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Research Note

Emergent Literacy in Spanish-Speaking Children With Developmental Language Disorder: Preliminary Findings of Delays in Comprehension- and Code-Related Skills

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Purpose: This exploratory study describes the emergent literacy skills of children with developmental language disorder (DLD) who speak Spanish, a language with a simple phonological structure and transparent orthography. We examine differences between children with DLD and their typically developing (TD) peers on a battery of emergent literacy measures.
Method: Participants included 15 monolingual Spanish-speaking children with DLD (who did not present with cognitive difficulties) and 15 TD controls matched for age, gender, and socioeconomic status, ranging in age from 3;10 to 6;6 (years;months; M_{age} = 4;11). All children completed a battery of comprehension-related emergent literacy tasks (narrative retell, print concept knowledge) and code-related emergent literacy tasks (beginning sound, rhyming awareness, alphabet knowledge, and name-writing ability).
Results: On average, children with DLD performed significantly worse than TD controls on a battery of comprehension- and code-related emergent literacy measures. On all code-related skills except rhyming, children with DLD were more likely than their TD peers to score "at risk."
Conclusions: The results suggest some universality in the effect of DLD on reading development. Difficulties with emergent literacy that are widely documented in English-speaking children with DLD were similarly observed in Spanish-speaking children with DLD. Future research should explore long-term reading outcomes in Spanish for children with DLD.

For years, professionals in the field of speech-language pathology have observed a connection between young children's oral language ability and the subsequent ease with which they learn to read (e.g., Lervåg et al., 2018). A considerable body of empirical research spanning 3 decades confirms this relationship; notably, over 40% of U.S. children identified with specific language impairment (now developmental language disorder [DLD]; Bishop et al., 2017) at ages 5 and 6 years meet the criterion for reading disability when they reach second grade (Catts et al., 2002). Research investigating the early origins of reading disability has identified significant gaps in the emergent reading and writing skills of children with impaired language ability as compared to children with typical language ability—gaps that are detectable as early as preschool (e.g., Boudreau & Hedburg, 1999; Pavelko et al., 2018; Snowling et al., 2019).

What is less clear is how the relationship between language and emergent literacy manifests for children who speak languages other than English. Given wide-ranging phonological and orthographic differences among diverse language systems, there is reason to suspect that the degree to which emergent literacy skills are affected by a comorbid diagnosis of DLD could vary with respect to the language spoken. This study aims to provide an initial exploration of the emergent literacy skills of monolingual children who speak Spanish, comparing the performance of children with DLD and those with typical development.

DLD and Emergent Literacy Development: Evidence From English

DLD affects between 7% and 10% of the population (Norbury et al., 2016; Tomblin et al., 1996) and is characterized by severe difficulty with language not attributable to other known conditions, such as genetic syndromes, autism

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spectrum disorder, acquired brain injury, or hearing loss (Bishop et al., 2016; Leonard, 2014). While children with DLD primarily experience difficulties with the comprehension and production of oral language, there is evidence that they struggle to comprehend and produce written language, as well (e.g., Snowling et al., 2019). Of relevance to the current study, these lags begin to appear on tasks of emergent literacy (Boudreau & Hedberg, 1999; Pavelko et al., 2018; Tambyraja et al., 2015). The term *emergent literacy* refers to the foundational skills that develop before a child receives formal reading instruction and are consistently predictive of their later reading ability (Whitehurst & Lonigan, 1998). Emergent literacy can be conceptualized as two distinct but interrelated groups of skills: comprehension-related skills (e.g., vocabulary, grammar, print concept knowledge), which primarily underlie later reading comprehension, and code-related skills (e.g., phonological awareness, alphabet knowledge, name writing), which primarily underlie later decoding (Connor, 2016; Storch & Whitehurst, 2002; Whitehurst & Lonigan, 1998).

One of the first studies to systematically evaluate the emergent literacy skills of children with DLD was conducted by Boudreau and Hedberg (1999). They assessed 18 English-speaking preschool children with DLD, using Leonard's (2014) criteria excluding children with low nonverbal intelligence, and 18 typically developing (TD) peers matched for age, gender, and socioeconomic status. As a group, children with DLD scored significantly lower than TD controls on both comprehension-related and code-related emergent literacy tasks. Since 1999, their results have been replicated and expanded. English-speaking children with DLD have performed poorer, on average, than their TD peers on tasks assessing narrative language ability (Pankratz et al., 2007), print concept knowledge (Justice et al., 2006; Pavelko et al., 2018; Skibbe et al., 2008), phonological awareness (Catts et al., 2005; Snowling et al., 2019), alphabet knowledge (Justice et al., 2006; Snowling et al., 2019), and name writing (Cabell et al., 2009; Pavelko et al., 2018). Moreover, a greater proportion of children with DLD are classified as at risk (i.e., 1 *SD* below the typical average) on emergent literacy tasks than children in the general population (Tambyraja et al., 2015).

Emergent Literacy Development in Spanish

The emergent literacy skills that underlie early reading in alphabetic languages are largely universal. With respect to comprehension-related skills, all children need language skills in order to make sense of the words they decode in text. With respect to code-related skills, all children must learn to associate letters with sounds, so that they may eventually access whole-word phonological representations of known words (Ehri, 2017; Grainger & Ziegler, 2011). However, the ease with which a new string of letters can be translated into a phonological code will depend on the phonology and orthography of the language in which children learn to read (Goswami, 2008; Ziegler & Goswami, 2005). Languages with simple phonological structure, like Spanish, are easier to segment into their component sounds because the majority of syllables follow a simple consonant–vowel (CV) structure and have limited clusters and blends (Goikoetxea, 2005; Gorman & Gillam, 2003). Therefore, in Spanish, segmentation of syllables at the level of onset–rime is often equivalent to segmentation at the phonemic level. For example, a Spanish speaker who segments the syllables of the word "papá" into onset and rime (onset:"p," rime: "a") will also arrive at the phonemes comprising the word (/p/ /a/ /p/ /a/; Goswami, 2008). This is not the case for languages like English or German, where many onsets and rimes contain clusters of phonemes, as in "spot" and "post," which must be segmented further (De Cara & Goswami, 2002).

Orthographic transparency also influences literacy development (e.g., Landerl et al., 2019). In Spanish, letters correspond to phonemes with a high degree of transparency, such that nearly every phoneme is represented by a single, unique letter. Thus, the reader needs to learn fewer phoneme-to-letter conversions in Spanish than, for example, in English, where one letter can represent multiple phonemes (as the letter P does in the words *pet, psycho,* and *graph*) and one phoneme can be represented by multiple spellings (as the phoneme /f/ in words like *frog, tough,* and *photo*). Previous cross-linguistic research suggests that both the simple phonological structure of Spanish and its highly regular phoneme-to-letter correspondence facilitate the process of learning to read in Spanish (Castejón et al., 2015; Ellis et al., 2004; Florit & Cain, 2011; Müller & Brady, 2001; Seymour et al., 2003; Ziegler et al., 2010). In theory, this should also help Spanish-speaking children with DLD as they learn to read.

Although reading disorders like dyslexia have been studied extensively in monolingual Spanish (e.g., Jiménez et al., 2009; Lopez Escribano, 2007; Serrano & Defior, 2008; Suárez-Coalla & Cuetos, 2015), there are few studies of DLD or its relationship to emergent literacy development in Spanish. We can look to the research on TD readers for insight into how language and literacy emerge in young Spanish speakers. Despite the finding that children learning to read in Spanish are mostly accurate decoders by the end of first grade (Goldenberg et al., 2014; Seymour et al., 2003), research prior to first grade nonetheless shows considerable variability across early comprehension- and code-related skills (Castilla-Earls et al., 2015; San Francisco et al., 2005; Tabors et al., 2003). For instance, a study examining the narrative production of Spanish-speaking preschoolers in Colombia revealed developmental patterns of narrative macrostructure and microstructure, though they report considerable variability across ages and skills (Castilla-Earls et al., 2015). Another study examined the early code-related skills of Spanish-speaking 4-year-olds in Puerto Rico and reported high levels of variability in children's phonological awareness skills ($M = 3.68$, $SD = 2.84$; Tabors et al., 2003). Work by Kim and Pallante (2012) with kindergarteners in Chile also described high variability on code-related skills: On a task of phonemic segmentation, children's scores ranged from 0 to 80, with a mean of 37.89 and an *SD* of

20.88. On a letter-naming fluency task, the standard deviation (SD = 11.98) was nearly as large as the mean (M = 12.22). Some children were able to name 76 letters in a minute's time, while others could not name a single letter. Notably, oral language at kindergarten entry explained significant variance on the letter-naming task (R = .38, p < .05).

Critically, none of the previous work on emergent literacy in Spanish specifically examined these skills in children with DLD. To our knowledge, the only published findings on early reading development in monolingual Spanish-speaking children with DLD come from a pilot intervention study by Pratt et al. (2015). They reported that a clinically identified sample of 13 preschool children receiving therapy for DLD in Mexico knew an average of 7.58 letters (SD = 8.59), nearly identical to the number of letters (7.47 letters, SD = 8.66) known by English-speaking children with DLD reported by Cabell et al. (2009). Still, the Pratt et al. (2015) study did not systematically compare the results of children with DLD to a group of TD controls, so it is impossible to conclude how well these young Spanish speakers with DLD performed relative to their same-age, same-language peers.

This Study

It is widely reported that English-speaking children with DLD are, on average, slower to acquire critical emergent literacy skills than their TD peers (see Schuele et al., 2007, for a review) and that they are more likely to score at risk on tasks of emergent literacy (Tambyraja et al., 2015). Research exploring these trends among children with DLD who are learning to read in languages other than English is limited. Although previous research on literacy development in Spanish suggests that early reading is facilitated by the simple phonological structure and transparent orthography of Spanish (Seymour et al., 2003), if and how this helps Spanish-speaking children with DLD learn to read are unclear.

Given this gap in the literature and the absence of developmental norms within a Spanish-speaking population, this study seeks to examine the comprehension- and code-related emergent literacy skill development of monolingual Spanish-speaking preschoolers with DLD, as compared to a control group carefully matched on age, gender, and socioeconomic status. We include both variable-centered analyses of group mean differences, as has previously been done in English by Boudreau and Hedberg (1999) and others, as well as person-centered analyses (Hoff, 2006; Tambyraja et al., 2015), describing the proportion of children with DLD who exhibit risk based on their emergent literacy scores. Given the exploratory nature of the study, this combination of complementary analyses allows for the possibility that development of emergent literacy in Spanish-speaking children with DLD is heterogeneous. Specifically, we pose the following questions:

1. Are there group mean differences on comprehension-related emergent literacy skills between Spanish-speaking children with DLD and TD controls matched for age, gender, and socioeconomic status? To what extent do children with DLD exhibit risk for comprehension-related emergent literacy delay, as compared to controls?
2. Are there group mean differences on code-related emergent literacy skills between Spanish-speaking children with DLD and TD controls matched for age, gender, and socioeconomic status? To what extent do children with DLD exhibit risk for code-related emergent literacy delay, as compared to controls?

We hypothesize that Spanish-speaking children with DLD will show lags on the emergent literacy skills closely related to oral language, namely, the comprehension-related skills. Our hypotheses regarding code-related skills are nondirectional. It is possible that the simple phonological structure and transparent orthography of Spanish that facilitate learning to read in Spanish among TD readers (e.g., Seymour et al., 2003) will also help children with DLD as they acquire code-related emergent literacy skills. It is also possible that Spanish-speaking children with DLD will struggle with code-related skills, as previously suggested by Pratt et al. (2015).

Method

Participants

Thirty children participated in this study. Participants included 15 monolingual Spanish-speaking children with a diagnosis of DLD, as well as 15 age-, gender-, and income-matched TD controls (see Table 1). Each group comprised 10 boys and five girls. All children were recruited from private preschools, kindergartens, and speech-language clinics located in a mid-size city in southeastern Mexico. Given the lack of normative data in monolingual Spanish regarding when emergent literacy skills develop, as well as the potential for delayed development of these skills among children with DLD, we invited children to participate if they fell within the broad window of 3;6 and 6;6 (years;months). Nonetheless, 26 of the 30 children in our sample were between 4 and 5 years old (M = 4;11, SD = 8.48 months).

Using a family background questionnaire (described in Measures), families of children with DLD and TD children provided information about their income, education, and home literacy environment. The average monthly income of families in our sample was 25,700 Mexican pesos (SD = 14,930), which was equivalent to roughly U.S. $1,300 at the time of data collection (U.S. $1 = 19.65 Mexican pesos). Although the mean income of our sample represents the top quartile of earners in Mexico, according to Mexico's Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography), families at this percentile should be considered moderate earners, as day-to-day living expenses are likely a concern for them (Instituto Nacional de Estadística y Geografía, 2015). Independent-samples t tests showed no significant group differences on income (p = .225) or age (p = .501). All parents were literate. The majority of fathers (19 of 26 who returned

Table 1. Descriptive variables, by language ability group.

Variable	DLD group Range	DLD group *M*	DLD group *SD*	TD group Range	TD group *M*	TD group *SD*	*p*
Language—BELE[a]							
Elicited production	2–12	5.87	3.27	6–18	12.07	2.55	.000
Definitions	4–11	7.40	2.13	7–16	10.93	2.69	.000
Comprehension	0–10	5.67	3.31	8–18	12.07	2.55	.000
Riddles[b]	5–12	7.83	2.40	9–14	11.00	2.10	.035
Demographics							
Age in months	46–78	58.40	9.45	48–75	60.27	7.60	.501
Monthly household income[c,d]	10,000–60,000	24,500	12,066	12K–90K	35,272	29,286	.225
Gender (% male)		67			67		1.00
Mother education (% finished HS)		85			92		.514
Father education (% finished HS)		92			92		1.00
Home literacy practices							
Books in home	3–30	11.90	7.45	1–80	19.91	22.54	.298
Frequency of child interacting with book (% who read at least 1× weekly)		54			46		.707
Frequency of adult–child shared reading (% who read at least 1× weekly)		38			46		.305

Note. DLD = developmental language disorder; TD = typically developing; HS = high school.
[a]Batería de Evaluación de la Lengua Española (Rangel et al., 1988). [b]Data based on children ages 5 years and older (*n* = 12). [c]Data based on 26 of 30 participants who returned their questionnaire. [d]Income in pesos, 1 U.S. dollar = 19.65 Mexican pesos.

surveys) and mothers (18 of 26 respondents) had completed at least a high school education. Regarding literacy practices in the home, half of all parents reported that their children looked at books independently at least once a week. Parents also reported that most children read weekly with an adult. In most cases (96%), respondents identified the mother as the adult who read with the child; however, families also indicated that shared reading occurred with the child's father, older siblings, and grandparents. Across the sample, families reported that they had, on average, 16 children's books in the home (*SD* = 17.65, after one outlier was removed who reported over 1,200 books in the home). Finally, all parents who responded to the questionnaire (26 of 26) asserted that they wanted their child to value reading. Home literacy data are presented by group in Table 1; no significant differences between groups were observed on any variables.

Procedure

Recruitment and Consent

Children in the DLD group were referred to participate in the study based on school psychologists' report of delayed language development and/or by referral from local speech and language clinics. Parents of these children received a flier that explained the study, outlined participation expectations, and invited them to participate. Parents who were interested in participating subsequently received a consent form, which they discussed with research staff, and then opted to sign or not. All recruitment and consent activities were approved by the institutional review board of the second and third authors' institution.

Recruitment and consent of children with DLD occurred first. A diagnosis of DLD was confirmed following the conventional conditions outlined in Leonard (2014). Children were considered to have DLD if they met the following inclusionary and exclusionary criteria: (a) typical nonverbal intelligence; (b) a standard score falling 1.25 *SD*s below the mean on a test of normed expressive and receptive language; (c) typical hearing; (d) no history of recurring otitis media with effusion; (e) no comorbid neurological, sensory, social, or emotional disorders; and (f) no obvious oral structural abnormalities. Given that one of our research aims was to evaluate children's ability to produce letter names and letter sounds, we also excluded children with severe articulatory difficulties. All diagnostic measures are described in detail in the following section.

Once a child was admitted to the DLD group, a child with typical language development was recruited to serve as their control. Efforts were made to individually match the children in the control group to the children in the DLD group based on age (birthdays within 3 months), gender, and income. In 12 of 15 cases, TD controls were recruited from the same classroom as the child with DLD. Similar to the recruitment procedures for children with DLD, parents of TD controls received a flier and discussed the study with research staff before consenting. At the study's conclusion, all parents who consented to participate (regardless of whether they were eventually excluded due to results of our diagnostic assessment battery) received a report detailing their child's performance on all measures.

Data Collection

For nearly all participants, assessments were administered in a quiet room in the child's school. Assessment of children with DLD who were recruited from speech and language clinics ($n = 3$) occurred in the clinic at a time that did not conflict with the child's existing program of therapy. All assessments were performed by research staff fluent in the regional dialect of Mexican Spanish, and all assessors had prior experience working in Spanish with young children with communication disorders.

Children's assessments were delivered in two stages to both those children ultimately identified as having DLD and to the TD control group: First, assessors administered a diagnostic battery in order to determine eligibility; second, assessors administered a battery of language and emergent literacy measures (see Table 2). All children had the right to refuse to be tested and could stop at any time or decline to respond. If a child appeared uncomfortable, assessors returned the child to the classroom. All children received stickers for participating.

Diagnostic Measures

The following battery of assessments was administered to children to confirm the presence or absence of DLD. As is customary of DLD, most criteria are exclusionary. First, children were given an experimenter-created phonological screen consisting of 20 two-syllable nonwords that follow a CVCV or CVCVC phonotactic patterns of most Spanish words. Children had to reproduce 75% of phonemes correctly in order to ensure intelligibility and be included in the study. Likewise, children with obvious oral structural abnormalities were excluded, as determined by visual examination by assessors. Next, children completed the Matrices subtest of the Kaufman Brief Intelligence Test–Second Edition in Spanish (Kaufman & Kaufman, 2004); a standard score of 85 or higher was the cutoff for participation. Though the test was not normed on monolingual Spanish speakers, it has been used in the past with children with language disorders in Spain (Pons et al., 2013). For the first nine items, children choose which of five pictures best match concepts portrayed in the single-stimulus picture. For Items 10 through 46, children choose which picture best completes a matrix of pictures. The pictures featured in the stimuli should be familiar to children growing up in a mid-size city in Mexico.

Subsequently, children's language ability was evaluated using four subtests of the Batería de Evaluación de la Lengua Española (Rangel et al., 1988), a test of language ability developed and normed in Mexico with Mexican children. Children with a standard score of 1.25 *SD*s below the mean on at least one test measuring receptive language (Comprensión Gramatical [Grammatical Comprehension] or Adivinanzas [Riddles]) and at least one test measuring expressive language (Producción Dirigida [Elicited Production] or Definiciones [Definitions]) were considered DLD. As determined by parent report, children in the DLD group had no history of recurrent otitis media with effusion and no comorbid neurological, sensory, social, or emotional disorders. Finally, a pure-tone hearing screening was conducted using a mobile phone application, Audiogram (Cocciolo, 2016), which functions like an audiometer, and Bose Around Ear (AE2) headphones. Using the app, children were presented with

Table 2. Measures delivered, by battery.

Construct	Measure and subtests
I. Diagnostic measures	
Language ability	Batería de Evaluación de la Lengua Española (Rangel et al., 1988)
Expressive morphosyntax	Elicited Production
Expressive semantics	Definitions
Receptive morphosyntax	Comprehension
Receptive semantics	Riddles
Nonverbal intelligence	Kaufman Brief Intelligence Test (Kaufman & Kaufman, 2004)
	Matrices
Articulation	Phonological repetition task
Hearing	Pure-tone hearing screen
Comorbid disorders	Parent questionnaire
II. Comprehension-related emergent literacy measures	
Narrative language ability	Frog Retell
Syntax	Mean length of utterance in words
Vocabulary	Number of words
	Number of different words
Narrative structure	Index of Narrative Complexity (Petersen et al., 2008)
Print concept knowledge	Phonological Awareness Literacy Screening for Preschool in Spanish (Ford & Invernizzi, 2009)
	Print and Word Awareness
III. Code-related emergent literacy measures	
Phonological awareness	Phonological Awareness Literacy Screening for Preschool in Spanish (Ford & Invernizzi, 2009)
Onset-rime awareness	Beginning Sounds
Rhyme awareness	Rhyming
Alphabet knowledge	Uppercase Letter Names
	Uppercase Letter Sounds
Name writing	Name Writing

pure tones at 4000, 2000, and 1000 Hz at 20 dB in each ear. Occasionally, because of ambient noise in the school, the intensity was increased to 25 dB for the lowest frequency. Children who heard all tones in both ears were included in the study; children who did not hear all tones (n = 1) were excluded from the study and referred for further assessment. Hearing tests were performed on 12 of 15 children with DLD; however, parents and schools reported no history of ear infections or hearing loss for all children in the sample.

Diagnostic measures for children in the TD group were identical to those used with the DLD group, with one important distinction: the language performance of the TD group needed to fall within 1.25 *SD*s of the mean on all subtests of the Batería de Evaluación de la Lengua Española. Additionally, given the parent report of no recent episodes of otitis media with effusion and children's normal language development, the TD children did not receive a hearing screening.

Descriptive Measures

Additionally, caregivers completed a background questionnaire that provided information about caregivers and their children, including questions about the educational attainment of caregivers, family income, and home literacy practices. This survey has been used in prior research with children in Mexico with language disorders (Pratt et al., 2015). We received questionnaires from 26 of 30 families, and one caregiver left blank the question about household income. For participants for whom we did not have explicit socioeconomic status data, we ensured that their TD or DLD match came from the same classroom, in order to ensure economic parity.

Emergent Literacy Measures

Comprehension-Related Skills

Children completed a narrative language retell task, following the protocol described in Castilla-Earls et al. (2015), but using the wordless picture book, *Frog, Where are You?* (Mayer, 1969). Children are "read" the book (see the Appendix for the script in Spanish and an English translation) and then asked to retell the story. Children's responses were video-recorded and subsequently transcribed using CLAN (MacWhinney, 2009) by monolingual speakers of Mexican Spanish. Four children (two per group) are missing narrative data and were removed pairwise from analyses.

Narrative transcriptions were analyzed according to the Index for Narrative Complexity (INC; Petersen et al., 2008), in addition to traditional language sampling metrics such as total number of words, number of different words, and mean length of utterance in words (MLU), calculated using CLAN (MacWhinney, 2009). The INC is a coding scheme consisting of eight elements of narrative macrostructure, including character, setting, initiating event, internal response, plan, action attempt, complication, and consequence. Additionally, the INC measures five elements of narrative microstructure, including story markers, temporal markers, adverbial clauses, dialogue, and narrator commentary. Children were scored on each item on a scale from 0 to 2, with respect to the depth and breadth of their response, which were then summed for a total score out of 26. The coding scheme has been used successfully to score narratives of monolingual Spanish-speaking children in previous work (Castilla-Earls et al., 2015).

Interrater reliability for the INC was examined for macrostructure (story grammar elements) and microstructure features on five randomly selected language samples (19%). The first author served as the second rater. Agreement was reached if both coders assigned the same score to each story grammar element or microstructure feature. We calculated reliability using the following formula: agreements divided by agreements plus disagreements multiplied by 100. The total point-by-point interrater reliability for coding of the INC was 90.77%.

Transcription reliability was also computed. Transcribers were initially trained on a series of common transcriptions and deemed reliable when exact agreement on words reached 90%. Then, five videos were randomly selected to be transcribed by a second transcriber. Exact agreement on words transcribed ranged from 91% to 99%, with a mean agreement percentage of 96.14%. A Krippendorff's alpha interrater reliability coefficient (Hayes & Krippendorff, 2007) was calculated for the interval data represented by each transcriber's number of words per utterance, for each transcript. Alpha values ranged between .79 and .96, with a mean Krippendorff's alpha of .86. Where disagreements occurred, coders conferenced until they reached a consensus. Finalized transcripts were analyzed using CLAN (MacWhinney, 2009) for MLU, total number of words, and number of different words.

Children's print concept knowledge was assessed using the Print and Word Awareness subtest of the Phonological Awareness Literacy Screening for Preschool in Spanish (PALS-PreK Español; Ford & Invernizzi, 2009). The Print and Word Awareness subtest is embedded in a shared reading activity. The assessor reads a short book with the child and asks the child print-related questions. The questions target children's knowledge about topics such as print directionality (e.g., "Muéstrame dónde empiezo a leer." [Show me where I start to read]), word identification ("Veo dos palabras que son iguales. ¿Cuáles son?" [I see two words that look the same. Where are they?]), and children's ability to track print with their finger while reading. The subtest consists of 10 questions and each question is scored as correct (1) or incorrect (0).

Code-Related Skills

Children were assessed on five additional measures of emergent literacy using the PALS-PreK Español (Ford & Invernizzi, 2009). We measured children's phonological awareness using the Rhyming Awareness subtest and the Beginning Sounds Awareness subtest. The Rhyming subtest asks children to choose which of three corresponding pictures rhymes with the target word. The Beginning Sounds subtest asks children to sort a group of picture cards by their initial phoneme (/m/, /l/, or /p/). Each task has a maximum of 10 possible points.

The construct of alphabet knowledge was evaluated by measuring children's knowledge of letter names and letter sounds. Letter names were assessed using the uppercase Alphabet Recognition subtest of the PALS-PreK Español, during which the examiner shows the child 29 letters arranged on an 8.5 × 11 in. sheet of paper and asks the child to name one letter at a time. Letters that are not being tested may be covered with a piece of scrap paper. Children are scored on each letter with either a 0 (indicating an *incorrect response or no response*) or a 1 (indicating a *correct response*). The test has a maximum possible score of 29. Letter sounds were assessed in a similar fashion; however, for this subtest, children must produce the sound the letter makes. The Letter Sounds subtest has a maximum possible score of 25, as letters with sounds that cannot be produced in isolation in Spanish (H, Q, Ñ) are not included on the test, nor is the example (M).

Children's ability to write their names was assessed using the name-writing procedure outlined in PALS-PreK Español, in which children are given a sheet of paper and instructed to draw a self-portrait and write their name beneath it. Children's responses are scored on a 7-point scale, ranging from a scribble with no distinction between the name and the picture to a name written correctly without any backward or mirror image writing. The complete scoring manual is available from PALS-PreK Español (Ford & Invernizzi, 2009).

Results

This study aimed to compare the emergent literacy skills of Spanish-speaking children with DLD and those with typical language development matched for age, gender, and socioeconomic status. Descriptive data for each group are presented in Table 3, and scatter plots of children's performance across comprehension- and code-related skills are shown in Figures 1 and 2, respectively. Bivariate relationships across all emergent literacy skills for the DLD and TD groups are displayed in Table 4.

Prior to the main analyses, raw data and residuals were evaluated according to central tendencies based on means, standard deviations, histograms, skewness and kurtosis values, and Q-Q plots. Although there was slight negative skew on the name-writing task within the control group and some slight positive skew for the letter sounds task within the DLD group, skewness and kurtosis statistics for all of the dependent variables and their residuals fell between the recommended range of −2 to 2.

Research Question 1: Comprehension-Related Skills

Our first research question sought to compare performance on comprehension-related emergent literacy measures among children with DLD and TD children. We tested the statistical significance of group differences using a two-group multivariate analysis of variance (MANOVA) with five dependent measures: MLU, number of words, number of different words, narrative complexity, and print concept knowledge. No demographic variables were controlled for in the analysis, because the groups were intentionally matched on age, gender, and socioeconomic status. Assumptions of normality, independence, and homogeneity of variance were met. The omnibus test statistic was significant, Wilks' Λ = .45, $F(5, 19) = 4.56$, $p = .007$, with strong observed power (.91) and a large effect size ($\eta_p^2 = .55$), indicating significant mean differences between children in the DLD and TD groups. Post hoc univariate comparisons revealed that the TD controls significantly outperformed children with DLD on MLU, $F(1, 23) = 11.38$, $p = .003$; number of different words, $F(1, 23) = 4.22$, $p = .050$; narrative complexity, $F(1, 23) = 4.89$, $p = .037$; and print concept knowledge, $F(1, 23) = 21.79$, $p < .001$. The largest effect size was

Table 3. Emergent literacy measures, by language ability group.

	DLD group			TD group			Effect size
Variable	Range	*M*	*SD*	Range	*M*	*SD*	η^2
Comprehension-related skills							
MLU	1.70–6.68	4.89	1.26	4.11–9.08	6.77	1.82	.33**
Number of words	52–317	195.33	69.24	125–356	240.29	74.35	.13
Number of different words	29–106	82.33	20.63	67–146	97.79	22.66	.16*
Narrative complexity[a]	1–16	10.92	4.25	5–19	13.36	3.46	.18*
Print concepts[b]	2–8	5.27	2.25	6–10	8.57	1.40	.49**
Code-related skills							
Beginning sounds[b]	2–10	6.13	2.03	5–10	8.64	1.91	.29**
Rhyming[b]	3–7	4.47	1.36	3–10	6.71	2.84	.20*
Letter names[b]	0–18	6.47	5.36	2–29	16.00	9.12	.29**
Letter sounds[b]	0–18	4.73	5.30	5–25	14.00	6.48	.38**
Name writing[b]	3–7	4.79	1.48	3–7	6.07	1.30	.19*

Note. DLD = developmental language disorder; TD = typically developing; MLU = mean length of utterance in words.

[a]Index of Narrative Complexity (Petersen et al., 2008). [b]Phonological Awareness Literacy Screening for Preschool in Spanish (Ford & Invernizzi, 2009).

*Significance at alpha of .05. **Significance at alpha of .01.

Figure 1. Scatter plots of comprehension-related skills and age, across developmental language disorder (DLD) and typically developing (TD) groups. Dashed line = 1 *SD* below TD mean; print concepts = Phonological Awareness Literacy Screening for Preschool Print and Word Awareness task; INC = Index of Narrative Complexity; MLU = mean length of utterance in words.

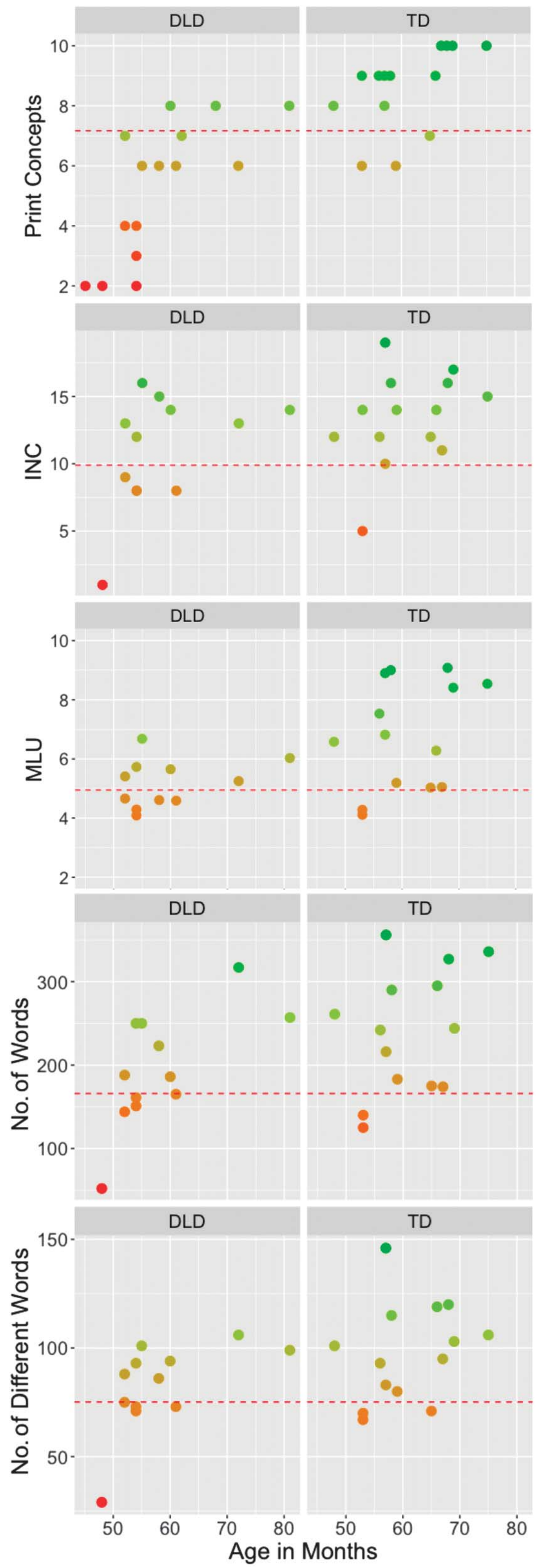

Figure 2. Scatter plots of code-related skills and age, across developmental language disorder (DLD) and typically developing (TD) groups. Dashed line = 1 *SD* below TD mean. All tasks come from Phonological Awareness Literacy Screening for Preschool in Spanish.

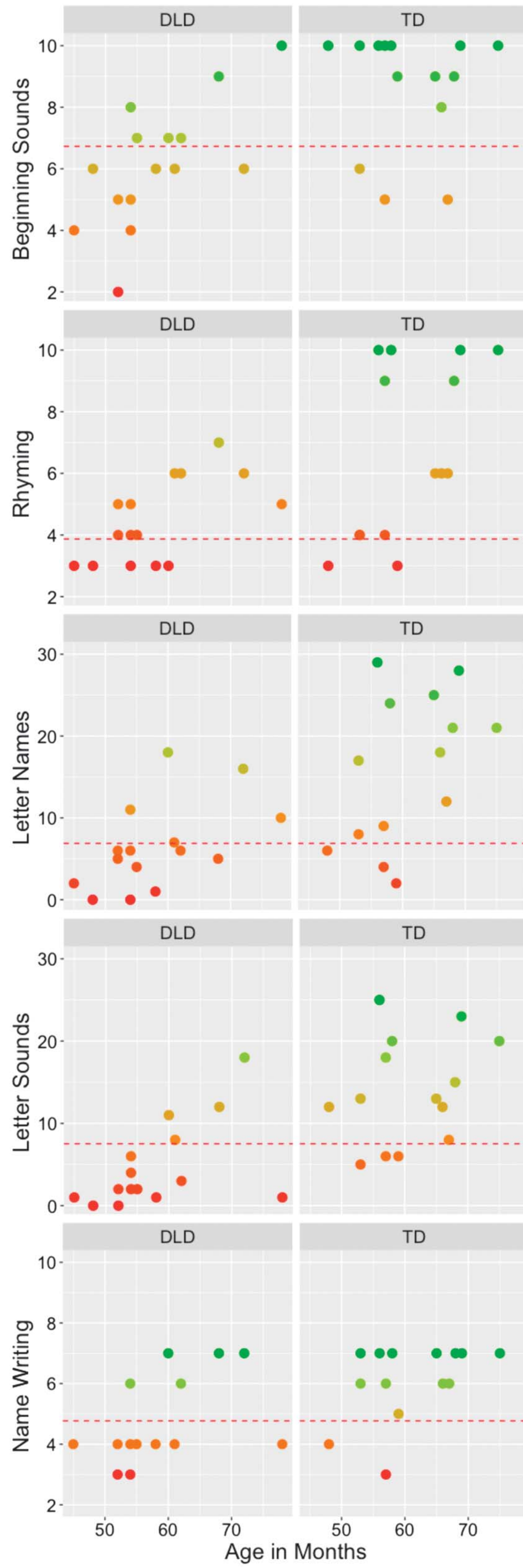

Table 4. Bivariate correlations for the developmental language disorder group (in gray below the diagonal) and the typically developing group (in white above the diagonal).

Variable		1. Age	2. MLU	3. NuW	4. NDW	5. INC	6. PC	7. BS	8. Rh	9. LN	10. LS	11.NW
1.	Age	—	.34	.36	.27	.36	.53*	.00	.54*	.47	.28	.46
2.	MLU	.45	—	.89**	.80**	.69**	.71**	.61**	.79**	.44	.76**	.21
3.	NuW	.66*	.80**	—	.92**	.67**	.66*	.59*	.62*	.27	.60*	.12
4.	NDW	.58*	.94**	.93**	—	.71**	.67*	.45	.56*	.16	.50	.13
5.	INC[a]	.46	.91**	.83**	.93**	—	.29	.58*	.58*	.23	.48	.49
6.	PC	.71**	.66*	.52	.67*	.73**	—	.23	.68**	.53	.62*	.28
7.	BS[b]	.69**	.25	.28	.25	.27	.63*	—	.45	.48	.74**	.36
8.	Rh[b]	.60*	.13	.26	.21	−.03	.42	.26	—	.76**	.87**	.67**
10.	LN[b]	.53*	.32	.32	.45	.28	.50	.33	.27	—	.80**	.76**
11.	LS[b]	.49	.17	.42	.38	.17	.40	.30	.51*	.71**	—	.55*
12.	NW[b]	.42	−.08	.16	.23	.03	.43	.46	.42	.68**	.79**	—

Note. MLU = mean length of utterance in words; NuW = number of words; NDW = number of different words; INC = Index of Narrative Complexity; PC = Print Concepts; BS = Beginning Sounds; Rh = Rhyming; LN = Letter Names; LS = Letter Sounds; NW = Name Writing.

[a]Petersen et al. (2008). [b]Phonological Awareness Literacy Screening for Preschool in Spanish (Ford & Invernizzi, 2009).

*Significance at alpha of .05. **Significance at alpha of .01.

observed on print concept knowledge ($\eta_p^2 = .49$). All effect sizes are reported in Table 3.

We also assessed the proportion of children at risk for delays in comprehension-related emergent literacy in each group. In order to determine risk status, cut-points were calculated for each measure following the procedures reported in Tambyraja et al. (2015). Cut-points for risk (also called "cutoff scores"; Bishop & Edmundson, 1987) were obtained by subtracting 1 *SD* from the mean scores of the TD group on each measure. TD means, standard deviations, and cut-points are shown in Table 5. The cut-points for each comprehension-related emergent literacy skill are illustrated as horizontal dashed lines in the graphs in Figure 1. Children who scored below the cut-points are those depicted below the dashed lines. On all measures of comprehension-related emergent literacy, a greater percentage of children with DLD scored below the cut-points than did children with typical language. However, chi-square tests found that these differences were significant only for the following measures: MLU, $\chi^2 = 3.87$, $p = .045$; narrative complexity, $\chi^2 = 4.34$, $p = .037$; and print concept knowledge, $\chi^2 = 9.95$, $p = .002$.

Research Question 2: Code-Related Skills

Our second research question sought to compare children's performance on code-related emergent literacy measures across DLD and TD groups. We tested the statistical significance of group differences using a two-group MANOVA with five dependent measures: beginning sounds, rhyming, letter names, letter sounds, and name writing (note that "print concept knowledge" is now grouped with comprehension-related skills in our restructuring of emergent literacy skills). As with the previous analyses, no

Table 5. Cut-points and percentages at risk for delay, by group, on emergent literacy measures.

Variable	TD mean	(*SD*)	Cut-point	% DLD at risk	% TD at risk	*p*
Comprehension-related skills						
MLU	6.77	(1.82)	4.95	50.0	14.3	.049
Number of words	240.29	(74.35)	165.94	41.7	14.3	.265
Number of different words	97.79	(22.66)	75.13	41.7	21.4	.117
Narrative complexity[a]	13.36	(3.46)	9.90	41.7	7.0	.037
Print concepts[b]	8.57	(1.40)	7.17	80.0	21.4	.002
Code-related skills						
Beginning sounds[b]	8.64	(1.91)	6.73	60.0	21.4	.035
Rhyming[b]	6.71	(2.84)	3.87	33.3	14.3	.231
Letter names[b]	16.00	(9.12)	6.88	66.7	21.4	.014
Letter sounds[b]	14.00	(6.48)	7.52	73.3	21.4	.005
Name writing[b]	6.07	(1.30)	4.77	66.7	14.3	.004

Note. TD mean = unadjusted mean score from typically developing children; cut-point = derived by subtracting 1 *SD* from the mean score of TD children; DLD = developmental language disorder; TD = typically developing.

[a]Index of Narrative Complexity (Petersen et al., 2008). [b]Phonological Awareness Literacy Screening for Preschool in Spanish (Ford & Invernizzi, 2009).

demographic variables were controlled for. Assumptions of normality, independence, and homogeneity of variance were mostly met, with the exception of a significant result of Levene's test of homogeneity of variance in rhyming, likely because TD children had both higher means and greater variability. However, MANOVA is relatively robust to heterogeneity of variance, provided group sizes are equal (Finch, 2005). The omnibus test statistic was significant, Wilks' $\Lambda = .58$, $F(5, 22) = 3.14$, $p = .027$, with observed power of .78 and a large effect size ($\eta_p^2 = .42$), indicating significant mean differences between children in the DLD and TD groups. Post hoc univariate comparisons showed that TD children significantly outperformed children with DLD on all tasks of code-related emergent literacy: beginning sounds, $F(1, 26) = 10.84$, $p = .003$; rhyming, $F(1, 26) = 6.51$, $p = .017$; letter names, $F(1, 26) = 10.41$, $p = .003$; letter sounds, $F(1, 26) = 15.86$, $p < .001$; and name writing, $F(1, 26) = 6.10$, $p = .020$. The largest effect size was observed on the Letter Sounds subtest. All effect sizes are reported in Table 3.

We also compared the percentage of children with DLD who scored below the risk cut-points in code-related emergent literacy skills. For all code-related measures, a higher proportion of children with DLD scored at risk than children in our TD control group. Chi-square tests confirmed these proportions were significantly different across groups for beginning sounds, $\chi^2 = 4.44$, $p = .035$; letter names, $\chi^2 = 5.99$, $p = .014$; letter sounds, $\chi^2 = 7.81$, $p = .005$; and name writing, $\chi^2 = 8.19$, $p = .004$. There was no significant difference in risk proportionality for rhyming, $\chi^2 = 1.44$, $p = .231$.

Discussion

This study sought to improve our understanding of how literacy develops in Spanish-speaking children, particularly those with DLD who may be at increased risk for reading difficulties. There are remarkably few empirical studies that examine the language and emergent literacy skills of young Spanish-speaking children (e.g., Goikoetxea, 2005; Kim & Pallante, 2012) and even fewer that include children with language disorders (Goldstein, 2012). We know from research in English that preschool-age children with DLD perform more poorly on tasks of emergent literacy than their TD peers (Boudreau & Hedberg, 1999) and that these skill deficits often manifest as reading disabilities when children reach primary school (Catts et al., 2002). However, a systematic investigation into the performance of Spanish-speaking children with DLD on tasks of emergent literacy has not previously been conducted.

The work presented here examined both the comprehension-related skills that primarily underlie later reading comprehension and the code-related skills that primarily underlie later decoding. We hypothesized that Spanish-speaking children with DLD would show deficits in the comprehension-related emergent literacy skills, as these rely on the oral language skills that are symptomatically impaired in a DLD population (Justice et al., 2006; Pankratz et al., 2007). We did not make a similar hypothesis about children's code-related skills, as it is possible that the acquisition of these skills is aided by the transparent orthography and simple phonological structure of Spanish. Within both domains of emergent literacy skills, we conducted two complementary analyses: First, we explored whether significant group differences exist between children with DLD and a group of TD peers matched for age, gender, and socioeconomic status; second, we explored the extent to which Spanish-speaking children with DLD exhibit risk in comprehension- and code-related emergent literacy development, as compared to their TD peers.

With respect to comprehension-related emergent literacy skills, we found that children with DLD performed significantly worse than controls on four of five emergent literacy tasks (MLU, number of different words, narrative complexity, and print concept knowledge), as hypothesized. The overall effect size was robust, $\eta_p^2 = .55$, with univariate effect size values ranging from .18 (narrative complexity) to .49 (print concept knowledge). This echoes findings from English, which have also found significant differences on tasks of narrative complexity (Pankratz et al., 2007) and print concept knowledge (Boudreau & Hedberg, 1999; Justice et al., 2009; Pavelko et al., 2018; Skibbe et al., 2008). In addition to group mean differences, we analyzed these data using a person-centered approach to compare percentages of children at risk for reading difficulties across groups. Chi-square results showed that children with DLD were significantly more likely to score below the cut-points on MLU, narrative complexity, and print concepts. No differences were found on number of words or number of different words, suggesting that lexical productivity may not be consistently impaired in all Spanish-speaking children with DLD.

With respect to code-related emergent literacy skills, children with DLD performed, on average, significantly worse than TD controls. The overall effect was strong, $\eta^2 = .42$, though less robust than the effect size observed for comprehension-related skills. Univariate analyses showed significant differences on all five measures, with effect sizes ranging from $\eta^2 = .19$ (name writing) to $\eta^2 = .38$ (letter sounds). In the person-centered analysis, we observed that children with DLD were significantly more likely to score at risk in beginning sounds, letter names, letter sounds, and name writing, with percentages of children with DLD who scored below the cut-point ranging from 60% (beginning sounds) to 80% (print concept knowledge). However, on the rhyming task, only 30% of children in the DLD group scored below the cut-point. Perhaps this is because rhyming —and phonological awareness, more generally—is purportedly easier in Spanish, due to its relatively simple phonological structure (Goikoetxea, 2005).

These results point to some universality regarding how DLD affects reading. Despite the transparent orthography and clear phonological patterns in Spanish, Spanish-speaking children with DLD nonetheless struggled significantly with many of the foundational concepts that underlie reading, including code-related skills. The broader literature on reading development in transparent orthographies has found that

TD children learn to decode relatively quickly and accurately (Castejón et al., 2015; Seymour et al., 2003), likely due to the one-to-one, sound-to-symbol correspondence. The work presented here complicates these findings somewhat. It appears that the simplified "code" in Spanish does not protect children with DLD from showing similar deficits on emergent literacy skills as children with DLD learn to read in more opaque languages.

Additional cross-linguistic and longitudinal research is necessary to explore whether these early deficits actually manifest as reading disability as children get older. Importantly, future research should include outcomes in both decoding and reading comprehension, for it is possible that this is where languages with varying orthographical depth diverge. Research in orthographically opaque languages, like English, has shown that children with deficits in comprehension-related skills are at increased risk for difficulties in reading comprehension (e.g., Catts et al., 2002), whereas children with poor phonological awareness and alphabet knowledge are slower to map phonemes onto graphemes, which, in turn, places them at increased risk for difficulties in decoding and reading fluency (e.g., Gillon, 2007). Given that learning to decode is easier in orthographically transparent languages (Ziegler & Goswami, 2005) and that decoding skills are acquired more rapidly by children learning to read in transparent orthographies (Castejón et al., 2015; Seymour et al., 2003), downstream difficulties with decoding accuracy among Spanish speakers may be less pronounced. Instead, future research should examine the role of emergent literacy on decoding fluency, as well as its effect on later reading comprehension. According to verbal efficiency theory (Perfetti, 1985), decoding accuracy and fluency should facilitate reading comprehension, because cognitive resources normally employed in decoding can be reallocated to meaning making.

Clinically, these results underscore the importance of targeting emergent literacy skills in young children who speak Spanish, in particular among those with DLD. Interventions that target print knowledge (Piasta et al., 2012) and phonological awareness (Gillon, 2002) have had widespread success in English. Empirical validation of interventions that target these skills in Spanish is needed. Clinical research should also investigate whether distinct profiles of emergent literacy skills exist in Spanish, as has been found in English monolinguals (Cabell et al., 2011) and in Spanish–English bilinguals in the United States (Ford et al., 2013; Gonzalez et al., 2016).

Finally, the findings we presented should be interpreted with some restraint due to the following limitations. First, though our sample was carefully constructed and controlled, it was nonetheless small. As such, we caution against wide-ranging generalizations about the shared nature of DLD and emergent literacy development in Spanish. Relatedly, we attempted to control for classroom instruction by recruiting TD controls from the same school and, when possible, from the same classroom as children with DLD; however, replication with a larger sample size would further eliminate any possible environmental confounds between groups. Finally, the measure of code-related emergent literacy skills that we used in our analysis was developed in the U.S. context. Though we did not attempt to interpret the findings normatively, subsequent research should seek to use tools developed for use in a monolingual Latin American context.

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Appendix

Narrative Retell

"Rana, ¿Dónde estás?"

Page	Spanish script	English translation
1.	Había una vez un niño que tenía un perro y una rana. La rana vivía en una jarra grande en su cuarto.	Once upon a time there was a child who had a dog and a frog. The frog lived in a large jar in his room.
2.	Una noche mientras el niño y su perro dormían, la rana se escapó de la jarra. Saltó por la ventana.	One night while the boy and his dog slept, the frog escaped from the jar. He jumped through the window.
3.	Cuando el niño y el perro se despertaron en la mañana, vieron que la jarra estaba vacía.	When the boy and the dog woke up the next morning, they saw that the jar was empty.
4.	El niño buscó a la rana por todos lados. El perro también buscó a la rana. Cuando el perro intentó ver dentro de la jarra, se le atoró la cabeza en ella.	The boy looked all over for the frog. The dog looked for the frog, too. When the dog tried to look for the frog in the jar, his head got stuck inside it.
5.	El niño llamó a la rana por la ventana abierta, "Rana, ¿dónde estás?" El perro sacó su cabeza por la ventana, aún tenía la jarra atorada.	The boy called out to frog through the open window. "Frog, where are you?" The dog looked out the window, too, with the jar still stuck atop his head.
6.	La jarra estaba tan pesada que el perro se cayó por la ventana de cabeza.	The jar was so heavy that the dog fell headfirst out of the window.
7.	El niño levantó al perro para ver si estaba bien. El perro no se lastimó, pero la jarra se destrozó.	The boy lifted his dog to see if he was alright. The dog was not hurt, but the jar broke into pieces.
8.	El niño y el perro buscaron a la rana afuera.	The boy and the dog looked for the frog outside.
9.	El niño llamaba a la rana.	The boy called out to the frog.
10.	El niño llamaba a la rana a través de un hoyo que estaba en la tierra. El perro le ladraba a unas abejas en un panal.	The boy yelled for the frog through a hole in the ground. The dog barked at some bees in a hive.
11.	Un topó salió del hoyo y le mordió la nariz al niño. Mientras tanto, el perro seguía molestando a las abejas, saltando al árbol y ladrándoles.	A groundhog came out of the hole and bit the boy's nose. Meanwhile, the dog continued bugging the beehive, jumping up the tree and barking at the bees.
12.	El panal se cayó y todas las abejas salieron. Las abejas estaban muy molestas con el perro por destruir su casa.	The beehive fell to the ground and all of the bees were released. The bees were very angry with the dog for destroying their home.
13.	El niño no le ponía atención al perro. Notó que había un gran hoyo en un árbol. Trepó el árbol y llamó a la rana a través del hoyo.	The boy wasn't paying attention to the dog. He noticed another big hole inside a tree. He climbed the tree and yelled for the frog through the opening.
14.	Un búho salió de repente del hoyo y tiró al niño al piso.	Suddenly, an owl emerged from the hole and knocked the boy to the ground.
15.	El perro pasó corriendo junto al niño, lo más rápido que podía, porque las abejas lo estaban persiguiendo.	The dog began running next to the boy, as fast as he could, because the bees were chasing him.
16.	El búho perseguía al niño hasta llegar a una piedra muy grande.	The owl chased after the boy, until he arrived at a large rock.
17.	El niño subió a la piedra y otra vez llamó a la rana. Se agarró de unas ramas del árbol para no caerse.	The boy climbed on top of the rock and yelled again for the frog. He grabbed onto the branches of the tree, so that he wouldn't fall.
18.	Pero…lo que pensó que eran ramas, ¡no eran ramas! Eran los cuernos de un venado. El venado subió al niño a su cabeza.	But…what the boy thought were branches, weren't actually branches! They were the antlers of a deer. The deer lifted the boy onto his head.
19.	El venado empezó a correr con el niño aún en su cabeza. El perro corría con ellos también. Se estaban acercando a un gran barranco.	The deer started to run with the boy still seated atop his head. The dog ran with them, too. They were getting close to a big ravine.
20 – 21.	El venado se paró de repente y el niño y el perro se cayeron por el barranco.	The deer stopped suddenly, and the boy and the dog fell down into the ravine.
22.	Había un lago debajo del barranco. Ellos se cayeron en el agua, uno sobre otro.	There was a lake at the bottom of the ravine. They fell into the wáter, one over the other.
23.	Escucharon un ruido que se les hacía conocido.	Then they heard a noise that sounded familiar to them.
24.	El niño le dijo al perro que no hiciera ruido y escuchara.	The boy told the dog to be quiet and listen.
25.	Se arrastraron en silencio y miraron atrás del tronco.	They held each other in silence and looked behind the trunk.
26.	Ahí encontraron a su rana, junto con su mamá.	And there they found their frog, together with his frog-mom.
27.	También había unas ranas bebés, una de ellas saltó hacia el niño.	There were also some baby frogs. One of the babies jumped toward the boy.
28-29.	A la rana bebé le cayó bien el niño y quería ser su nueva mascota. El niño y el perro estaban muy felices porque tenían a una nueva rana mascota para llevar a su casa. Mientras el niño se iba a su casa, se despedía de su vieja rana.	The baby frog liked the boy and wanted to be his new pet. The boy and the dog were so happy, because they had a new pet to bring home. While the boy turned toward his house, he waved goodbye to his old pet frog.