were read hesitantly;

(3) Most word-reading errors were "minor", consisting in hesitancy, self-correction or repetition: "balcón" was read "bal-cón", "gitano" was "guitano-gitano", and "mediodía" was "me-medi-mediodía". The "major" errors committed consisted in reading "daba" as "baba", "pala" as "palo", "coma" as "cama", "carro" as "caro", "cebra" as "cerda", "frutero" as "furtero", "sable" as "sabe", "sello" as "seño", "clavel" as "clave" and "montaña" as "nuntaña";

(4) In reading EDIL-1 and TALE texts aloud he added words, omitted words (e.g., *tiró*) and replaced words with others (e.g., *molino* with *molinero*, *decía* with *dice*, *contento* with *convento*, *como* with *comió*, *todo* with *toda*, *en* with *y*). He followed the text read with his finger. Recordings exhibit excessive pauses between one word and the next, a tendency to read polysyllabic words one syllable at a time (e.g., "pun-titos", "pro-vi-siones", and "ata-ata-re-adas"), hesitation, a monotonous sing-song diction, and no notice being taken

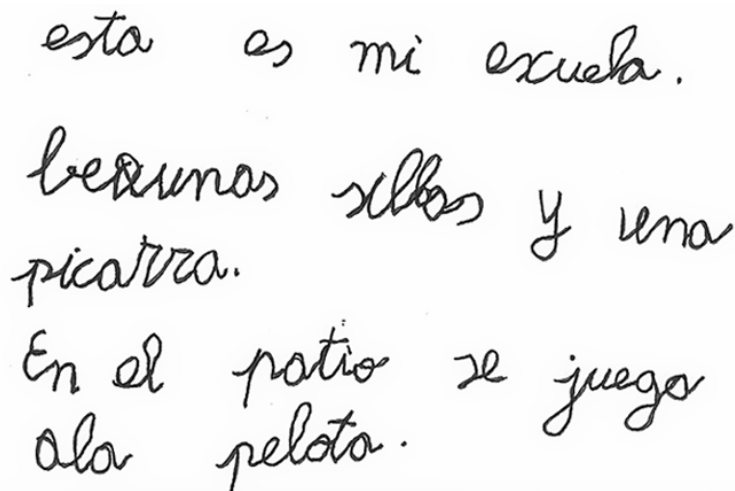
of punctuation.

In writing accuracy tests, the following mistakes were made:

(1) In copying words, the syllables *tar* and *pir* were written “*tra*” and “*pri*”, respectively, *dromedario* was written “*dromdario*”, *biblioteca* “*biblitesa*” or “*biblioleca*”, *niñas* “*miñas*”, and *suburbios* “*suburdios*”;

(2) In both the dictation test and spontaneous writing, many spelling and punctuation mistakes were committed, including h-dropping and h-insertion, writing “*i*” for *y* (or viceversa) or “*b*” for “*v*” (or viceversa), inversion of letters (“*em*” for *me*), writing small letters instead of capitals after a full stop, and omitting or misplacing accents. Words were run into each other or split in two (“*beounas*”, “*seabia*”, and “*ala*” in the dictation test; “*alos*”, and “*emgus tan*”).

As Figure 1 illustrates, Pedro’s handwriting was generally large, but irregular in both size and spacing. He also failed to differentiate properly between “*a*” and “*o*”, or between “*s*” and “*z*”, and he replaced the dot of “*i*” with a stroke.



esta es mi escuela.  
beounas xibos y una picatza.  
En el patio se juega ala pelota.

Figure 1. TALE Level 1 dictation performed by Pedro during initial evaluation (December, 2010).

**Tests of lexical versus phonemic reading.** Pedro was asked to read aloud and write from dictation lists that contained both familiar words and matched pseudowords. In the oral reading task, he read known words better than words whose pronunciation he had to construct by phonological interpretation of the written symbol. The dictation results appeared to confirm his difficulty with “natural spelling”.

**General intelligence.** Pedro’s centile score on the RAVEN (Escala CPM-Color/Colored Progressive Matrices) test was 60, slightly above the mean for his age group.

**Specific diagnostic tests for dyslexia.** Pedro’s centile score on the reversal test was 98. In other words, he had no difficulty in discriminating perceptually between left and right, or between related distinctions, and was, therefore, theoretically mature enough to learn to read. On the Spanish version of the Bangor Dyslexia Test (Outón, 1996; 2010), he scored positive for dyslexia on 6.5 of the nine items administered, giving typical dyslexic responses, such as looking at his hands when asked to distinguish right from left, using his fingers in the subtraction exercise, and muddling months with seasons and weather conditions. Although the Bangor test is not definitive for children of Pedro’s age (seven years four months at the time the test was administered), these results clearly indicated a diagnosis of dyslexia when considered in conjunction with all the other information noted above.

### **Summary of Educational Strengths and Weaknesses**

Pedro's special educational needs were identified as concerning reading, writing and mathematics (the latter not discussed in this paper). More specifically, in the areas of reading and writing, he needed to improve accuracy, consolidating automatic phonemic interpretation of all letters except "e", "u", and "t", and vice versa:

- (1) acquire the ability to write short compositions without splicing or splitting words, forming morphosyntactically correct sentences separated by full stops;
- (2) improve his reading aloud as to rhythm, intonation, speed, and fluency;
- (3) improve metalinguistic competence, i.e., the ability to check and correct his/her own writing and oral reading;
- (4) gain self-confidence as to his ability to perform reading and writing tasks successfully.

As positive qualities, we noted his willingness to take pains over his work, the care with which he treated his school material, his enjoyment of drawing and physical education, and his good adaptation to school in general.

### **Intervention**

It was decided that one of the authors would give Pedro a personalized reading and writing recovery programme composed of three one-hour sessions each week, with a pupil/teacher ratio of unity. The programme would be carried out in Spanish, would concentrate on reading and writing tasks rather than on associated neuropsychological factors, and would adopt a slow and highly structured approach. We expected that considerable progress could be achieved within approximately six months.

### **Programme Design**

To achieve the first of the goals noted in summary of educational strengths and weaknesses, we used the multi-sensorial methodologies of Outón (2004; 2010). We also tried to increase awareness of phonemes and the ability to divide spoken or heard words in proper sequences of phonemes. It was expected that it would take 4-6 sessions to consolidate each letter-phoneme correspondence.

For the second goal, improvement of written composition, we began with three- or four- word sentences suggested by Pedro himself. Given each sentence, he first had to divide it orally into individual words (with the aid of his fingers, if necessary), then to compose it on a steel sheet using magnetized letters, then to copy the composed sentence in writing, and finally to write it without the model with the help of the following explicit protocol: "Think it, say it aloud, capitals for the first letter and in proper names, full stop at the end, revise it" (in pursuit of the fourth of the goals, this kind of protocol was also used to increase meta-cognitive awareness in relation to other linguistic tasks). As time went on, the complexity of the sentences was increased.

Initially, the texts used as exercises in reading aloud were also very simple, consisting of about 40 words (e.g., the stories of the series "Poquito a poco"). Texts of progressively increasing difficulty were subsequently taken from the series "La sirena, Sapo y Sepo", "El tren azul and El barco de vapor". We always endeavored to choose texts that would be of interest to Pedro. These exercises began with the instructor reading the text to Pedro very expressively (Sepúlveda, 1996; Rasinski & Padak, 2000; Rasinski, Homan, & Biggs, 2009), taking great care over pronunciation, oral punctuation and intonation. This was followed by discussion of the content of the text (and of any associated illustrations), including discussion of the vocabulary used and of how the story would continue. Pedro then read the story aloud himself while being tape-recorded, listened to the recording and pointed out his mistakes, and read it aloud again, faster, and making every effort not to make

mistakes. At home, he read it a third time to his parents.

As well as programming, the above exercises in written composition and reading aloud, we also paid special attention to the words and phrases that Pedro found the hardest to learn, compiling a “cacographic/cacolexic vocabulary” (Suárez, 1995, pp. 178-180).

Finally, to improve Pedro’s self-confidence, we supplemented the above exercises with reading and writing tasks that he would be able to perform successfully (Chapman & Tunmer, 1997), unstintingly praised successful performance, encouraged his parents to pay more attention to him, and sometimes let him choose the book he was to read at home.

### Implementation and Evaluation of Results

The implementation and progress of the programme sketched above were recorded during each session using “ad hoc” worksheets on which Pedro’s performance of each task was described and the problems evinced were noted (see Table 1). On the basis of these records, minor changes were introduced dynamically into the programme in areas in which particular difficulties were observed.

Table 1

#### *Translation of a Typical Educator’s Worksheet*

Week 8		Date: 25/2/2011
Goals	Activities	Performance
1	Activities with /θ/. Revision of pronunciation of /θ/with “a”, “o”, and “u”. Ditto with “e” and “i”. Classification of previously studied words according to the presence of “za”, “zo”, “zu”, “ce”, and “ci”: cebolla, ciclista, zapatero, encerado, bicicleta, azucarera, zorro, zueco, zona, lazo, pecera, cepillo, sucio, trozo, pinza, ciudad, zumo, plaza.	(Ok) (Ok) (Classification Ok. Wrote “ciquilsta” for ciclista, “vicieleta” for bicicleta, “corro” for zorro, “pineza” for pinza).
3, 4	Reading from En la cocina. I read first, very expressively. We discuss the drawing and the meaning of the text. Pedro reads and is taped and timed. We listen to the tape and discuss the mistakes. Pedro reads the text again, faster.	(First time, 2’57”; second time, 2’20”). (Read “bizcocho” for bizcochos, “cocina” for canción, “tis” for zis, “a-ceite” for aceite, “tiznado” for tiznado. Inserted and omitted the conjunction “y”. Repeated the sentence “Qué hace falta”). (Read “tiz-nado” for tiznado again. Corrected himself upon reading “en” for “es”).
2, 4	Dictation of the reading text of the previos session (El niño tiene un cigarro. El cigarro está encendido), practicing “Think it, say it aloud, capitals for the first letter and in proper names, words properly separated, full stop at the end, revise it”. Cut out the words of the text, order them and paste them on blue card.	(Ok, no spelling mistake. Left too much space between “un” and “cigarro”). (After cutting the words out, he repeated the sentences to himself under his breath as he ordered them).
1, 3, 4	Homework: to read En la cocina to his parents and to look in the text for words with “za”, “zo”, “zu”, “ce”, and “ci”.	

In August 2011, after 30 weeks’ work (90 sessions), a general evaluation of Pedro’s progress was carried out using some of the reading and writing tests initially applied during diagnosis, plus Level 2 of De la Cruz’s (1988) reading comprehension tests (Pruebas de lectura/Readings tests) and the WISC-R (Escala de inteligencia de Wechsler para niños-revisada/Wechsler intelligence scale for children-revised). Table 2 summarizes the errors made, before and after intervention, in the TALE syllable reading test and in reading pseudowords aloud. In the reading comprehension test, Pedro’s score of 96 was well above the average for second year primary

school children (96 is the 90th centile). The WISC-R results reflected average intelligence: verbal IQ 99, performance IQ 106, total IQ 102. Improvement in reading and writing accuracy was shown by the reduction in the number of errors in the TALE, in reading aloud, in the writing of dictated words and pseudowords, and in the absence of deviation from “natural spelling” in dictations (see Figure 2). Written composition had improved substantially as regards natural spelling, punctuation, and word splicing and splitting; and the tape recordings made during the later work sessions showed marked improvement in reading aloud as regards intonation, rhythm, punctuation and speed. Pedro had, moreover, acquired the habit of taking great care over his reading and writing tasks, taking time at the end to revise them and correct them if necessary. It was assumed that he had gained in self-confidence.

Table 2

*Performance in the TALE Syllable Reading Test and in Reading Pseudowords Aloud at Inicial Evaluation (December 2010) and in August 2011*

Tale syllable reading test			
Errors/time	December 10	August 11	Remarks
Substitutions	2	-	The number of errors, initially much greater than the mean for Level 1, fell below the mean for Level 4. Speed increased from about Level 1 to Level 3.
Rotations	3	-	
Additions	1	-	
Corrections	1	-	
Hesitation	2	-	
Total	9	0	
Time(s)	27"	18"	
Pseudoword reading test (Comparison of whole-word and grapheme-phoneme conversion routes)			
Errors/time	December 10	August 11	Remarks
Substitutions	4	1	The number of errors was halved, and most of those made in August 11 were minor. Speed increased slightly.
Rotations	1	-	
Additions	1	3	
Corrections	1	-	
Hesitation	3	1	
Total	10	5	
Time(s)	37	29	

*El patito feo*

*Una vez en un corral, nacieron juntos ocho patitos muy bonitos pero uno era muy feo. Tan feo era que sus hermanitos no lo querían y con frecuencia se reían y se burlaban de él. El patito feo estaba muy triste. Su mamá trataba de consolarlo pero él al verse despreciado decidió marcharse al bosque.*

Figure 2. Dictation (Mesanza, 1991, p. 184) performed by Dámaso in August 2011. Each sentence was first read completely, and then phrase by phrase.

In spite of this progress, Pedro had to repeat Grade 2. However, at the end of the first term (2011, December), his end-of-term marks showed adequate progress in all areas, and the first time this had happened. His mother's comment was: "It would be worth giving him a pass from time to time just to see the look of happiness on his face when he showed me his school report".

### Final Remarks

In this work, we treated a second-year primary school pupil for a reading and writing problem of the kind usually classified as "developmental or true dyslexia". We began by examining not only the pupil's writing performance, but also his family background, situation at school and medical history. We then designed a personalized intervention programme concentrating on reading and writing tasks rather than on the associated neuropsychological factors (body scheme, handedness, perception, etc.) that have traditionally been addressed in the treatment of dyslexia. A multi-sensorial methodology was adopted for the teaching of letter-phoneme correspondences, and slow, sure progression was sought with strongly structured, sequenced tasks using materials with which the pupil was not familiar. The programme was implemented in one-to-one classes allowing the educator to pay attention to the pupil's strategies and monitor his performance closely.

At present, Pedro continues to receive individual classes designed and given in the same spirit as the initial programme described in this paper. Our current expectation is that within about six months, his performance will have reached the mean for his school class.

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