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Spanish developmental dyslexia: Prevalence, cognitive profile, and home literacy experiences

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ABSTRACT

This study was designed to examine the prevalence, cognitive profile, and home literacy experiences in subtypes of Spanish developmental dyslexia. The subtyping procedure used comparison with chronological-age-matched and reading-level controls on reaction times and accuracy responses to high-frequency words and pseudowords. Using regression-based procedures, 8 phonological dyslexics and 16 surface dyslexics were identified from a sample of 35 dyslexic fourth graders by comparing them with chronological-age-matched controls on reaction times to high-frequency word and pseudoword reading. However, when the dyslexic subtypes were defined by reference to reading-level controls, 12 phonological dyslexics were defined but only 5 surface dyslexics were identified. Both dyslexic subtypes showed a deficit in phonological awareness, but children with surface dyslexia also showed a deficit in orthographical processing assessed by a homophone comprehension task. This deficit was associated with poor home literacy experiences, with the group of parents with children matched in reading age, in comparison with the group of parents with children with surface dyslexia, reporting more literacy home experiences.

Introduction

Developmental or congenital dyslexia has been characterized by the developmental inability to read despite adequate opportunities, intellectual ability, and motivation (Hynd & Hynd, 1984). Research conducted with an English-language focus has described dyslexic children with differing degrees of deficiency in reading pseudowords and irregular words, leading to the conclusion that there

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are developmental analogues of the acquired forms of dyslexia (Castles & Coltheart, 1993; Manis, Seidenberg, Doi, McBride-Chang, & Petersen, 1996; Stanovich, Siegel, & Gottardo, 1997).

These cases of developmental dyslexia were interpreted within the functional cognitive architecture assumed by the dual-route theory, which contemplates a phonological dyslexia profile characterized by impaired phonological skills and fairly well-preserved orthographic skills and a surface dyslexia profile characterized by impaired orthographic skills and fairly well-preserved phonological skills. In addition to the dual-route model, other connectionist models may explain individual differences in dyslexia, including the dual-route cascaded (DRC) model of visual word recognition and reading aloud (Coltheart, Curtis, Atkins, & Haller, 1993; Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001), the parallel distributed processing (PDP) model (Seidenberg & McClelland, 1989), and the connectionist dual process (CDP) model (Zorzi, Houghton, & Butterworth, 1998). These computational models of normal and disordered reading aloud differ in their architectural, representational, and processing assumptions. There is, however, general agreement that there are at least two procedures involved in the translation of orthography to phonology: one restricted to whole-word information and the other including or specializing in subword information (Woollams, Lambon Ralph, Plaut, & Patterson, 2007).

Nevertheless, the dual-route model has been one of the common paradigms in subtyping studies (Ho, Chan, Chung, Lee, & Tsang, 2007). Research to determine the extent to which the dual-route models are functional in Spanish (e.g., de Vega & Carreiras, 1989; de Vega, Carreiras, Gutiérrez, & Alonso-Quecuty, 1990; Defior, Justicia, & Martos, 1996; García-Albea, Sánchez-Casas, & del Viso, 1982; Valle-Arroyo, 1996) indicate that there is no difference between the processes involved in reading acquisition in Spanish, a language with a transparent orthography, and the processes implicated in reading acquisition in English, a language with an opaque orthography. In addition, other research studies on phonological dyslexia in transparent orthographies have found that results of individual cases of phonological dyslexia where there is a dissociation of reading words versus nonwords are similar to results found in opaque orthographies (e.g., Cuetos, Valle-Arroyo, & Suárez, 1996; Iribarren, Jarema, & Lecours, 1999). Consequently, if reading mechanisms are the same for different alphabetic writing systems, then the pattern of results found in the subtyping work in English should also be expected in Spanish.

Wydell and Butterworth (1999) proposed the hypothesis of granularity and transparency to predict the incidence of phonological dyslexia in different languages. According to this hypothesis, any orthography can be described on two dimensions: the transparency of print-to-sound translation and the size of the smallest orthographic unit that represents sound (i.e., granularity). They also suggested that orthographies with fine granularity and opaque print-to-sound translation would have a high incidence of phonological dyslexia. In contrast, orthographies with fine granularity and transparent print-to-sound translation would have a low incidence of phonological dyslexia (e.g., Serbo-Croatian, Spanish, Finnish). In summary, phonological dyslexia would be just as common across languages, but phonological dyslexics would be harder to detect in languages with regular orthographies (Frith, 1999).

Spanish has a transparent and fine-grained orthography. The Spanish orthography has 24 graphemes (5 vowels and 19 consonants), each of which represents a unique sound. Therefore, the process of translating print to sound is never ambiguous because each letter of the alphabet has a unique pronunciation except the letters *c, g,* and *r.* For example, *c* is pronounced as /k/ when followed by the vowel *a, o,* or *u* and as /th/ or /s/ (depending on the region) when followed by the vowel *e* or *i;* the letter *g* is pronounced as /g/ when followed by the vowel *a, o,* or *u* and as /h/ when followed by the vowel *e* or *i;* and *r* is pronounced as /rr/ when it appears at the beginning of a word or is preceded by the letter *l, n,* or *s* and as /r/ when it appears in the middle of a word or at the end of a word. Moreover, phonological errors can result from a misapplication of accent rules (e.g., melón as mélon). Some Spanish words must have an acute accent (′) on the last, second to the last, or third to the last vowel.

Research generally supports the hypothesis of a higher incidence rate of phonological dyslexia in English in comparison with surface dyslexia (e.g., Castles & Coltheart, 1993; Manis et al., 1996; Stanovich et al., 1997), but contradictory results were found when we reviewed Spanish studies (Calvo, 1999; Jiménez & Ramírez, 2002; Martínez, 1995; Serrano, 2005). English studies use similar criteria (e.g., similar types of stimuli for matching and identification, similar accuracy measures for irregular words and pseudowords, similar assessment tasks to test the validity of subgrouping) to diagnose phonological dyslexia versus surface dyslexia. However, one reason for the discrepancy in the frequency of phonological dyslexia and surface dyslexia diagnoses between Spanish studies has