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J. Experimental Child Psychology 86 (2003) 169–193

Journal of  
Experimental  
Child  
Psychology

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## Developmental dyslexia in different languages: Language-specific or universal?

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Received 21 April 2003; revised 1 August 2003

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### Abstract

Most of the research on developmental dyslexia comes from English-speaking countries. However, there is accumulating evidence that learning to read English is harder than learning to read other European orthographies (Seymour, Aro, & Erskine, 2003). These findings therefore suggest the need to determine whether the main English findings concerning dyslexia can be generalized to other European orthographies, all of which have less irregular spelling-to-sound correspondences than English. To do this, we conducted a study with German- and English-speaking children ( $n = 149$ ) in which we investigated a number of theoretically important marker effects of the reading process. The results clearly show that the similarities between dyslexic readers using different orthographies are far bigger than their differences. That is, dyslexics in both countries exhibit a reading speed deficit, a nonword reading deficit that is greater than their word reading deficit, and an extremely slow and serial phonological decoding mechanism. These problems were of similar size across orthographies and persisted even with respect to younger readers that were at the same reading level. Both groups showed that they could process larger orthographic units. However, the use of this information to supplement grapheme–phoneme decoding was not fully efficient for the English dyslexics.

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*Keywords:* Developmental dyslexia; Phonological deficit; Reading; Length effect; Cross-language research

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## Introduction

Children affected with developmental dyslexia have difficulty learning to read and spell despite adequate intelligence and educational opportunity, and in the absence of any profound sensory or neurological impairment. Dyslexia is the most common of the childhood learning disorders.

Much of what we know about the nature and the origin of developmental dyslexia comes from studies that were conducted in English-speaking countries. A simple check in the Medline database (<http://www.ncbi.nlm.nih.gov>) shows that about two-thirds of all publications on developmental dyslexia since 1998 have come out of English-speaking countries (US, UK, Australia, Canada, and New Zealand). Given the dominance of research using the English language, it is of great importance to know whether dyslexia is the same in countries that use different languages. The ideal research design would be to give dyslexic children who are learning to read different languages the *same* reading tests with highly comparable linguistic material while also ensuring that participants had been matched for other potentially important variables such as age, vocabulary development, and general intellectual ability. Unfortunately, only very few studies have met these strict criteria (e.g., Landerl, Wimmer, & Frith, 1997a; Paulesu et al., 2001) and they produced slightly conflicting results. The neuroimaging studies suggest a universal basis for dyslexia (Paulesu et al., 2001), whereas the behavioral studies suggest that the nature and prevalence of dyslexia might differ between orthographies (Landerl et al., 1997a).

As concerns the origin of developmental dyslexia, the most unifying hypothesis suggests that dyslexic children have specific impairments in representing, storing, and retrieving phonological information (i.e., the *phonological deficit hypothesis*, see Ramus, 2003; Snowling, 2000; Wagner & Torgeson, 1987). Because reading acquisition requires the child to learn the mapping between orthography and phonology (Jorm, Share, MacLean, & Matthews, 1984; Share, 1995), problems in the representation and use of phonological information inevitably lead to problems in reading acquisition (e.g., Bradley & Bryant, 1983; Bryant & Bradley, 1985; Goswami & Bryant, 1990). The phonological deficit hypothesis is supported by a number of studies showing that dyslexics have difficulties in tasks requiring verbal short-term memory, phonological awareness, phonological recoding, and rapid automatized naming (e.g., Brady & Shankweiler, 1991; Denckla & Rudel, 1976; Rack, Snowling, & Olson, 1992). Although it is still a matter of debate whether the phonological deficit can be reduced to a more low-level sensory deficit (e.g., Goswami et al., 2002; Helenius, Uutela, & Hari, 1999; Manis et al., 1997; Marshall, Snowling, & Bailey, 2001; Schulte-Körne, Deimel, Bartling, & Remschmidt, 1998a, 1998b; Serniclaes, Sprenger-Charolles, Carré, & Demonet, 2001; Tallal, 1980), it seems quite clear that any theory of dyslexia needs to account for the robust phonological deficits that are present in most dyslexics (Ramus, 2001, 2003; Ramus et al., 2003). A universal theory of dyslexia predicts that phonological deficits are very similar for dyslexics in different countries, an argument that we discuss further subsequently.

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