Learning Disabilities Research & Practice, *22*(3), 161–169

Learning Disabilities in Guatemala and Spain: A Cross-National Study of the Prevalence and Cognitive Processes Associated with Reading and Spelling Disabilities

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The main purposes of this research were twofold. We examined the samenesses about learning disabilities (LD) in Guatemala and Spain, two countries with the same language but cultural, political, and educational differences, first analyzing data about the prevalence of reading and spelling disabilities in Guatemala City and the Spanish region of the Canary Islands. The focus of the second study was to determine whether there are cross-national patterns of significant differences in cognitive processes associated with reading and spelling disabilities from a developmental approach in these two cultural contexts. We found some differences in the prevalence of specific LD in reading between both countries but we did not find significant differences between Guatemalan and Spanish reading-disabled children in cognitive processes that are involved in reading and spelling acquisition in spite of the cultural and educational differences between the two countries.

The assignment of people into diagnostic categories of disability has long been undertaken as part of the effort to understand human differences. Nevertheless, the classification, categorization, and labeling of children in education have been problematic because of issues such as stigmatization, peer rejection, and lowered self-evaluation (Keogh & MacMillan, 1996). The systems of classification, though, have provided a framework to guide intervention and allowed the development of specialized programs to support the special educational needs of these individuals (Minow, 1990).

Evidence clearly indicates that how individual countries use classification systems differs (Florian et al., 2006). Does this result in differences in terms of the numbers of students identified with a particular disability or differences in the makeup of the difficulties underlying the disability? This article addresses these questions by considering the status and prospects of learning disabilities (LD) in Guatemala and Spain. We examine the samenesses about LD in these different cultural, political, and educational contexts. Furthermore, we provide empirical data about the prevalence of LD and the cognitive profile of Guatemalan and Spanish children with reading and spelling disabilities from a developmental approach.

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COMPARING LD IN GUATEMALA AND SPAIN

Definitions

Educational legislation in Guatemala states that "Learning Problems" are diagnosed when the individual's achievement on individually administered standardized tests in reading, mathematics, or written expression is significantly below that expected for age, schooling, and level of intelligence (IQ) (Ministerio de Educación, 2001). This definition also says that LD must interfere with school achievement and daily activities that involve reading, writing, or mathematics skills. As has been pointed out by Artiles and Pianta (1993), special education programs for students with LD in Guatemala were created in the 1980s, are based on service delivery models in the United States, and adopted the Federal Register (1977) definition of LD. The creation of these services was facilitated by an exchange program sponsored by the Partners of the Americas between the Guatemalan Ministry of Education and Auburn University.

In Spain, "learning disabilities" implies a different conception with regard to the definition that enjoys considerable international agreement and consensus. Jiménez and Hernández-Valle (1999) published a study about the past and present of learning disabilities in Spain within special education. The authors concluded that there does not exist in Spain an LD category as has been defined by the National Joint Committee on Learning Disabilities (1994). Special educational needs or LD in Spain, as in some other

European countries such as the United Kingdom (McLaughlin et al., 2006), are identified when a pupil does not learn in the ordinary classroom setting and the teacher observes a difference between that pupil and the rest of the class's attainment regarding learning in subjects like reading, writing, and arithmetic that should have been achieved according to age or grade. Recently, however, the last publication of *Ley Orgánica* 2/2006, May 3, of Education (LOE) uses the term Specific Learning Disabilities (SLD) in the chapter on students with specific needs of educational support. In spite of this, there is no clear definition of LD.

Service Delivery

Special education in Guatemala and Spain is regulated by the following four principles: normalization, school integration, the sectorization of services through interdisciplinary teams, and the individualization of the teaching process. In Guatemala, 47 percent of the special education services are directed to students with LD, 15 percent to those with language disorders, 14 percent to those with mental retardation, and 12 percent to those with severe disabilities (Ministerio de Educación, 2005). The number of programs for students with LD in Guatemala has been growing rapidly (Artiles & Pianta, 1993).

In the Canary Islands region of Spain, 56 percent of the special education services are directed to students with LD, 24 percent to those with language disorders, 9 percent to those with mental retardation, and 10 percent to those with severe disabilities (Jiménez, Guzmán, Rodríguez, & Artiles, 2007). The support structure is provided through three kinds of interconnected professional groups. They are: (1) the *Equipos de Orientación Escolar y Psicopedagógicos* (EOEP) (School Counselling and Psychopedagogical Teams) which focus on assessment and educational counseling; (2) the special education teacher who can be attached to one school or can be working in several schools; and (3) specialist professionals in speech disorders, physiotherapy, psychotherapy, and psychomotor development who carry out individualized treatments.

Assessment Practices and Intervention Approaches

Artiles and Pianta (1993) noted that Guatemalan general education teachers in primary education refer students every year to multidisciplinary teams that conduct psychoeducational evaluations in areas such as academic achievement, language skills, and cognitive skills. An evaluation report is discussed by the multidisciplinary team, the teacher, and the parents. Decisions are made about eligibility, placement, and educational programming for each student, with periodic reevaluations of student placement and progress.

In Spain, individual teaching and LD assistance are provided within the ordinary curriculum setting. Diversity assistance, which includes the area of LD, should be taken into account when each school center plans the school educational project, school curriculum project, and the annual general program. Collaboration between parents or legal guardians and professionals is necessary to identify solutions for LD.

The educational response to LD in both countries is carried out through different service arrangements in schools. In Guatemala, students who require special resources, such as students with auditory or motor deficits or mental retardation, receive educational attention in integration classrooms. Support classrooms, though, are organized to provide educational resources to children who have learning disabilities in reading, writing, or arithmetic difficulties.

In Spain, the treatment of LD involves evaluation, educational counseling, and educational support using the *Adaptaciones Curriculares Individualizadas* (ACIs; Individual Curriculum Adaptations). LD children remain for a great portion of the school day in ordinary classrooms, but they receive some educational support in resource classrooms for a few hours throughout the week. Thus the educational response that must be provided for these children is implemented within the school system.

LD AND CULTURAL DIFFERENCES

Bravo-Valdivieso (2001) suggested that it is likely that the prevalence of children with LD in South American countries is greater than in the United States or in European countries because of factors like poor nutrition, cognitive-verbal development, and unsanitary conditions. He also pointed out that in South American countries we find many children with "general learning problems" that arise from their psychological or social immaturity for school learning. These learning problems may be greater in impoverished areas than in middle-class schools. Thus, it is important when studying children with LD in South American countries to differentiate children with general learning problems brought about by sociocultural factors from those with "specific learning disabilities" that have neuropsychological anomalies as their causes.

Regarding the latter, dyslexia is a significant difficulty with the acquisition of reading, writing, and spelling which may be caused by a combination of phonological, auditory, and visual processing deficits. Working memory, syntactic awareness, word retrieval, and speed of processing difficulties may also be present. Spanish studies using the Sicole-R (Jiménez et al., 2006), a computer-based assessment, within a context of reading level-match research designs have found that individuals with dyslexia have more difficulty than nondisabled readers in solving tasks designed to assess cognitive processes involved in reading and spelling (e.g., in reading nonwords, Jiménez & Hernández-Valle, 2000; in phonemic awareness, Jiménez, 1997, Jiménez et al., 2005; in working memory, Jiménez et al., 2005, Jiménez & García, 2006; in orthographical processing, Rodrigo et al., 2004; in syntactic processing, Jiménez et al., 2004; and in speech perception, Ortiz et al., 2007). However, we do not have empirical evidence about the generalizability and replicability of these findings in LD populations across cultural contexts—such as two countries that share the same language but differ greatly in culture—hence the reason for conducting the present research.

The first study was designed to analyze the prevalence of reading and spelling disabilities in Guatemala City and the Canary Islands region of Spain. The second study focused on analyzing the interaction between LD and this cultural diversity on reading and spelling performance from an information-processing model, testing whether there are cross-national patterns of difference on cognitive processes involved in reading and spelling from a developmental approach between Guatemalan and Spanish children with LD using a cross-sectional research design.

METHOD

Settings

Data on the Guatemalan sample were collected in Guatemala City, the capital of Guatemala. This city of approximately 2.5 million people accounts for 22 percent of the country's total population (INE, 2002). According to Coope and Theobald (2006), Guatemala has a long history of violence where thousands of lives and many communities were destroyed by displacement and disappearances. As a result of endemic poverty, Guatemala's children suffer from high rates of morbidity and mortality largely as a result of infectious diseases. In addition, there are high levels of childhood malnutrition: 25 percent of children younger than 5 are severely underweight and 46 percent of these suffer from moderate-to-severe stunting (UNICEF, 2001a, b).

Data on the Spanish sample come from the Canary Islands, an autonomous Spanish region composed of seven islands located in the Atlantic Ocean 67 miles/108 km off the northwestern coast of Africa. Because of its remoteness, insularity, small size, difficult topography, and climate, this region is considered as "ultra-peripheral" within the European Union. With an economy based in tourism and construction, the Canaries have recently experienced a high growth rate, reducing the gap with the Spanish average. In the last decade, too, the population has steadily grown because of immigration. The cultural level of the region has improved significantly from the past. Although a large proportion of the 16–35-year-old population has only a basic level of education, a similar percentage applies for university studies.

Participants

The Guatemalan sample was drawn from public and private schools in Guatemala City. Of the 557 children in the Guatemalan sample, there were 316 boys and 241 girls with ages ranging from 8 years, 8 months to 14 years, 7 months ($M = 134.5$ months, $SD = 16.1$ months). The average age of the 156 3rd-grade participants (92 boys, 64 girls) was 117.3 months ($SD = 10.0$). The mean age for 4th graders ($N = 143$; 78 boys, 65 girls) was 129.1 months ($SD = 8.2$). The average grade 5 age was 141.7 months ($SD = 7.2$) for the 131 students (75 boys, 56 girls). And, the average age for the 6th graders (154.2 months, $SD = 7.1$) was calculated from 127 children (71 boys and 56 girls).

The Spanish participants were also drawn from public and private schools in the cities of Sta Cruz de Tenerife and La Laguna. Of the 1,048 children in the Spanish sample, there were 630 boys and 418 girls with ages ranging from 7 years, 9 months to 12 years, 8 months ($M = 113.8$ months, $SD = 17.6$). The 209 2nd-grade students (120 boys, 89 girls) averaged 90.1 months in age ($SD = 4.0$). In grade 3 ($N = 198$; 115 boys, 83 girls), the mean age was 101.0 months ($SD = 4.9$). Fourth-grade students averaged 113.6 months ($SD = 4.7$; $N = 216$ from 125 boys and 91 girls). The average for the 216 5th graders (136 boys, 80 girls) was 125.8 months ($SD = 4.7$). And, the average age for students in grade 6 (137.6 months, $SD = 5.8$) was calculated from 209 children (134 boys and 75 girls).

Instruments

Culture Fair (or Free) Intelligence Tests

Also known as a measure of *g* (Scale 1 and 2, Form A; Cattell & Cattell, 1989), this test allows a measurement of the general mental capacity without interference from cultural bias. We used the "two halves" method to calculate reliability and reported a correlation coefficient of .86. We used as validity criteria scores on the TEA-1 test (Seisdedos, De la Cruz, Cordero, & González, 1991). A correlation coefficient of .68 was found between the *g* factor measure and results on the TEA-1 test.

Working Memory Test

To assess children's working memory, we administered the task used by Siegel and Ryan (1989). In this task, children listen to sentences that are missing the final word. The task consists of supplying the missing word and then repeating all the missing words from the set. For each level or set size, the score was 1 if the student performed the task successfully and 0 if he or she failed. There were three trials at each level of set size (2, 3, 4, and 5 words). Task administration was stopped when the child failed all the trials at one level.

Standardized Reading Skills Test PROLEC

This Spanish standardized reading test includes different reading subtests (Cuetos, Rodríguez, & Ruano, 1996). We administered the Word Reading (30 items) and Pseudoword Reading (30 items) subtests from the Word-Pseudoword reading section. All subtests measure response accuracy. We reported an alpha coefficient of .92, using as validity criteria the teacher's ratings of reading ability.

SICOLE-R

The SICOLE-R (Jiménez et al., 2006) is a computer-based assessment system for the diagnosis of reading disabilities in the Spanish language, which also includes a version adapted to the cultural and linguistic differences of a Guatemalan sample. The SICOLE-R Multimedia Battery includes seven modules.

The aim of the *Speech Perception* module is to evaluate listeners' ability to discriminate consonant contrasts in

the context of syllables. The stimuli-pairs recordings were produced by a phonetically trained, Spanish female speaker. There are three different tasks: (1) voicing contrast, (2) manner of articulation contrast, and (3) place of articulation contrast. The ISI is 1 second and the maximum intertrial interval is 5 seconds. To control for guessing rates, a derived score was calculated by subtracting the proportion of incorrect responses from the proportion of correct responses. This derived score was used in all accuracy analyses (range = 0 to 1; $\alpha = .95$).

The *Naming Speed Task* module was adapted from Denckla and Rudels' *Rapid Automatized Naming Ta*sk (1976). This task requires sequentially naming, as quickly as possible, two series of graphological signs (i.e., letters and numbers) and two series of nongraphological signs (i.e., colors and common objects).

The *Naming Task* module consists of reading aloud each of the verbal stimuli (i.e., words or pseudowords) that appear one by one on a computer screen. The response time of each stimulus is registered from the moment when the word or pseudoword appears on the screen until the subject pronounces the first reading sound. The sound is recorded by the voice key, which stops the computer's chronometer. The sequencing in the administration of the stimuli is as follows: blank screen on the computer (200 ms), fixation point in the center of the screen (400 ms), stimulus word or pseudoword. In total, the time between items is 2,000 ms. Average scores were used for the correct responses obtained in the word naming ($\alpha = .80$) and pseudoword naming tasks ($\alpha = .83$). Average scores were also calculated for the latency times of correct responses for words ($\alpha = .89$) and pseudowords ($\alpha = .91$).

The *Phonemic Awareness* module evaluates the subject's ability to manipulate the sounds or phonemes of spoken words and consists of four tasks. An average score was calculated by adding the correct responses in the four tasks and dividing that sum by the number of tasks.

In the *Isolation* task, the child listens to a word (e.g., *lana* [wool]) and has to say its first sound (/l/). Then, he or she has to point with the computer's mouse to the picture, the name of which begins with that same sound (in this example, *luna* [moon]). There are 15 items in this task ($\alpha = .75$).

The child listens to a word in the *Segmentation* task (e.g., *rana* [frog]) and then has to say its constituent sounds, phoneme by phoneme (i.e., /r//a//n//a/). Either pronouncing the sounds or saying the names of letters constitutes a correct response. There are 15 items in this task ($\alpha = .80$).

In the *Deletion* task, the child listens to a word (e.g., *blusa* [blouse]) and then has to delete its first sound. The way of responding is by using the mouse to select the correct choice from three available options (in this case, *lusa* from /lusa/, /tusa/, and /musa/). There are 15 items ($\alpha = .83$).

Additionally, the child listens to a sequence of phonemes (e.g., /m//e//s//a/) in the *Blending* task and has to say the whole word (*mesa* [table]). Three pictures are presented on the computer screen (e.g., table, donkey, and bed) and the child has to select the correct one with the mouse. There are also 15 items in this task ($\alpha = .86$).

The *Orthographical Processing* module of the SICOLE-R uses a homophone selection task. The subject is presented with a picture, two homophone words, and a spoken question (e.g., "Which is an animal?"). The child chooses one of the written words, with the correct response being the word that matches with the picture and the question. There are nine items ($\alpha = .97$). An average score of correct responses was calculated for this task.

In the root morphological comprehension task of the *Morphological Processing* module, the child is presented with a written word and two pictures, one of which corresponds to the word. The child must then read the written word out loud and point to the correct picture. Five different root morphemes are used. Each word changes the suffix on the same root during four presentations. The root morphemes are always meaningful units of words but never words in themselves. The suffixes do not change the grammatical class and inflection provides information about number and grade. Twenty items were administered ($\alpha = .92$). An average score of latency times for correct responses was calculated for this task.

The *Syntactic-Semantic Processing* module comprises seven tasks that evaluate the proper use of gender and number agreement rules, proper use of function words and their involvement in assigning syntactic roles, and subjects' execution of tasks using their knowledge of the syntactic structure of a sentence. An average score was taken by adding the correct responses obtained in the tasks and dividing this sum by the number of tasks.

Subjects are presented with truncated sentences in this module's *use of gender* task. They read the words in the sentence and words which are proposed as alternatives for properly completing the sentence. Each blank space is accompanied by two words differing in gender, only one of which will correctly complete the sentence. There are 12 items in this task ($\alpha = .78$). The *use of number* task is identical except that the words presented as alternatives for completing the sentence differ in number. There are 12 items in this task ($\alpha = .82$).

Two sentences and one picture are presented in the *word order* task. The subject must indicate which sentence corresponds to the picture. Sentences have a subject-verb-object structure. The two alternative answers vary in that the subject and object roles are reversed. There are 12 items ($\alpha = .60$).

The *correct use of assigning syntactic roles* task is similar to the word order task. A picture and a series of three sentences are presented, only one of which corresponds to the image. Two of the sentences are active; they differ in that one has a subject-verb-object syntactic structure, the other an object-verb-subject structure. The third alternative is a sentence in the passive voice. There are 12 items in this task ($\alpha = .73$).

Two types of exercises are used in the *function words* task. The first consists of two pictures presented at once together with a sentence. Only one picture corresponds to the sentence. In order to solve the task, the child must comprehend the meaning and the role that the function word plays in the sentence. The second exercise consists of presenting a sentence where one word is missing. Below the sentence are two function words and one noun; only one of the function words will properly complete the sentence. There are 12 items ($\alpha = .77$).

The task of the Syntactic-Semantic Processing module, *punctuation signs*, involves a short text missing punctuation signs. The child has to place the correct signs (i.e., period, comma, question mark, exclamation point, etc.) in the correct places using the computer's mouse ($\alpha = .86$).

The last task of the Syntactic-Semantic modules includes the comprehension task consisting of a short (64 words) story and five questions that were given to the children after reading. The measure was the average number of questions correctly answered. There are 12 items in this task ($\alpha = .63$).

Procedures

The Guatemalan and Spanish teachers who participated in the study were interviewed to help identify students with LD. First, each teacher received information about how to identify children with learning problems in reading and spelling but not in other curricula areas (e.g., arithmetic). Then, they had to identify children with low performance in reading or spelling when compared to the performances of peers of the same age in those two subjects. These teacher nominations formed the basis for selecting students to be tested.

Six experienced psychologists carried out the administration of the reading, verbal working memory, and IQ tests. They were blind regarding the group status of the children. The assessments were carried out individually during four sessions per subject in quiet, well-lit rooms provided by the schools that the children attended. The tasks were presented randomly, each being preceded by two examples to ensure that the children understood the instructions.

The recent definition of dyslexia adopted by the International Dyslexia Association (2002) and presented by Lyon, Shaywitz, and Shaywitz (2003) describes dyslexia as:

> a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (p. 2)

Using this definition, we operationalized specific LD based on the following criteria: (1) low performance on standardized reading tests (<25 percent correct in pseudoword reading and ≥75 percent correct in reading times for word or pseudoword reading); (2) poor academic performance in reading using a teacher's rating report and average achievement in other academic areas (e.g., arithmetic); and (3) IQ ≥ 75 to exclude students with intellectual deficits (Siegel & Ryan, 1989). The discrepancy between reading achievement and IQ test scores has been challenged (Jiménez & Rodrigo, 1994; Siegel, 1989; Sternberg & Grigorenko, 2002), however, and it will not be included in our definition of reading LD. Children with neurological disorders or sensory deficits were also excluded from the final analyses.

RESULTS

Prevalence

In the interviews with Guatemalan teachers 178 children were identified with reading and spelling disabilities. This represents 32 percent of the total sample of 557 students. Eleven percent were identified with reading disabilities, 9 percent with spelling disabilities, and 12 percent with reading and spelling disabilities. In the Spanish sample, 291 students (i.e., 28 percent) of the 1,408 children were identified with LD in reading and spelling. Spanish teachers reported that 6 percent of the children showed reading disabilities, 8 percent spelling disabilities, and 14 percent both.

These percentages vary if we take into account both the teacher's opinions and the psychometric criteria (e.g., IQ ≥ 75, pc < 25 in pseudoword reading, or pc ≥ 75 in word or pseudoword reading time). With regard to the Guatemalan teacher-identified group of 178 children, 93 (17 percent) were identified as having a specific LD. Of these, 8 percent were dyslexics and 9 percent also showed spelling disabilities. Of the 291 Spanish children, 55 (5 percent) were identified as having a specific LD; approximately 2 percent were dyslexics and 3 percent also had spelling disabilities.

There were no significant differences in the distribution of the LD subjects as a function of nationality and gender, $\chi^2(1) = .68, p = .40$, nor as a function of nationality and type of school, $\chi^2(1) = 3.01, p = .08$. There was not a significant difference between Guatemalan children with LD and Spanish children with LD for IQ, $F(1, 146) = .56, p = .45$, but there was one for age, $F(1, 146) = 20.9, p < .001$. Children who had sensory, acquired neurological, and other problems traditionally used as exclusionary criteria for LD were excluded. The means and standard deviations for IQ and age are presented in Table 1.

TABLE 1
Means and Standard Deviations on the Age and IQ

Country		*IQ*	*Age in Months*
Spain	Mean	97.20	121.78
	N	55	55
	SD	12.34	16.80
Guatemala	Mean	95.74	135.37
	N	93	93
	SD	10.76	17.82
Total	Mean	96.28	130.32
	N	148	148
	SD	11.35	18.59

Note. IQ = Intelligence quotient.

Cognitive Processes

We only selected children from third grade to sixth grade in both countries in order to match the groups on this variable. In spite of this control, the comparisons between Guatemalan and Spanish samples were compromised somewhat by the fact that there were significant differences in age. To control for this difference, one-way analyses of covariance (ANCOVAs) were conducted across the groups only for cognitive processes in which age served as the covariate. Prior to conducting each ANCOVA, we tested the goodness of fit; assumptions were met and thus ANCOVAs were used. A different procedure was used for analyzing the naming reading words and naming speed data. Here ANCOVAs were conducted by a general linear model, using accuracy responses and latency times as the dependent variables, grade and nationality variables as fixed factors, and age as the covariate. Table 2 shows the means and standard deviations of each cognitive process variable by nationality and grade.

There were no main effects by nationality for any of the cognitive process variables: verbal working memory, $F(1, 139) = .73$, $p = .39$; speech perception, $F(1, 139) = .02$, $p = .88$; pseudoword naming, $F(1, 139) = .02$, $p = .86$; latency times in word reading, $F(1, 139) = .38$, $p = .53$; latency times in pseudoword reading, $F(1, 139) = .06$, $p = .79$; phonological awareness, $F(1, 139) = .40$, $p = .52$; orthographical processing, $F(1, 139) = .73$, $p = .39$; morphological processing, $F(1, 139) = .91$, $p = .34$; syntactic processing, $F(1, 139) = .56$, $p = .45$; text comprehension, $F(1, 139) = .73$, $p = .39$; fluency, $F(1, 139) = .37$, $p = .54$; correct word naming, $F(1, 139) = .11$, $p = .73$; and naming speed, $F(1, 139) = 1.92$, $p = .16$.

Main effects for grade occurred, though, on five of the variables: latency times in word reading, $F(3, 139) = 4.59$, $p < .01$, $\eta^2 = .09$; latency times in pseudoword reading, $F(3, 139) = 2.76$, $p < .01$, $\eta^2 = .05$; syntactic processing, $F(3, 139) = 3.39$, $p <. 02$, $\eta^2 = .06$; fluency, $F(3, 139) = 4.12$, $p <. 01$, $\eta^2 = .08$; and naming speed, $F(3, 139) = 13.5$, $p <. 001$, $\eta^2 = .22$. There were no grade-level differences on the other cognitive process variables: verbal working memory, $F(3, 139) = 1.08$, $p = .35$; speech perception, $F(3, 139) = .64$, $p = .58$; pseudoword naming, $F(3, 139) = 1.32$, $p = .26$; phonological awareness, $F(3, 139) = 2.04$, $p = .11$; orthographical processing, $F(3, 139) = 1.08$, $p = .35$; morphological processing, $F(3, 139) = 1.21$, $p = .30$; text comprehension, $F(3, 139) = 1.08$, $p = .35$; and correct word naming, $F(3, 139) = 1.98$, $p = .11$.

Finally, there were no significant nationality × grade interaction effects for any of the variables: verbal working memory, $F(3, 139) = .96$, $p = .41$; speech perception, $F(3, 139) = .10$, $p = .95$; pseudoword naming, $F(3, 139) = .30$, $p = .82$; latency times in word reading, $F(3, 139) = 1.07$, $p = .36$; latency times in pseudoword reading, $F(3, 139) = .30$, $p = .82$; phonological awareness, $F(3, 139) = .12$, $p = .94$; orthographical processing, $F(3, 139) = .96$, $p = .41$; morphological processing, $F(3, 139) = 1.12$, $p = .34$; syntactic processing, $F(3, 139) = .35$, $p = .78$; text comprehension, $F(3, 139) = .96$, $p = .41$; fluency, $F(3, 139) = .28$, $p = .83$; correct word naming, $F(3, 139) = .22$, $p = .87$; and naming speed, $F(3, 139) = .99$, $p = .39$.

DISCUSSION

It is important to emphasize some striking similarities between, as well as differences in, the special education policies employed by Guatemala and Spain before we discuss the findings about the prevalence of LD and the cognitive profiles of children with reading and spelling disabilities in different cultural contexts. Although Guatemala adopted the U.S. Federal Register (1977) definition of LD and Spain did not, LD is considered as a diagnostic category in both countries. Also, special education in Guatemala and Spain is regulated by the same four principles: normalization, school integration, the sectorization of services through interdisciplinary teams, and the individualization of the teaching process. Individual teaching and LD assistance is made within the ordinary curriculum setting. Both Guatemalan and Spanish general education teachers in primary education refer students every year to multidisciplinary teams that conduct psychoeducational evaluations. The educational response to LD in both countries is carried out through different schooling modalities. A major difference in the special education policies employed by Guatemala and Spain, though, centers on the introduction of the *Adaptaciones Curriculares Individualizadas* (i.e., ACIs) in the Spanish school reform that represents a substantial change with respect to the traditional Individual Development Programs (i.e., PDIs) based on a behavioral approach.

We found some differences with regard to LD prevalence in the samples studied in both countries. Although reading problems have been recognized in children from different countries, for example, in Holland (De Gelder & Vroomen, 1991), Germany (Schneider, Roth, & Ennemoser, 2000), and Korea (Kim & Davis, 2004), there are continuing doubts about the specific characteristics of developmental dyslexia in different languages. Behavioral studies have shown that the nature and prevalence of dyslexia differ across languages (Landler, Wimmer, & Frith, 1997; Paulesu et al., 2001; Ziegler & Goswami, 2005). In the United States, LD prevalence rates range from 2 to 10 percent (APA, 2002) and reading disabilities affect at least 80 percent of the LD population (Lerner, 1989; Lyon, 1995), though percentages can vary as a function of criteria used, ranging, for example, from 5 to 17.5 percent in children of school age (Katusic, Colligan, Barbaresi, Schaid, & Jacobsen, 2001).

The prevalence of dyslexia in Italy has been reported as significantly lower than that in the United States (Lindgren, Renzi, & Richman, 1985). The transparency/opacity of the writing system has been suggested as a major variable affecting the level of difficulty in learning to read (e.g., Ziegler & Goswami, 2005). A transparent language is one in which there is a straightforward phoneme/grapheme correspondence. Italian, Spanish, and Russian are examples of transparent languages. It has been estimated that the development of reading is faster in Spanish than in English due to the differences in the orthography system of the two languages (Ziegler & Goswami, 2005).

To our knowledge, no estimates of the prevalence of reading disorders have been reported in Spanish-speaking countries but it is expected that the prevalence of reading disorders among a sample of Spanish-speaking Guatemalan

TABLE 2
Means and Standard Deviations on the Reading and Spelling Cognitive Processing Variables by Nationality and Grade

Nationality	*Grade*		*VWM*	*SP*	*NS*	*PA*	*HC*	*MCT*
Spain	3	Mean	1.53	8.37	50360.91	0.63	0.68	2162.17
		N	15	15	15	15	15	15
		SD	0.64	1.68	7593.64	0.10	0.15	623.97
	4	Mean	1.75	8.67	45516.20	0.70	0.72	2094.89
		N	12	12	12	12	12	12
		SD	0.45	1.13	5909.99	0.09	0.10	373.71
	5	Mean	2.20	9.27	36339.81	0.71	0.73	1806.65
		N	15	15	15	15	15	15
		SD	0.77	0.51	5435.22	0.09	0.13	454.65
	6	Mean	2.46	9.01	34406.88	0.74	0.80	1807.90
		N	13	13	13	13	13	13
		SD	0.66	0.90	7032.01	0.17	0.11	471.91
	Total	Mean	1.98	8.83	41709.00	0.69	0.73	1966.79
		N	55	55	55	55	55	55
		SD	0.73	1.17	9250.46	0.12	0.13	509.82
Guatemala	3	Mean	1.83	8.56	44242.57	0.63	0.71	2359.75
		N	29	30	30	30	30	30
		SD	0.711	1.08	14354.70	0.11	0.09	547.84
	4	Mean	2.22	8.78	42540.06	0.72	0.76	1869.49
		N	23	24	24	24	24	24
		SD	1.16	1.31	7571.15	0.14	0.17	513.45
	5	Mean	2.40	9.19	34214.81	0.73	0.79	1920.85
		N	10	11	11	11	11	11
		SD	1.07	0.65	11555.96	0.14	0.08	601.16
	6	Mean	2.50	9.26	36068.58	0.73	0.81	1998.39
		N	26	28	28	28	28	26
		SD	0.99	0.61	9817.88	0.15	0.10	591.17
	Total	Mean	2.19	8.90	40156.15	0.70	0.76	2074.15
		N	88	93	93	93	93	91
		SD	0.99	1.02	11760.99	0.14	0.12	586.69

Nationality	*Grade*		*PALA*	*PPALA*	*PALT*	*PPALT*	*TC*	*FL*
Spain	3	Mean	0.96	0.84	1873.65	2048.19	0.58	1380.89
		N	15	15	15	15	15	15
		SD	0.05	0.11	434.54	657.25	0.15	654.48
	4	Mean	0.96	0.85	1672.40	1847.94	0.51	1056.75
		N	12	12	12	12	12	12
		SD	0.03	0.10	321.55	491.51	0.23	469.27
	5	Mean	0.98	0.88	1431.18	1762.33	0.60	867.19
		N	15	15	15	15	15	15
		SD	0.02	0.09	487.18	481.40	0.23	322.82
	6	Mean	0.97	0.88	1248.35	1604.24	0.67	678.84
		N	13	13	13	13	13	13
		SD	0.03	0.07	305.24	550.01	0.20	426.89
	Total	Mean	0.97	0.86	1561.27	1821.60	0.59	1004.13
		N	55	55	55	55	55	55
		SD	0.03	0.09	458.67	561.49	0.21	542.36
Guatemala	3	Mean	0.95	0.79	1903.03	2305.95	0.52	1387.42
		N	30	30	29	30	30	30
		SD	0.05	0.14	491.18	739.08	0.24	545.30
	4	Mean	0.96	0.84	1467.73	1968.71	0.62	954.61
		N	24	24	24	24	24	24
		SD	0.03	0.09	483.71	621.07	0.21	504.28
	5	Mean	0.98	0.89	1394.16	1756.79	0.63	672.92
		N	11	11	11	11	11	11
		SD	0.01	0.08	228.88	420.56	0.15	160.43
	6	Mean	0.97	0.87	1398.75	1879.42	0.70	612.51
		N	28	28	28	28	28	28
		SD	0.03	0.08	334.26	522.62	0.18	156.45
	Total	Mean	0.96	0.84	1575.15	2025.55	0.61	957.91
		N	93	93	92	93	93	93
		SD	0.04	0.11	472.35	640.01	0.21	522.94

Note. VWM = Verbal working memory; SP = Speech perception; NS = Naming speed; PA = Phonological awareness; HC = Homophone comprehension task; MCT = Morphological comprehension; PALA = Word naming; PPALA = Pseudoword naming; PALT = Word reading time; PPALT = Pseudoword reading time; TC = Text comprehension; FLU = Fluency.

and Spanish children would be closer to that of Italian children due to the linguistic similarities between Spanish and Italian. In the present study, the percentages of children identified with LD in reading and spelling were not the same in both countries. In the Guatemalan sample, 17 percent were identified with a specific LD (8 percent were dyslexics and 9 percent showed spelling disabilities). Only 5 percent, however, were identified with a specific LD in the Spanish sample (2 percent were dyslexics and 3 percent showed spelling disabilities). These findings suggest that, although reading disorders are increasingly believed to have a biological origin (e.g., Kaplan et al., 2002; Olson, 2002), not only linguistic variables but also cultural and environmental variables can play important roles in the frequency and characterization of reading problems.

The second purpose of our study focused on the interaction between cultural diversity and LD in reading and spelling from an information-processing model. We did not find cross-national patterns of significant differences in cognitive processes that are involved in reading and spelling acquisition in spite of cultural and educational differences between the countries.

A limitation of this study was that we did not compare matched groups of low-socioeconomic-status (SES) children with and without LD who were in the same schools and social environments. There is empirical evidence about the comorbidity between LD and low SES. For instance, Bravo-Valdivieso (1995) conducted a study that selected two groups of Chilean children equivalent in age from similar low-income families and schools. The greatest differences between the groups were in the tasks of processing phonological information, memory of visually sequenced letters, auditory comprehension, and verbal abstraction of similarities. These results confirmed that severe reading retardation may appear as a LD independent of SES and IQ.

In sum, the present cross-cultural work provides evidence about the universality assumption of cognitive processes involved in reading and spelling LD. These findings have educational and social implications for LD in many countries, particularly in light of the increasing cultural diversity of the student population.

ACKNOWLEDGMENTS

We acknowledge the support from Guatemalan and Spanish teachers, children, and the administrations of the Guatemalan schools, Capouilliez and Cepaz, and the Spanish schools Hispano-Inglés, 25 de Julio, Narciso Brito, and San Fernando. We are indebted to the authorities of the Directorate General for Educational Planning and Innovation of the Department of Education, Culture and Sport of the Canary Islands Government, and Jeannette Cacacho from the Special Education Service, Guatemalan Ministry of Education. We are grateful to María José Castillo, Claudia Castañeda, Ana Vides, Anaité Cifuentes, Maria José Maldonado, Francisco Pérez, Estefanía Rojas, Cristina Rodríguez, Desirée González, Virginia Anzorena, Patricia Crespo, Julia Moraes de Souza, Patricia Rodas, Claudia Luna de Asturias, Anaite Valle de Herrarte, and Maria del Pilar Grazioso for their assistance during the data-collection phase of this study.

This research has been supported by Agencia Española de Cooperación con Iberoamérica, Fundación Telefónica Española, Dirección General de Ordenación e Innovación Educativa de la Consejería de Educación, Cultura y Deportes del Gobierno de Canarias, Dirección General de Universidades del Gobierno Autónomo de Canarias GRUP2004/13, and Plan Nacional I+D+I (Feder y Ministerio de Ciencia y Tecnología) BSO2003-06992. This research includes results from the Scientific Dissemination Plan about assistive technology in learning disabilities that was presented in the Universidad del Valle, Guatemala; Universidad de Guadalajara, México; University of Texas; and Arizona State University, September 2006.

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