Dyslexia in Spanish: the state of the matter

Francisca Serrano and Sylvia Defior

Dept. of Developmental and Educational Psychology, University of Granada

Spain

fdserran@ugr.es

Abstract

Dyslexia is a persistent problem in written language, consisting of a severe difficulty in word recognition. It is characterized by low reading performance, while other skills are not impaired, being normal or even superior in some cases. This paper reviews different proposals for defining and clarifying causes of dyslexia. Additionally, we comment on the heterogeneity of dyslexia as being characteristic both among different populations and in different languages.

Keywords: *dyslexia, transparent orthographic systems, Spanish, written language.*

Introduction

Both oral and written language constitute fundamental human abilities, as such they have been under investigation from the earliest periods of psychological research. The use of oral language as an instrument of communication makes us a unique species, while the development of written language is responsible for our species' development in the cultural area (Wolf, Vellutino & Gleason, 2000b). Reading, as the ability that enables processing of written language, is inseparable from this development, and therefore awakens interest parallel to that of language itself. Additionally, research about reading is justified because of the frequency, presence and importance of this skill in daily life in our society.

Study of the acquisition of reading skills is also of interest as a precursor to analyzing situations where we find difficulties in learning to read, such as dyslexia. Dyslexia is a persistent problem in written language, characterized by a severe difficulty in certain otherwise normal individuals to identify written words. It may appear when the person has already learned to read and write, as a consequence of a brain injury; or, it may be manifest before a child has learned to read, causing great difficulty in learning to read and write, and its origin may lie in constitutional deficiencies. In the first case we speak of acquired dyslexia and in the second, developmental dyslexia.

Dyslexic children begin to have problems as soon as they begin systematic instruction in reading; for them learning to read becomes a barrier to academic and personal development and thus a point of concern for parents, teachers and for the children themselves, as they continue to grow and do not find the answer to their problems. Their performance suffers in all school subjects where reading is necessary; furthermore, the children begin to reject reading and to devote themselves to other tasks that bring greater satisfaction, producing a vicious circle known as the Matthew effect (Stanovich, 1986). Their academic progress is conditioned by these difficulties, and their choice of profession may be largely determined due to this same reason. Intervention for improving their problems should be based on characteristics presented by dyslexic children, and on the underlying causal factors which explain their characteristic deficits.

Defining dyslexia

Conception of this problem has been the object of debate; thus, different definitions have appeared over the last decades.

A classic definition is the one proposed by the World Federation of Neurology in 1968. According to this definition, dyslexia is a problem characterized by a deficit in learning to read, despite the fact that the children receive a normal education, possess normal intelligence and have adequate sociocultural status. The definition also implies that these problems would be caused by basic cognitive deficits with a constitutional basis.

This definition is based on exclusion criteria and on the discrepancy between reading skill and general cognitive skill, that is, IQ. In this vein we find another of the definitions most recognized in the literature, that proposed by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 1995). According to this conception, the reading disorder, which falls under learning disorders, is characterized by reading performance (that is, reading precision, speed or comprehension as evaluated by normalized tests administered individually) which is substantially lower than what is expected as a function of chronological age, intelligence quotient, and schooling typical to the child's age.

Some studies have questioned these definitions of dyslexia which are based on discrepancy, and, in reference to IQ as a cutoff, they have demonstrated that dyslexic persons have the same problems with written language without taking IQ into account (Jiménez & Rodrigo, 1994; Siegel, 1990). Similarly, these definitions restrict the deficit only to the lim-

ited, specific realm of the cognitive system (see Frith, 1997; Frith 1999), when it is already well established that deficits in dyslexia are seen in several aspects of phonological processing (Hoien & Lundberg, 1997; Snowling, 2000).

For this reason, other definitions have arisen which recognize the distinctive characteristics of dyslexia and which avoid the limitations of earlier analyses. Hoien and Lundberg (1991) proposed a definition which can be summarized as follows: "dyslexia is a disability in the use of the written language code, based on a deficit in the phonological system of oral language".

Finally, consensus was reached with the definition proposed by the Orton Society for Dyslexia (now the International Dyslexia Society) in 1994, and later, by the National Institute of Health. This definition can be summarized by saying that dyslexia is a problem specific to language, with a constitutional basis, characterized by difficulties in decoding simple words and reflecting insufficient phonological processing skill. Several important aspects can be noted from this definition. First, it focuses on the level of word recognition; second, it holds a modular view which implies that the inadequate functioning of one system (in this case phonological processing) is possible, while other more general cognitive systems remain intact. It is also notable that the definition does not rely on IQ to determine dyslexia problems, but precisely on concrete difficulties that the problem brings with it (decoding, phonological processing).

These aspects make this definition one of the most accepted. Nonetheless, controversy continues among authors (Lundberg, 1999) as to which concrete problems are most important in defining dyslexia or what factors best explain these difficulties.

What causes dyslexia?

The definition of dyslexia is not the only point of disagreement in dyslexia research. Another point of divergence among authors relates to the causal factors of dyslexia. Many causes have been indicated as possible explanations for deficits found in dyslexia, ranging from the most biological to other more linguistic ones.

Probably due to influence from current research tendencies, we find genetic theories among the biological causes. Research focused on family studies and with twins (DeFries, Alarcón & Olson, 1997) suggests the hereditary character of dyslexia, while other research tries to determine what genes are at the root of the problem. The involvement of certain

chromosomes is considered, although the data are not conclusive (Fargerheim, Tonnessen, Raeymaekers & Lubs, 1999; Olson, 1999).

Another kind of biologically-oriented research tries to find the cause of dyslexia in the brain, based on differences found both in structure and in function of the brain of dyslexic persons vs. others without reading problems. In this area, studies by Galaburda, Corsiglia and Rosen (1987) are most notable; they found differences in the Planum Temporale and in magnocellular cells of the thalamus in postmortem analysis of dyslexic brains. Likewise, studies by Fawcett and Nicholson (2001) find both functional and structural differences between the cerebellums of normal and dyslexic persons. Finally, studies by Stein and Walsh (1997) indicate the importance of magnocellular cells in reading, basing themselves on studies that find that brains of dyslexic persons have fewer of these cells than those of normal persons.

Other research has looked for more cognitive explanations, having to do with processing modules which are considered key to reading. These explanations include studies which appeal to a phonological processing deficit (Lundberg & Hoien, 2001), others which define visual processing as the origin of the problem (Pavlidis, 1981), or fast processing of stimuli (Hari & Renvall, 2001; Wolf, 1991; Wolf, Bowers & Boddle, 2000a), temporal processing (Tallal, 1984; Farmer & Klein, 1995, for a review), the ability to automate processes involved in reading (Van der Leij & Van Daal, 1999a, 1999b), or even the existence of an attention deficit as the basis (Hari, Valta & Uutela, 1999; Facoetti & Turatto, 2000; Facoetti & Molteni, 2001).

We will highlight three of these explanations, due to their level of acceptance in the research community and their presence in scientific literature: (1) phonological deficit hypothesis, (2) visual deficit hypothesis, and (3) automatization deficit hypothesis. These are briefly reviewed below.

Visual deficit hypothesis

This theory maintains that a deficit specific to the visual processing system is the main underlying cause of dyslexia. One of the first influential theories regarding dyslexia was offered by Samuel Orton in 1925, who already was advocating a relationship between dyslexia and the visual system. Orton proposed that the cause of the problem lies in a dysfunction in perception and visual memory, characterized by a tendency to see letters and words inverted

(e.g. b instead of d; on instead of no). Other more recent theories along these lines have explained dyslexic deficits as a problem in the oculomotor system (Pavlidis, 1981).

Currently, these ideas are no longer maintained exactly as they were formulated, but the relationship between the visual system and dyslexia is considered to be important. New formulations of this hypothesis hold that dyslexia is caused by a specific deficit in the tranferral of sensorial information from the eyes to the primary areas of visual processing in the cortex. Studies which have compared the execution of dyslexic and normal children in processing stimuli have found evidence of this (e.g. Hogben, 1997). For example, it was found that the inter-stimulus processing interval in dyslexic persons is longer than in normal persons, so that when a second stimulus is presented, they may still be processing the previous one, and therefore be unable to dedicate cognitive resources to the new stimulus.

These ideas are supported by a neural substrate which research has located in the magnocellular cells of the visual system (Stein & Walsh, 1997). Cognitive and perceptual processing in the brain, to which information received from the eyes is transferred, is formed by two parallel systems which have different functions in visual perception: the parvocelular system and the magnocellular system. The former addresses visual processing of colors and details, the latter addresses global processing of the environment, especially in the case of brief sensorial input, such as in detecting movements, and in reading.

Research has shown that dyslexia may be associated with a deficit in the magnocellular system. Galaburda, Rosen and Sherman (1990) found clear differences in the magnocellular system between dyslexic and normal subjects, while these did not appear in the parvocellular system.

Phonological deficit hypothesis

This is the most accepted hypothesis in the literature for explaining deficits found in dyslexia. According to this hypothesis, dyslexia is caused by problems in the phonological system of language processing. These problems lead the individual to have difficulties in using the alphabetic code to identify words (Hoien, 1999). In effect, comprehension and acquisition of the alphabetic code require an ability to segment the chain of speech into phoneme-size units, and to match them with their written representation.

Phonological difficulties of dyslexic persons are seen not only in their segmentation problems, but also (a) in the repetition of non-words, especially if they are complicated and

contain unusual combinations, (b) in reading non-words and in writing them in dictation, (c) in problems with short-term visual memory, and (d) in attention problems and difficulties with fast naming (Wolf, 1991), especially with colors, objects and letters.

Neurological studies have also found indications in the brain which support a phonological deficit hypothesis. In most persons the left hemisphere controls language functions. Within this hemisphere, certain areas are more critical than others for reading. Recently developed technology has made it possible to observe brain images (MRI, fMRI, PET) and brain activity registered while the subject carries out different kinds of tasks (Posner & Raichle, 1994). Several studies show differences between dyslexic subjects and normal subjects in the function of brain areas involved in reading (Posner, Abdullaev, McCandliss & Sereno, 1999; Posner & McCandliss, 1999; Paulesu et al, 2001).

Automatization deficit hypothesis

Although there are doubts as to the role it plays in basic skills like reading, automaticity is considered to be a key characteristic in skilled reading. In fact, learning to read can be interpreted as learning to automate the skills of recognizing and identifying words (Van der Leij & Van Daal, 1999a).

In recent years, one sector of dyslexia research has focused on the study of automatization of reading, with the objective of exploring other difficulties which characterize dyslexia. This perspective of study looks at problems which dyslexic persons have in making reading processes automatic. This issue may make word recognition slower and clumsier, which in turn affects comprehension (e.g. Bowers & Wolf, 1993; Wolf, 1991; Wolf & Bowers, 1999; Wolf et al., 2000a). A general reading automatization deficit has been indicated in dyslexia, and has been seen in many jobs with different tasks (Nicolson & Fawcett, 1990, 2001). Dyslexic persons show automatization problems in fast naming both with linguistic stimuli such as letters, as well as with non-linguistic stimuli such as colors (Bowers & Swanson, 1991), such that the fast naming of all kinds of stimuli becomes the index of reading automatization and fluency. For a review of automatization problems in dyslexia, the reader is referred to the recent article by Savage (2004).

In general, it seems that the reading execution of dyslexic persons does not reach the level of relatively attention-free automaticity which is developmentally normal (Van der Leij & Van Daal, 1999a). On the other hand, the automatization deficit is not limited only to the

area of reading, but can be observed in other areas of functioning, for example at the motor level (Wolff, Michel, Ovrut, & Drake, 1990).

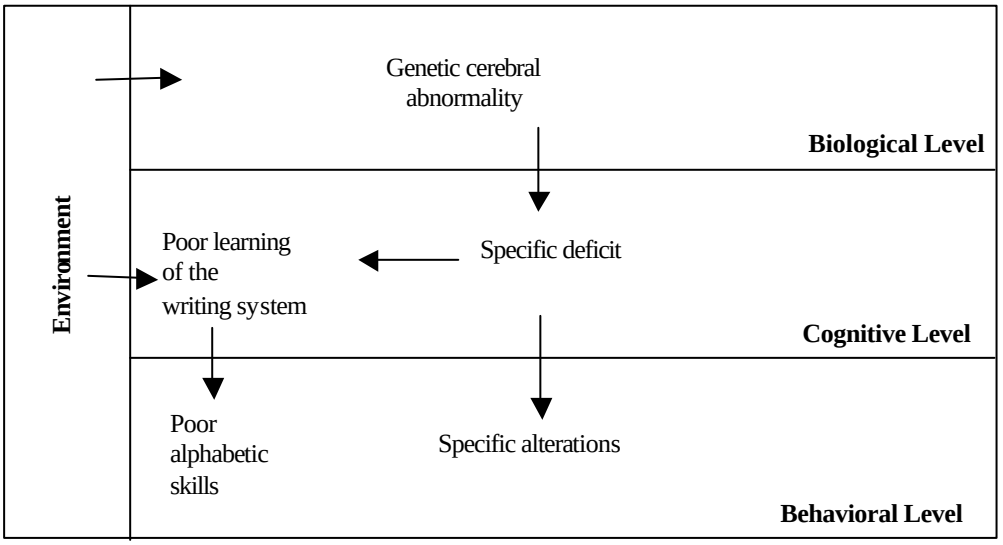
The neurological substrate which undergirds this hypothesis is found in papers by Nicolson and Fawcett (2001), already cited, or those by Van der Leij and Van Daal (1999a), regarding the cerebellum. According to these studies, there are differences at the level of the cerebellum when one compares the execution of dyslexic and normal persons on motor and reading tasks.

Generally speaking, one finds disparity in explanations for dyslexia, giving the impression of a certain explanatory "chaos". Nonetheless, the different explanatory proposals regarding dyslexia need not be opposing, but can be considered complementary. In the three hypotheses mentioned, explanations point to origins with either a biological, cognitive processing or behavioral nature, all of which could, in fact, be joined into an integrating explanation.

An integrated model

Frith (1997, 1999) proposes that the explanation of dyslexia should be done from various descriptive levels. The author proposes an integrated causal model which takes into account environmental influence and which includes processing levels noted in the three explanatory hypotheses discussed above: biological, cognitive and behavioral (see figure 1).

Figure 1. Frith's representation of the causal model of dyslexia (1997)



According to Frith (1997), genetic explanations and those based on brain mechanisms and structures would be located at the biological level. Explanations based on a cognitive processing deficit, such as the phonological hypothesis, would be located at the cognitive level, and explanations based on the resulting deficit manifestations in dyslexia (low reading performance, problems with phonological awareness, difficulties in fast naming) would be located at the behavioral level. These levels in turn can be influenced by conditions which concur in the environment, such as the orthographic system with which one is learning to read, the reading instruction materials, the importance assigned to learning to read, family environment, etc.

The advantage of this model is that it allows us to integrate different explanatory levels which the scientific literature on dyslexia has so far treated separately. It offers an integrated view of the problem which takes into account the diversity of dyslexic manisfestations in the population.

Heterogeneity in dyslexia

Such a diversity of factors in explaining causes of dyslexia has been related to the very heterogeneity which is observed within the specific population of dyslexic persons. Ever since the earliest theoretical observations, researchers have noted the apparent heterogeneity of children with reading disabilities (Morris, Shaywitz, Shankweiler, Katz, Stuebing, Fletcher, Lyon, Francis & Shaywitz, 1998). Attempts to classify this variability emerge from studies which try to find different subtypes of dyslexia. Resulting typologies have used different classification criteria. Since the pioneer studies by Boder (1973), who classifies children with reading disabilities into dysphonetic, dyseidetic and mixed, other studies have followed which propose a classification which stems from theoretical reference points.

Thus, Stanovich (1988, 1991) hypothesized the existence of two types of dyslexia, based on the observation that dyslexic persons shared a deficit in phonological mastery of language, but varied in other linguistic and cognitive characteristics. He differentiated two types, those which had specific cognitive problems restricted to the phonological level, vs. all other bad readers ("garden-variety"), who are characterized by cognitive and linguistic problems unrelated to the phonological level.

Another classification was proposed by Wolf et al. (1994, 2000a), based on the idea of the existence of a double deficit. In order to determine subtypes of dyslexia, Wolf not only

took into account the evaluation of phonological skills, but also fast naming skills. Based on these two variables, he found three types of subjects with reading disabilities: those who only had problems in phonological skills, those who only had problems in fast naming skills, and those who had problems in both skills.

A classic classification of dyslexic persons was proposed by Castles and Coltheart (1993). These authors developed their typology from research carried out on language problems resulting from brain damage, and using the explanatory framework of the dual-route model.

Studies of persons with acquired dyslexia found two patterns of symptoms which fulfilled a double dissociation (references for these studies can be found in Castles & Coltheart, 1993). First, there were reports of persons who were able to read aloud regular words and nonwords, but who had problems with irregular words. These persons' most common errors were the regularization of irregular words, that is, they pronounced them according to G-P conversion rules, without addressing their special character. This symptom pattern was called superficial dyslexia, and is that which arises from damage to brain areas involved in the lexical reading procedure. On the other hand, other authors have described cases of people who were able to read both regular and irregular words without problems, but they had difficulty with nonwords, difficulties that followed damage to brain areas involved in the sublexical reading procedure. This type of dyslexia is called phonological.

It has been found that this double dissociation is also fulfilled when reading problems are not the consequence of brain damage, that is, when we speak of developmental dyslexias. Despite the continuing controversy over this topic, this idea is well established in the literature (Calvo, 1999; Castles & Coltheart, 1993; Genard, Mousty, Content, Alegria, Leybaert & Morais, 1998; Manis, Seidenberg, Doi, McBride-Chang & Petersen, 1996; Manis, Seidenberg, Stallings, Joanisse, Freedman, Curtin & Keating, 1999; Morris et al., 1998; Stanovich, Siegel & Gotardo, 1997).

In their classic study, Castles and Coltheart (1993) examined a total of 112 participants, 56 of whom were dyslexic and were significantly behind in reading. They used a battery of tests which allowed for separate evaluation of the functioning of the two reading routes proposed in scientific literature. Tests of reading pronounceable nonwords (for evaluation of the sublexical route) and of reading irregular words (for evaluation of the lexical route)

were included within this battery. Results support the existence of the two subtypes of dyslexia found in patients with brain damage.

Later studies by Manis et al. (1996; 1999) have validated this division from the perspective of connectionist models, instead of dual-route models. Thus, the most utilized classification of dyslexic problems distinguishes between phonological and superficial dyslexic persons. Phonological dyslexic persons can only read by the lexical route, since the phonological route is disturbed, and they are characterized by reading familiar words well, but being unable to read pseudowords or unfamiliar words, since they cannot use the grapheme-phoneme conversion mechanism. They are sensitive to the frequency effect, but not to the length of words nor to regularity. They commit visual errors in pseudowords which look like real words, with numerous lexicalizations (reading already for alreasy; moved for toved) and in the reading of similar words (proceed instead of precede). They also commit morphological or derivative errors: they keep the root but change the suffix (walked, instead of walk; hopeful instead of hoped) and they have more errors in function words than in content words. Superficial dyslexics can read by the phonological process but not by the lexical process; therefore, they are usually unable to recognize a word as a whole. These people read regular words better, whether they are familiar or not, they can read pseudowords and their most frequent errors are those of omission, addition or substitution of letters. They are also characterized by the regularization of irregular words and the confusion of homophones, because lexical access is guided by the sound and not by the spelling of the word. It is also possible to find a group of mixed dyslexics, where both types of deficits occur.

Dyslexia, deficit or delay?

The distinction between subtypes of dyslexia is related to another theoretical debate between those who consider that a specific deficit exists in written language, and those who consider dyslexia to be a mere maturational delay, which could be remedied with the passing of time and with specific intervention in these problems (Bandian, 1996; Gottardo, Chiappe, Siegel & Stanovich, 1999; Jacobson, 1999; Jiménez & Hernández, 2001; Metsala, Stanovich & Brown, 1998; Samuelsson, Finnstroem, Leijon & Mard, 2000; Treesoldi, Stella & Faggela, 2001). The idea that dyslexia is a problem of delayed development is supported in observation of children diagnosed with superficial dyslexia (Samuelsson et al, 2000). Their problems are not so noticeable when it comes to reading accuracy, as is the case in children with phonological dyslexia or other reading problems; it has been found that, with time and effort, they

manage to attain the reading level of their classroom peers. However, it appears as if studies that maintain this hypothesis did not take into account these children's problems in reading speed and fluency. There are not many reading tests which measure reading speed in addition to accuracy, nor are there tests applicable to persons beyond mandatory schooling. Likewise, these hypotheses are maintained in studies performed in transparent orthographic systems (Jiménez & Hernández, 2001; Treesoldi et al., 2001; Serrano & Defior, submitted; Wimmer, 1993), where dyslexic characteristics observed are less serious than those presented by children with more opaque spelling systems, such as English, and who improve with time and treatment. The hypothesis that dyslexia is due to a deficit with respect to the normal development pattern, and is not merely a delay, is supported by studies with older dyslexic persons, where problems persist despite their having received normal academic training and not having presented other problems outside of the reading-writing area (Jackson & Dollinger, 2002; Kitzen, 2001; Wilson & Lesauz, 2001). Although the controversy is unresolved, studies with dyslexic adults and children find that some deficits in dyslexia are so serious that they cannot be explained as a delay, but as a deviation from the normal development pattern, thus supporting the specific deficit hypothesis (Bandian, 1996; Gottardo et al., 1999; Jacoson, 1999;. Metsala et al., 1998).

Clarification of this discussion is important when it comes to planning treatment for dyslexia. This would range from mere support which helps to alleviate the delay, to specific actions that would act on the deficit, respectively. It is thus necessary to continue investigating using studies that use a reading age design, as well as studies with transparent writing systems.

Dyslexia in different writing systems

The majority of studies in the area of learning to read and of reading disabilities were performed with English-speaking persons. However, multi-lingual studies (Müller & Brady, 2001; Öney & Durgunuglu, 1997; Seymour, Aro & Erskine, 2003) have suggested differences between writing systems, leading us to think that results from English language studies are not totally applicable to those with different orthographies. According to this line of study, development of reading skills is produced differently in different orthography systems, being influenced by the orthographic system and the linguistic environment in which the reader is developing (Müller & Brady, 2001).

Orthographic systems are distributed in an opaqueness-transparency continuum according to the degree to which they respect the alphabetic principle. Thus, transparent orthographies are those where the grapheme-phoneme correspondence is one to one. Opaque orthographies are those where one phoneme corresponds to several graphemes, and one grapheme can correspond to several phonemes. Different writing systems are distributed along this continuum, closer or further from either end as a function of their characteristics. There is a good deal of consensus as to where each one should be placed along this opaqueness-transparency range. Regarding European orthographies, those closer to the transparent end would be Finnish, Greek, Italian and Spanish; those closer to the opaque end would be English, French, Danish and Portuguese (Seymour et al., 2003).

The importance of carrying out such studies which compare different orthographies is justified by the fact that the particular characteristics of each writing system may affect the way that reading develops in each of them, as mentioned above. Transparency-opaqueness could influence the early correlates of reading. While decoding and phonological factors would be important reading indicators in English orthography (Adams, 1990; Bradley & Bryant, 1983), in more transparent orthographies, where decoding is easier than in opaque ones, this skill could have a lesser influence. Likewise, the transparent-opaque nature of languages can influence development of reading from its earliest stages until fluent reading. Since in a transparent orthography it is easier to reach an expert level of reading than in an opaque one, beginning readers would consequently have more cognitive resources available for high-level processing skills like text integration and comprehension (Stanovich, 1993)

Dyslexia might also be influenced by differences among orthographic systems. It has been supposed that the prevalence of learning disabilities in different countries reflects differences in their orthographic complexity; dyslexia is more common in countries where the orthography is complex, that is, where the writing system is more opaque, than in those where it is more transparent. Causal correlates of dyslexia have even been indicated to be more important than others as a function of the writing system under consideration. In opaque orthographies, the comparison criterion for reading achievement in children with dyslexia vs. normal children is accuracy in reading execution. In transparent orthographies, reading accuracy is a less important factor, while a slow reading speed is more decisive. Work done in these types of writing systems, such as German (Wimmer, 1993; Wimmer & Mayringer, 2001), Finnish (Holopainen, Ahoen & Lyytinen, 2001; Müller & Brady, 2001), Italian (Treesoldi et al.,

2001) and Spanish (Jiménez & Hernández, 2001; Serrano & Defior, in press; submitted) support these ideas.

In any case, and despite these differences, it is still maintained that reading disabilities in dyslexia are based principally on a phonological processing deficit, independently of the orthographic system. A recent study by Paulessu et al. (2001) showed that, although manifestations of dyslexia might change as a function of the orthographic system under consideration, the main cognitive deficit and the brain-level bases for this problem were universal. In this study, participants were dyslexic and normal children from countries with transparent orthographies (Italian) and opaque orthographies (English and French). Italian dyslexics had better reading execution (as measured only by the number of correct answers) than the English and French, but when the three types of dyslexics were compared to normal children in their respective countries, the pattern of results from the three nationalities (differences between dyslexic and normal children) was similar.

Differences between writing systems can also influence determination of the subtypes of dyslexia. According to Wimmer (1993), a German phonological dyslexic would have different characteristics than an English phonological dyslexic, in the sense that phonological processing difficulties would be greater, seeing that they have persisted despite the transparency of the language. On the other hand, if skill in handling the grapheme-phoneme correspondence rules is *the* characteristic which distinguishes the two subtypes of dyslexics, the transparent nature of the language could also influence the variation in differences among the two subtypes. Finally, differences among writing systems could also influence the measurement used to compare dyslexic problems. While in more opaque orthographies the measure most often used is reading errors, in more transparent orthographies it is more appropriate to consider reading time (Treesoldi & cols. 2001).

Spanish is a writing system located near the transparency end of the above-mentioned continuum. Some studies in Spanish (Calvo, 1999; Jiménez & Hernández, 2001) lend empirical support to the conclusions noted for transparent orthographies. In a recent study, Serrano & Defior (in press) examined skills of phonological awareness in dyslexic children in an equivalent reading age design. Results showed that the problems of dyslexic children were more significant when analyzing the speed measurement of the phonological task, in agreement with other studies in German and in Italian. Another study with the same design (Serrano & Defior, submitted) found difficulties when measuring accuracy in a nonword read-

ing task, probably due to the high phonological demands of the task, since items were formed without following phonotactic rules of word-construction in Spanish. Even so, on this same task, and in others discussed in the same study, difficulties for dyslexic persons were more striking in speed measures.

Conclusion

Developmental dyslexia is a serious problem in the academic realm, since the skill it affects is both a tool and an objective in the teaching-learning process. As such, it is a concern both in the school community as well as in family life. Nonetheless, its conceptualization and the determination of its causes are still controversial topics which stimulate scientific research and discussion. On the other hand, recent translinguistic studies have brought out the need to take into account characteristics of the writing system when defining characteristics of dyslexia.

Spanish is considered to be a transparent orthographic system. Learning the alphabetic code is facilitated by an almost complete one-to-one correspondence between graphemes and phonemes, and it is considered to be easier and quicker than with other more opaque orthographies. However, there do exist cases of problems with learning to read and write. In developmental dyslexia in Spanish, there exists a deficit in phonological processing which is fundamentally characterized by speed problems. Currently, speed is not often taken into account in evaluation and diagnosis of reading competency; consequently some children appear to have few problems when compared to their classmates, making it more difficult to identify them as dyslexic, or to proceed with an intervention which would be of benefit to them.

Along this line, it should be taken into account that in orthographically transparent systems, speed problems in reading are a clearer indicator than accuracy problems. Similarly, in educational circles it is important to take these problems into account both in evaluating children's disabilities and school achievements, as well as in providing support at the school and family levels. Regarding intervention, automatization skills in dyslexic children should be strengthened, at the same time not saturating their processing capacity with irrelevant tasks that occupy resources they need for other tasks.

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