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Is There a Syllabic Stage in Spelling Development? Evidence From Portuguese-Speaking Children

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Two longitudinal studies were conducted to investigate the development of Brazilian Portuguese-speaking children's ability to spell words in light of Ferreiro's and Ehri's models of spelling development. Twenty children participated in the 1st study. Their spelling skills were evaluated periodically from ages 4 to 6 years. The 124 children who participated in the 2nd study ranged from 4 to 7 years of age. They were tested twice, with an interval of approximately 6 months. The results suggest that Ehri's partial alphabetic phase offers a more parsimonious explanation of children's early understanding of the relationship between print and speech than does Ferreiro's syllabic stage. It is argued that syllabic spellings are more accurately depicted as an instance of partial alphabetic spellings.

Keywords: spelling development, syllabic stage, Portuguese-speaking children

The present studies investigated the early growth of Brazilian Portuguese-speaking children's spelling skills in light of two influential models of spelling development: Ehri's phase model and Ferreiro's stage model. In what follows, we review the two alternative proposals and then describe the design of the studies.

Ferreiro's ideas have had a profound impact on the concept of literacy acquisition and instruction in Brazil. Twenty years after its first Brazilian edition, Ferreiro and Teberosky's (1986) *Psychogenesis of the Written Language* continues to be considered one of the most important publications in early literacy development and a fundamental book for teachers of young children (Cardoso-Martins, Capovilla, et al., 2005). A major argument in this book is that children go through three main stages in their attempt to understand the nature of their writing system (see also Ferreiro, 1989; 1990, Ferreiro et al., 1982). In Brazil, these stages are often referred to as *presyllabic*, *syllabic*, and *alphabetic* (e.g., Grossi, 1990; Weisz, 2000).

During the presyllabic stage, children are oblivious to the fact that print represents sounds. They are nonetheless aware of the representational nature of print, and they expend a lot of cognitive effort trying to pinpoint its distinctive features. Two of Ferreiro's (1989, 1990) most famous principles—the principle of *minimum quantity* and the principle of *internal variations*—develop during this stage. According to the former, a word needs to have a minimum number of characters or letters, which, in Spanish, is generally three. But having three or more letters is by no means sufficient. According to the principle of internal variations, a word also has to be made up of different letters or characters.

Having constructed these principles, children begin to search for principles that enable them to distinguish between different words. This search results in a sort of cognitive revolution, the understanding that print represents speech. Initially, however, children believe that the letters they see in print stand for whole syllables. As a result, they spell one and only one letter for each syllable in the word, writing, for example, the letters *XYS* for the three-syllable Spanish word *caballo* (horse; Ferreiro & Gomez Palacio, 1982). This hypothesis, known as the *syllabic hypothesis*, is destabilized by the spellings children see in their environment, and it eventually gives way to the alphabetic stage, at which letters are conceptualized as what they really are: symbols for individual phonemes.

The syllabic hypothesis is extremely important in Ferreiro's developmental progression. In addition to being the first manifestation of the understanding that print represents speech, the syllabic hypothesis calls the child's attention to the phonological similarities and differences between words. As a result, sooner or later, children begin to explore the hypothesis that letters represent relatively stable sounds. For example, the letter *M* in the child's name *Maria* may be used to represent the syllable /ma/ in any word (Ferreiro, 1990). More frequently, however, children begin to use vowels in such a stable fashion, a result of the regular nature of the vowel system in the Spanish orthography. For example, Ferreiro (1989) cited the case of a child who wrote *AIOA* for *mariposa* (fly), *AOA* for *paloma* (dove), *AAO* for *pajaro* (bird), and finally, *AO* for *gato* (cat).

Cardoso-Martins and Batista (2005) presented an alternative account of Ferreiro's syllabic hypothesis. They suggested that young children's syllabic spellings result from their incipient understanding that letters represent sounds and from their attempt to represent the sounds they can detect in the pronunciation of words. In Spanish, those sounds often correspond to vowel names. This is also true of languages in which syllabic spellings have been

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documented, such as Portuguese (Grossi, 1990) and Italian (Pontecorvo & Zucchermaglio, 1990). For instance, the names of the letters *a*, *o*, and *i* in Spanish can be clearly heard in the pronunciation of the Spanish words *gato*, *mariposa*, *paloma*, and *pajaro*. Because there is only one vowel per syllable, the spelling of young speakers of those languages will sometimes be syllabic. In other words, rather than providing the impetus for learning about letter–sound relations, syllabic spellings are an incidental result of this knowledge.

Consistent with this hypothesis, Cardoso-Martins and Batista (2005) observed a strong correlation between the incidence of syllabic spellings—that is, spellings in which the number of letters corresponds to the number of syllables in the words—and the ability to represent sounds in the pronunciation of words with phonetically appropriate letters. As in the examples mentioned above, the letters in the syllabic spellings of the children who participated in Cardoso-Martins and Batista's study usually corresponded to vowels whose names could be heard in the pronunciation of the words. Furthermore, the researchers observed clear signs of the understanding that speech represents sounds in the so-called presyllabic spellings (i.e., spellings that are not syllabic or alphabetic). For example, children's presyllabic spellings often began with a phonetically appropriate letter—that is, a letter that stood for a sound at the beginning of the word. These results further support Cardoso-Martins and Batista's suggestion that syllabic spellings are an incidental result of young children's incipient understanding of the sound-symbolizing function of letters.

The findings of Cardoso-Martins and Batista's (2005) study suggest that the development of Brazilian Portuguese-speaking children's spelling skills might be more aptly described in terms of children's increasing ability to map sounds in the pronunciation of words with phonetically appropriate orthographic units. Ehri (1992, 1998) has provided such an account of the development of English-speaking children's ability to read and spell words. In Ehri's view, children progress through four phases, each characterized by a predominant, although by no means exclusive, process: (a) *prealphabetic*, (b) *partial alphabetic*, (c) *alphabetic* or *full alphabetic*, and (d) *consolidated alphabetic*.

Initially, when children do not know the names and sounds of letters, they produce more or less arbitrary letters that do not bear any relationship to the sounds in the pronunciation of words. As children learn about letter names and sounds, they begin to understand the sound-symbolizing function of letters in spellings. At the dawn of this understanding, children are able to represent only a few sounds in a word, generally a sound at the beginning or a sound at the beginning and a sound in the end of the word. For example, children may produce the letters *JL* for the word *jail* (Ehri & Wilce, 1985). As this example shows, the sounds children initially are able to represent quite often correspond to letter names in the pronunciation of words (Treiman & Kessler, 2003; Treiman, Tincoff, & Richmond-Welty, 1996; see also Levin, Patel, Margalit, & Barad, 2002). Ehri has called this type of spelling *partial alphabetic* to distinguish it from the full graphophonic processing that is characteristic of the full alphabetic phase.

For most children, explicit instruction in print–speech correspondences at the sublexical level seems necessary for movement into the full alphabetic phase. Children are now able to represent all sounds in the pronunciation of words with phonetically appropriate letters. In the final, consolidated alphabetic phase, children become able to operate with multiletter units that correspond to syllables or parts of syllables in words (e.g., the letter sequence *ight* to represent the phoneme blend /ait/ in words like *light*, *fight*, and *night*).

In a series of studies, Cardoso-Martins and her colleagues have shown that Ehri's phase model can successfully account for Brazilian Portuguese-speaking children's early development of the ability to read words (see Cardoso-Martins, 2006, for a summary of this work). The studies described in the present article tested the hypothesis that Ehri's model can also successfully account for Brazilian Portuguese-speaking children's early spelling development.

Two longitudinal studies are reported. The first was part of a research project investigating the hypothesis that young children use their knowledge of letter names in their initial attempts to connect speech to print (see Cardoso-Martins & Batista, 2005). Preschool children's ability to spell words was evaluated at five different times between the ages of 4 and 6 years. The second study included a larger, more representative sample of children. Children ranging from 4 to 7 years of age at the beginning of the study were asked to spell a series of words as well as they could at two different times: between the months of March and June and toward the end of the second school semester.

On the basis of the results discussed above, we expected Ehri's postulated sequence of phases to provide a better description of children's early spelling development than Ferreiro's stage model. In particular, we expected syllabic spellings to be an instance of what Ehri has called *partial alphabetic* spellings.

Even though we did not expect to find any evidence for a syllabic stage—at least not in the manner conceptualized by Ferreiro—we were open to the possibility that children attempt to connect print to speech before they understand the sound-symbolizing function of letters. For example, children could notice the relationship that exists between the number of letters in the spelling of words and the length of the words' pronunciation and, consequently, write more letters for longer than for shorter words. With this purpose in mind, we investigated whether children classified as prealphabetic according to Ehri's model showed any awareness of that relationship. Specifically, we tried to determine whether children tend to produce more letters for multisyllabic as opposed to monosyllabic and disyllabic words before they understand the sound-symbolizing function of letters.

Study 1

Method

Participants

Thirty-three children participated in the study. However, only the 20 children (11 girls, 9 boys) who were assessed at all five test times (see below) were included in the present analyses.

At the beginning of the study, the children ranged in age from 47.40 to 61.90 months (M = 54.20, SD = 3.88). All were enrolled in 1st-year preschool classes at a private school in a large Brazilian city, and none could read any words in a list of 30 words frequently found in children's books. As described below, the children were assessed at five different times: at the middle and at the end of both their first and second preschool years and toward the middle of their third preschool year. Even though the children were exposed to literacy activities as part of their preschool

program, formal instruction in reading and spelling only started at the beginning of their third preschool year. Our last evaluation occurred approximately 3–4 months after the beginning of such instruction. At this time, the children's mean age was 78.19 months ($SD = 5.12$).

Procedure and Materials

This study was part of a research project investigating young children's ability to use their knowledge of letter names to spell words (see Cardoso-Martins & Batista, 2005, for the results of the evaluation that occurred when the children were, on average, 65.58 months old). Children were asked to spell a series of words at five different times, at intervals of approximately 6 months. Children's knowledge of letter names and sounds as well as their reading ability were also assessed at all test times. All evaluations were conducted individually in an empty room in the child's school, in sessions lasting about 15–20 min. Letter knowledge and reading ability were always assessed in the same session. The spelling task was administered in two different sessions, a few days after assessment of letter knowledge and reading ability. The tasks administered are described below.

Letter name knowledge. The evaluator showed 24 letters printed randomly on a card and asked the child to name each one of them (see Appendix A for the names of the letters in Brazilian Portuguese). Only capital letters were used given the evidence that young children are more familiar with capital as opposed to lowercase letters (Ehri, 1986). Reliabilities, as measured by split-half correlations, ranged from .64 to .93 ($M = .79$, $SD = .12$).

Letter sound knowledge. The child's task consisted of identifying letters corresponding to consonant sounds enunciated by the evaluator. The task consisted of 1 training trial and 15 test trials. Sixteen cards, each containing six capital consonant letters printed horizontally in the middle of the card, were used in the task. For each item, the evaluator presented the corresponding card and asked the child to identify the letter that "said" the sound enunciated by the evaluator. For example, in the first trial, the child saw a card with the letters *R*, *M*, *F*, *P*, *D*, and *J* and was asked to show the letter corresponding to the sound /f/. Reliabilities, as measured by split-half correlations, ranged from .41 to .77 ($M = .61$, $SD = .13$).

The requirement that children search for the target letter may have imposed memory demands extraneous to the task. However, except for the final test time, when the children performed at ceiling on both the letter sound and letter name tasks, performance on the letter sound task correlated significantly with performance on the letter name task (range = .65–.69), suggesting that the task is a valid measure of letter knowledge.

Reading words. The child was asked to read 30 words frequently found in books for children (Pinheiro & Keys, 1987). The words were printed in capital letters in the center of individual cards. For each card, the child was instructed to try to read the word. No child could read any words at Time 1, and 19 children could not read any words at Time 2. Split-half correlations for the last three test times ranged from .87 to .99 ($M = .93$, $SD = .06$).

Spelling words. Thirty words were dictated at the last three test times, 20 at the first and 18 at the second. In general, only words occurring infrequently in books for young children were included in the task (mean frequency of occurrence in Pinheiro's, 1996, word-frequency count ranged from 0 to 1.9 [$M = 0.7$]). At all test times, half of the words were dictated on 1 day and half a few days afterwards so as not to fatigue the child. Fewer words were used in the first two test times because we were afraid that spelling 15 words might be too demanding for children in the 1st year of preschool.

The children were told to spell the words the best way possible. If the children said that they did not know how to spell, we said that we did not expect them to spell the word correctly and that they should just try to write the letters that they thought were needed for the target word.

The words were chosen with the objective of investigating young children's ability to use their knowledge of letter names to spell words (see Cardoso-Martins & Batista, 2005). At each test time, half of the words began with a consonant whose entire name or part of the name could be heard in the pronunciation of the word (e.g., the word *telefone* [/teleˈfoni/; telephone], in which the entire name of the letter *t* can be heard in the pronunciation of the word, and the word *chicote* [/ʃiˈkɔti/ ; whip], in which part of the name of the letter *x* can be heard in the beginning of the pronunciation of the word). In a few cases, the consonant occurred in the middle of the word (e.g., the word *isqueiro* [/isˈkeru/ ; lighter], in which the name of the letter *q* can be heard in the second syllable of the word). These words were matched with words beginning with or containing the same consonant letter but whose name could not be heard in the pronunciation of the word—for example, the word *tartaruga* [/tahtaˈruga/ [turtle]) and the word *esquilo* [/isˈkilu/ [squirrel]). Instead, a phoneme contained in the name of the letter could be heard in the pronunciation of the word (e.g., the phoneme /t/ in the beginning of the word *tartaruga* is contained in the name of the letter *t*). To illustrate, the words that were used at Time 1 are listed in Appendix B along with information regarding the number of syllables and the number of letter names that can be heard in the pronunciation of each word. For example, the word *tartaruga* [/tahtaˈruga/ [turtle]) has four syllables, /tah-ta-ˈru-ga/, and four letter names can be heard in the pronunciation of the word, one in each syllable (*a-a-u-a*). Information regarding the words' frequencies of occurrence in Pinheiro's (1996) word-frequency count is also given in Appendix B. Even though different lists of words were used at the five evaluations, the words did not differ substantially with regard to any of those variables. For example, mean proportions of entire letter names that could be heard in the pronunciations of the words were .45, .47, .49, .46, and .45 for the first, second, third, fourth, and fifth evaluations, respectively.

After spelling a word, the child was asked to read it aloud and, at the same time, pass his or her finger underneath it, following the procedure that has been used by Brazilian educators to assess spelling development in the preschool years (e.g., Weisz, 2000). However, only the number of letters was used to code a spelling as syllabic, because we did not record whether the child read the word syllabically.

Results

Early Development of Spelling Skills: Ferreiro's Stage Model

To assess Ferreiro's hypothesis, we classified children's spellings according to three different levels: presyllabic, syllabic, and alphabetic. Spellings were coded by two independent judges. Interrater agreement, calculated as the percentage of codings agreed on by the two coders, was 99%. At each time, a child was classified in one of the three levels when more than half of her of his productions corresponded to spellings at that level. There were a few cases in which half of the spellings had been coded at one level and half at another. In these cases, the child was assigned to the less advanced level.

The presyllabic level consisted of spellings that could not be coded either as syllabic or as alphabetic. Examples include *APHJM* for *queijo* [/ˈkeʒu/ [cheese]) and *DLLEB* for *girafa* [/ʒiˈrafa/ [giraffe]).

Syllabic spellings were spellings in which the number of letters corresponded to the number of syllables in the word. The spellings *AEM* for *girafa* (/ʒiˈrafa/ [giraffe]), *TICA* for *telefone* (/teleˈfoni [telephone]), and *FQ* for *figo* [/ˈfigu/ [fig]) are examples of spellings coded as syllabic.

Alphabetic spellings were spellings in which all sounds in the pronunciation of the word were represented by a phonetically appropriate, even if not conventional, letter. This was the case of

the spellings *GIPE* for *jipe* [/ˈʒipi/ [jeep]) and *TOMATA* for *tomada* (/toˈmada/ [outlet]). Spellings in which the number of sounds represented by a phonetically appropriate letter was greater than the number of sounds not represented or misrepresented were also coded as alphabetic—for example, *VIA* for *veia* (/ˈveya/ [vein]), *GIRAGOU* for *girassol* (/ʒiraˈsɔw/ [sunflower]), or *QEIO* for *queijo* (/ˈkeʒu/ [cheese]). A letter was considered phonetically appropriate if it represented the target sound in other words, even if only in other orthographic contexts. For example, the letter *u* in *GIRAGOU* was considered phonetically appropriate because that letter represents the sound /w/ in words like *pau* (stick) and *chapéu* (hat). Letter changes involving sounds that differed only with regard to the voicing feature were also considered phonetically appropriate (e.g., the use of the letter *c* or *q* to represent the phoneme /g/ or the use of the letter *g* to represent the phoneme /k/).

Figure 1 illustrates the number of children classified in each of the three levels at each test time. The figure also illustrates the changes that occurred between test times. As illustrated in Figure 1, only 7 children were classified as syllabic at any point during the study (1 child was classified as syllabic at two different test times, and 6 were classified as syllabic at only one time). Thirteen children seemed to skip the syllabic stage altogether, moving directly from the presyllabic to the alphabetic level.

In a stage model, children are not expected to move toward less advanced stages. Yet, as can be seen from Figure 1, 4 children regressed from the syllabic level to the presyllabic level, 1 child between Times 1 and 2 and 3 children between Times 3 and 4.

Early Development of Spelling Skills: Ehri's Phase Model

To assess the appropriateness of Ehri's model to children learning to spell in Portuguese, we classified children's spellings according to three levels: prealphabetic, partial alphabetic, and alphabetic. Again, two independent coders classified all spellings. Interrater agreement, calculated as the percentage of codings agreed on by two independent coders, was 94%. (Disagreements were discussed until the two coders reached an agreement.) A child was assigned to one of the levels when more than half of his or her spellings had been coded at that level. In the few cases in which no level accounted for more than half of the spellings, the child was assigned to the level containing the most spellings. An exception to this rule occurred when the child produced more spellings coded as prealphabetic than as either partial alphabetic or alphabetic but the sum of spellings coded as partial alphabetic and alphabetic outnumbered the number of prealphabetic spellings. In these cases, the child was assigned to the partial alphabetic level. This was the case, for example, for a child who produced 14 prealphabetic spellings, 11 partial alphabetic spellings, and 5 alphabetic spellings in the task administered at Time 4. Finally, in cases in which half of a child's spellings had been coded at one level and half at another, he or she was assigned to the less mature level.

As is evident from Figures 1 and 2, Ferreiro's and Ehri's developmental models differ only with regard to the first two levels. Ehri's Level 1, or prealphabetic, spellings did not reveal any understanding that letters represent sounds. Examples included *DLLEB* for *girafa* (/ʒiˈrafa/ [giraffe]) and *VIOBORPOD* for *cabelo* (/kaˈbelu/ [hair]).

Partial alphabetic spellings, however, showed the beginning of that understanding. A spelling was coded as partial alphabetic if its first letter represented the first consonant or vowel in the word. Examples include *TAP* for *telephone* (/teleˈfoni/ [telephone]), *IADCHJ* for *chicote* (/ʃiˈkɔti/ [whip]), and *VPRADTJI* for *veia* (/ˈveya/ [vein]). We had initially thought of considering letter–

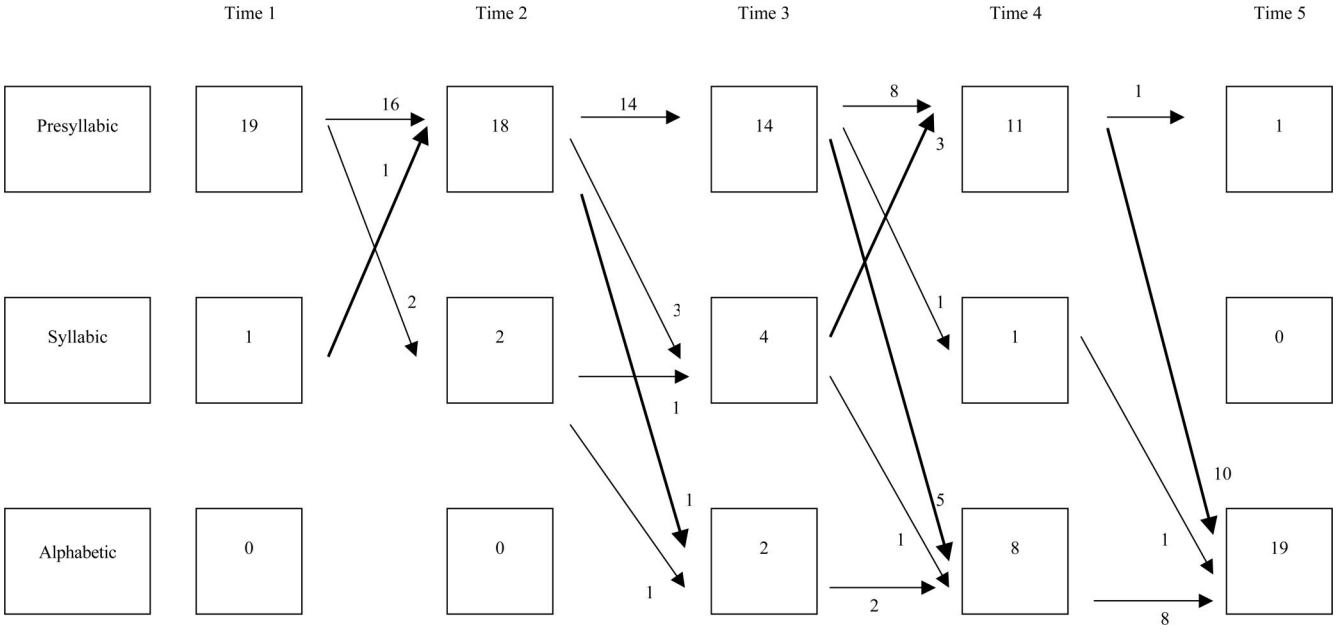

Figure 1. Study 1: Spelling development according to Ferreiro's stage model. Horizontal arrows indicate the number of children who remained in the same level, and oblique arrows indicate the number of children who changed levels from one test time to the other. Descending arrows represent changes to more advanced levels; ascending arrows indicate regressions—that is, changes to less advanced spelling levels. Bold arrows depict unexpected changes.

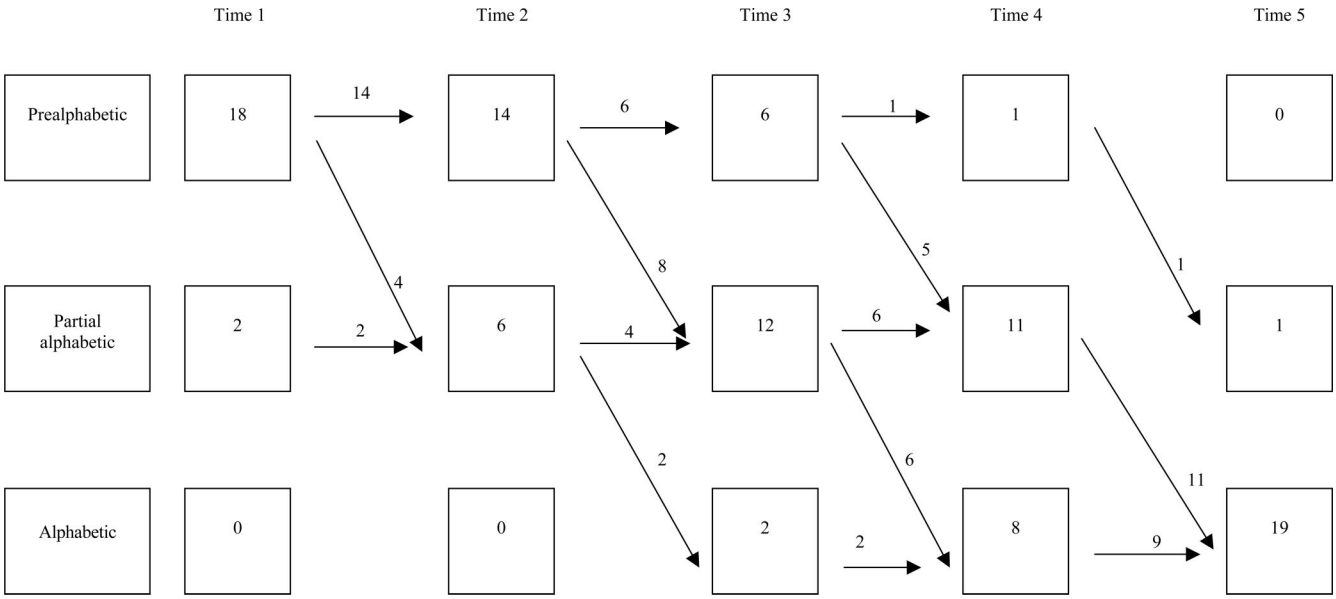

Figure 2. Study 1: Spelling development according to Ehri's model of literacy development. Horizontal arrows indicate the number of children who remained in the same level, and oblique arrows indicate the number of children who changed levels from one test time to the other. Descending arrows represent changes to more advanced levels.

sound relations in any position in the word. However, the classification of letter–sound relations in the middle of the word proved to be more difficult than we had anticipated. For example, it is questionable that the letter *b* that appears in the spelling *VIOBORPOD* for *cabelo* (/ka'belu/ [hair]) stands for the sound /b/ in the pronunciation of the word. In view of this, we opted to consider only the first letter in the spelling of the word. This seemed a reasonable criterion given the evidence that sounds at the beginning of the word are more likely to be represented by an appropriate letter than sounds either in the middle or at the end of the word. This is true even after children learn to read target words to criterion (Cardoso-Martins, Resende, & Rodrigues, 2002). Furthermore, in the immense majority of cases, only the consonant or the vowel sound in the first syllable of the target words were represented by a phonetically appropriate letter.

As can be seen in Figure 2, Ehri's phase model seems to offer a more adequate description of children's early spelling development than Ferreiro's stage model. In particular, the partial alphabetic level appeared as an intermediate level between the prealphabetic and alphabetic levels for 19 of the 20 children. No child seemed to skip the partial alphabetic level, moving directly from the prealphabetic to the alphabetic level. In addition, not even a single child regressed towards a less advanced level across test times.

What Is the Nature of Syllabic Spellings?

As mentioned above, Cardoso-Martins and Batista (2005) suggested that the syllabic spellings observed among young speakers of Spanish, Portuguese, and Italian result from children's reliance on letter names in the early phases of spelling development (Levin et al., 2002; Treiman & Kessler, 2003; Treiman et al., 1996). As Cardoso-Martins and Batista noted, vowel names are frequently heard in the pronunciation of words in those languages. Because there is only one vowel per syllable, children's reliance on letter names to spell words will sometimes result in syllabic spellings. This hypothesis predicts that the incidence of syllabic spellings should vary as a function of children's knowledge of letter names and sounds. Furthermore, it also predicts a strong connection between children's syllabic spellings and their incipient ability to represent sound–letter relations in spellings.

Table 1 presents the mean proportions of syllabic spellings and correct responses for the letter knowledge and reading tasks at each test time. An inspection of this table reveals that, as expected, syllabic spellings were very infrequent at Times 1 and 2, when the children knew relatively few letter names and sounds. Syllabic spellings peaked at Time 3—that is, precisely the test time at which the children both knew most letter names and sounds and had not started to spell alphabetically.

We conducted three analyses in an attempt to test the prediction of a strong connection between children's syllabic spellings and their incipient ability to represent sound–letter relations in spellings. First, we looked at whether children classified as syllabic spellers, according to Ferreiro's model, had been classified as partial alphabetic spellers, according to Ehri's model. Of the 8 instances of syllabic spellers, only 1 was coded as prealphabetic. All other cases had been coded as partial alphabetic spellers, a significant difference (by binomial test, $p < .05$ [one-tailed]).

Second, if syllabic spellings are an incidental result of young children's tendency to spell the letters whose sounds they can identify in the pronunciation of words, syllabic spellings should be more prevalent among partial alphabetic children than among prealphabetic children. Therefore, we calculated the mean number

Table 1
Mean Proportions (With Standard Deviations in Parentheses) of Syllabic Spellings and Correct Responses on the Letter Knowledge, Reading, and Syllable Segmentation Tasks as a Function of Test Time in Studies 1 and 2

		Task			
Study and time	Syllabic spellings	Letter name	Letter sound	Reading words	Syllable segmentation
Study 1					
Time 1	.13 (.19)	.31 (.26)	.27 (.21)		
Time 2	.19 (.27)	.48 (.28)	.33 (.20)	.01 (.03)	
Time 3	.34 (.27)	.72 (.25)	.48 (.27)	.04 (.11)	
Time 4	.19 (.20)	.92 (.09)	.73 (.22)	.20 (.31)	
Time 5	.01 (.04)	.98 (.04)	.93 (.06)	.50 (.39)	
Study 2					
Time 1	.16 (.18)	.65 (.34)	.51 (.22)	.03 (.06)	.59 (.27)
Time 2	.15 (.19)	.80 (.28)	.66 (.25)	.16 (.23)	.74 (.28)

of syllabic spellings for the prealphabetic and the partial alphabetic children separately for Time 2 and Time 3. (Only 2 children were classified as partial alphabetic at Time 1, and only 1 child was classified as prealphabetic at Time 4. At Time 5, with the exception of 1 child, all children were classified as alphabetic.) As can be seen from Table 2, the partial alphabetic children produced a greater number of syllabic spellings than the prealphabetic children. However, the difference between the two groups was significant only for Time 3, $t(16) = -2.27$, $p < .01$ (one-tailed), $d = .24$.

Finally, we coded all letters in the syllabic spellings of the syllabic children as arbitrary or phonetically appropriate. A letter was coded as arbitrary if it did not bear any relationship to a sound in the syllable it stood for. For example, the letter *r* in the spelling *KIRI* for *canivete* (/kani'vɛti/ [pocket knife]) was coded as arbitrary because it never stands for either the consonant or the vowel sound in the syllable *ve* (vɛ/). Phonetically appropriate letters were coded as either letter names or letter sounds. A letter was coded as a letter name when its entire name could be heard in the pronunciation of the word—for example, both the letter *d* and the letter *u* in the spelling *DU* for *dedo* (/'dedu/ [finger]) were coded as letter names because their names can be heard in the pronunciation of the word, the name of the letter *d* in the first syllable and the name of the letter *u* in the last. The remaining phonetic letters were coded as letter sounds. Most of the letter sounds stood for a phoneme contained in the name of the letter (e.g., the letter *d* in the spelling *DOI* for *dado* (/'dadu/ [dice] apparently stands for the phoneme /d/, which can be detected in the name of the letter *d*). Examples of exceptions to this pattern included the letters *e* and *o* when they stood for the phonemes /e/ and /o/, respectively, which are not contained in the names of the letters (/ɛ/ and /ɔ/, respectively).

Table 2
Mean Proportions (With Standard Deviations in Parentheses) of Syllabic Spellings Produced by the Prealphabetic and Partial Alphabetic Children as a Function of Test Time in Studies 1 and 2

	Spelling level	
Study and time	Prealphabetic	Partial alphabetic
Study 1		
Time 1	.12 (.17)	.25 (.35)
Time 2	.11 (.15)	.36 (.41)
Time 3	.20 (.12)	.46 (.27)
Time 4	.20[a]	.31 (.20)
Time 5		.20[b]
Study 2		
Time 1	.13 (.13)	.25 (.24)
Time 2	.17 (.13)	.25 (.25)

[a] Only 1 child was prealphabetic at Time 4. [b] Only 1 child was partial alphabetic at Time 5.

The majority of letters in the syllabic spellings of the children assigned to the syllabic stage were phonetically appropriate letters (mean proportion = .69). As a matter of fact, except for 1 child, all syllabic spellers produced a larger number of phonetic as opposed to arbitrary letters in their syllabic spellings, a statistically significant difference (by binomial test, $p < .05$ [one-tailed]). Furthermore, as might have been expected on the basis of the hypothesis that syllabic spellings are an incidental result of young children's reliance on letter name knowledge, the majority of the phonetically appropriate letters corresponded to letters whose names could be clearly detected in the pronunciation of the word. This was true for 6 of the 8 instances of syllabic spellers. As can be seen in Table 3, vowel names were more frequent than consonant names, a fact that is hardly surprising given the evidence that vowel names occur much more often in the pronunciation of words in Brazilian Portuguese than do consonant names (Cardoso-Martins et al., 2002).

Discussion

The results of Study 1 raise questions for Ferreiro's stage model of early spelling development. In particular, the results question the hypothesis that the syllabic stage is universal in the develop-

Table 3
Mean Proportions (With Standard Deviations in Parentheses) of Phonetic Letters Coded as Letter Names or Letter Sounds in the Syllabic Spellings of the Syllabic Children in Studies 1 and 2

	Letter name		Letter sound	
Study	Consonant	Vowel	Consonant	Vowel
Study 1 ($n = 8$)	.10 (.06)	.59 (.16)	.21 (.16)	.09 (.14)
Study 2 ($n = 13$)	.13 (.08)	.62 (.11)	.08 (.08)	.17 (.08)

ment of spelling. Although only 7 children were classified as syllabic spellers across the whole study, all children, without exception, had begun to produce alphabetic spellings by the end of the study.

Furthermore, an analysis of the spellings of the syllabic children suggests strongly that rather than being the result of a belief that letters stand for whole syllables, syllabic spellings are more accurately depicted as an incidental result of young children's reliance on letter names to spell words at the beginning of spelling development (Levin et al., 2002; Treiman et al., 1996). The majority of letters in the spellings of the syllabic children consisted of letters whose names could be heard in the pronunciation of the words.

In contrast, Ehri's phase model of reading and spelling development, built upon the basis of her observations of English-speaking children's productions, seems to accurately describe early spelling development in Brazilian Portuguese. In particular, Ehri's partial alphabetic phase accounts for these children's early understanding of the connection between print and speech more parsimoniously than does Ferreiro's syllabic stage. As a matter of fact, Ehri's partial alphabetic level encompassed practically all children assigned to the syllabic stage. It also characterized many of the children (from 10% to 91%) classified as presyllabic at Times 1, 2, 3, and 4.

A major limitation of this study is the fact that it included only 20 children, all of whom were attending the same preschool program. Our second study was designed to overcome this limitation. As described below, it included a larger, more representative sample of children.

Study 2

Method

Participants

One hundred and twenty-four preschool children (64 boys, 60 girls) participated in the study. Forty-four children were enrolled in 2nd-year preschool classes at two private schools in a large Brazilian city. At the beginning of the study, their mean age was 62.98 months ($SD = 3.31$). The remaining children were enrolled in two public schools in the same city: 33 in 2nd-year preschool classrooms (mean age = 62.61 months, $SD = 4.82$) and 47 in 3rd-year preschool classes (mean age = 73.36 months, $SD = 5.43$).

Only children who read fewer than three words in the reading task administered at the beginning of the study were included in the study. This criterion was adopted to maximize our chances of finding syllabic spellings among the participants.

For the same reason, all of the 3rd-year preschool students came from public schools. At the time of the study, children enrolled in Brazilian private schools learned to read during their 3rd year in preschool, and most children could spell alphabetically by the middle of that school year. In Brazilian public schools, in contrast, formal literacy instruction usually did not start before first grade. This was the case for the public schools in the present study. In both schools, formal instruction in reading and spelling only started in first grade. However, children were exposed to literacy activities as part of their educational program in both the second and the third preschool year. Common activities included children being read to by their teachers, learning about the alphabet, writing their own names, and so forth. As is usually the case in Brazil, most of the public school students came from very poor homes, whereas the students in the private schools came from families of middle to high socioeconomic status.

Materials and Procedure

The children were tested at two different times, with an interval of approximately 6 months in between. Time 1 occurred during the months of March and April (for the children enrolled in the private schools) and during the month of June (for the children enrolled in the public schools). Time 2 occurred during the second semester of the school year: during the months of September and October for the private school students and during the month of November for the public school students. At both test times, children were administered a series of tasks across three sessions distributed over a period of a few days. Children were tested individually in a quiet room in their school. The tasks administered are described below, separately for each session.

First Session

Reading words. Participants were asked to read a list of words frequently found in books for children (Pinheiro, 1996). The words were printed in capital letters in the center of individual cards. Cards were presented one at a time, and participants were asked to try to read them. Children were asked to read 15 words in the evaluation that took place during the first semester and 20 words in the evaluation that took place during the second semester. Most children ($n = 86$) could not read any words at Time 1. In contrast, 67 children had begun to read at Time 2. At this time, reliability, as measured by split-half correlation, was .89.

Letter name knowledge. Participants were asked to name 23 capital letters printed randomly on a chart. Reliability, as measured by split-half correlations, was .94 for both test times.

Letter sound recognition. Participants listened to consonant and vowel sounds and pointed to the letters typically representing those sounds. The task consisted of 1 training item followed by 24 experimental items. For each item, six capital letters were displayed horizontally on a chart. The evaluator asked, "Which letter makes the sound __?" Reliabilities, as measured by split-half correlations, were .91 for Time 1 and .90 for Time 2. At both test times, performance on the letter sound recognition task correlated significantly with performance on the letter knowledge task ($r = .76$ for Time 1, $r = .81$ for Time 2).

Second Session: Spelling Words

The participant was asked to spell words varying in number of syllables. Despite being common in young children's vocabularies, most of these were words found infrequently in books for preschool children. For example, the words used at Time 1 appeared, on average, 7.75 times in Pinheiro's (1996) word-frequency count for kindergarten books, which included 4,573 words ranging in frequency from 1 to 600. Words were dictated by the evaluator one at a time. We told the children that it was okay for them to make mistakes but that they should try to write the words as well as they could. Twelve words were dictated at Time 1. At Time 2, we excluded 1 monosyllabic word from the list and included 1 new word in each of the other syllable sizes. We followed this procedure in an attempt to increase the number of syllabic spellings, because the principle of minimum quantity might work against children's proclivity to spell monosyllabic words syllabically. Appendix C lists the words that were dictated at Time 1. Information regarding the number of syllables and the number of letter names that could be heard in the pronunciation of the words is also included in Appendix C, along with information regarding each word's frequency of occurrence in Pinheiro's (1996) word-frequency count. Except for the word *flor* (/floh/ [flower])—which was used only at Time 1—and the words *cerveja* (/seh'veʒa/ [beer]), *zebra* (/'zebra/ [zebra]), and *barata* (/ba'rata/ [roach])—which were used only at Time 2—the same words were used at both test times.

Third Session: Syllable Segmentation

The task evaluated children's ability to segment words into their constituent syllables. At the beginning of the task, we verified that the child

could count. Then we told him or her that words can be broken into segments and that we would ask her or him to count the number of segments in a series of words. We then said, "Pay attention: The word *lata* [can] has two small pieces: *la* and *ta*," at the same time tapping on the table with a pencil, once for each syllable in the word. "Now it's your turn. How many pieces are there in the word _____?"

The task consisted of 5 training words followed by 12 experimental words for the test that was administered during the first semester and 14 experimental words for the test that was administered during the second semester. At each test time, the experimental words were the words used in the spelling task. Correct responses to the training items were praised, and incorrect responses were corrected. No feedback was given during the experimental items. Reliabilities, as measured by split-half correlations, were .77 for Time 1 and .83 for Time 2.

Results and Discussion

Early Development of Spelling Skills: Ferreiro's Stage Model Versus Ehri's Phase Model

In what follows, we analyze our longitudinal data in terms of Ferreiro's and Ehri's developmental models. The same criteria described in Study 1 were used to classify children's level of spelling development. Again, two independent judges coded all spellings. Interrater agreement was 99% for Ferreiro's coding system and 96% for Ehri's. Disagreements were discussed until the two coders reached an agreement.

The results were virtually identical to the results reported above for Study 1. As can be seen from Figure 3, relatively few children were classified as syllabic: One child was classified as syllabic at both Time 1 and Time 2, and 4 and 7 children were classified as syllabic at Time 1 and Time 2, respectively. Furthermore, many children seemed to skip the syllabic stage. Specifically, of the 36 presyllabic children at Time 1 who progressed toward more advanced levels at Time 2, only 7 progressed to the syllabic stage. Twenty-nine children moved straight to the alphabetic stage, a statistically significant difference (by binomial test, $p < .001$).

In contrast, as illustrated in Figure 4, 68 children were classified at Ehri's partial alphabetic level: 15 children at both Time 1 and Time 2 and 53 children at at least one test time. In striking contrast to the results obtained for the syllabic stage, relatively few children seemed to skip the partial alphabetic level. In fact, of the 40 children classified as prealphabetic at Time 1 who progressed to a more advanced level at Time 2, significantly more children moved to the partial alphabetic level ($n = 30$) than to the alphabetic level ($n = 10$; binomial test, $p < .01$).

In both classification schemes, 2 children classified at the middle level at Time 1 regressed to the first, less mature level at Time 2. However, although the same number of children seemed to regress or progress in the case of Ferreiro's classification scheme, significantly more children progressed to the alphabetic level than regressed to the prealphabetic level in the case of Ehri's classification scheme (binomial test, $p < .001$).

Are Syllabic Spellings Partial Alphabetic Spellings?

Again, our results suggest that syllabic spellings are better conceptualized as partial alphabetic spellings than as the result of young children's hypothesis that letters correspond to whole syllables. Similar to what was found in Study 1, the immense majority

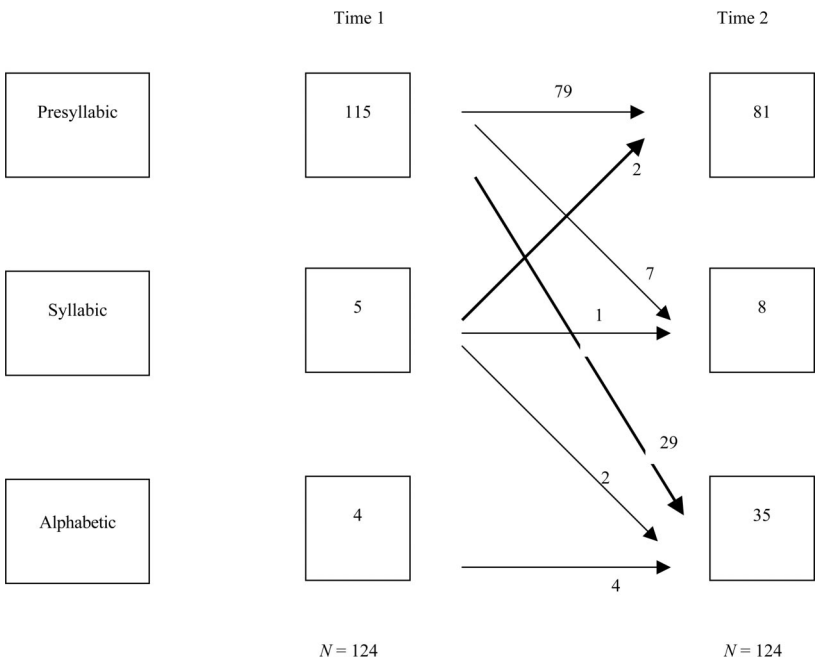

Figure 3. Study 2: Spelling development according to Ferreiro's stage model. Horizontal arrows indicate the number of children who remained in the same level, and oblique arrows indicate the number of children who changed levels from one test time to the other. Descending arrows represent changes to more advanced levels; ascending arrows indicate regressions—that is, changes to less advanced spelling levels. Bold arrows depict unexpected changes.

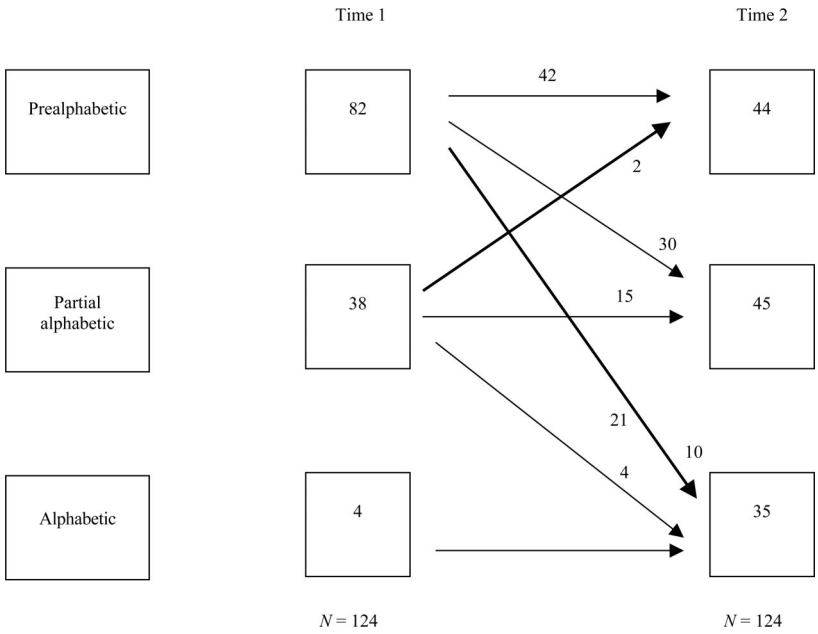

Figure 4. Study 2: Spelling development according to Ehri's model of literacy development. Horizontal arrows indicate the number of children who remained in the same level, and oblique arrows indicate the number of children who changed levels from one test time to the other. Descending arrows represent changes to more advanced levels; ascending arrows indicate regressions—that is, changes to less advanced spelling levels. Bold arrows depict unexpected changes.

of the children classified as syllabic spellers in Ferreiro's classification scheme were also classified as partial alphabetic spellers in Ehri's scheme. Specifically, only 1 of the 13 syllabic spellers was coded as prealphabetic in Ehri's classification scheme. All other cases were coded as partial alphabetic spellers, a highly significant difference (by binomial test, $p < .001$).

In addition, as illustrated in Table 2, the children classified as partial alphabetic tended to produce a greater number of syllabic spellings than the children classified as prealphabetic, $t(118) = 2.97$, $p < .01$, $d = .10$ (for Time 1), and $t(87) = 1.89$, $p < .10$, $d = .04$ (for Time 2).

Finally, most of the letters (mean proportion = .80) in the in the syllabic spellings of the children assigned to the syllabic stage were phonetically appropriate rather than arbitrary letters. Again, only in 1 case did arbitrary letters outnumber phonetically appropriate letters, a significant difference (by binomial test, $p < .01$). As was the case in Study 1, letter names, particularly vowel names, occurred more often than letter sounds. This was the case for all instances of syllabic spellers.

Is There Any Evidence That Children Connect Print to Speech Before They Learn About Letter Names and Sounds?

Our results question Ferreiro's hypothesis that the syllabic hypothesis constitutes the first manifestation of the understanding that print maps onto speech and, as such, constitutes a major landmark in spelling development. Relatively few children were characterized as syllabic spellers in either Study 1 or Study 2. In addition, many children progressed from the presyllabic stage straight into the alphabetic stage, a finding that is difficult to accommodate within Ferreiro's stage model. Finally, and perhaps most important, there was a close overlap between children's syllabic and partial alphabetic spellings, suggesting that syllabic spellings are an incidental result of children's attempt to map letters onto sounds that they can detect in the pronunciation of words.

The analyses described below were conducted with the aim of exploring a more lenient version of Ferreiro's syllabic hypothesis: that children use more letters or signs to represent longer as opposed to shorter words. To test this hypothesis, we calculated the mean number of letters produced by the children for each of the various words and then correlated these numbers with the number of syllables in the words. This was done separately for Time 1 and Time 2 of Study 2. (Only Study 2 was included in this analysis because it included words with a wider range of syllables than did Study 1.) At both test times, only children classified as prealphabetic were included in the analyses.

Neither correlation was significant ($r = .23$ for Time 1, $r = .20$ for Time 2). At both times, children tended to produce the same number of letters regardless of the number of syllables in the word. At Time 2, for example, children produced, on average, 4.30 ($SD = 0.30$), 3.90 ($SD = 0.13$), 4.17 ($SD = 0.52$), and 4.29 ($SD = 0.27$) letters for the one-, two-, three-, and four-syllable words, respectively.

Together with the results presented above, these results suggest that knowledge of letter names and sounds is essential for children to understand the connection between print and speech. As illustrated in Table 4, letter knowledge differentiated between the

Table 4
Mean Numbers (With Standard Deviations in Parentheses) of Correct Responses on the Letter Knowledge and Syllable Segmentation Tasks for the Prealphabetic and Partial Alphabetic Children in Study 2 as a Function of Test Time

	Spelling level	
Time and task	Prealphabetic (n = 82)	Partial alphabetic (n = 38)
Time 1		
Letter name	12.11 (8.05)	20.08 (3.47)
Letter sound	10.01 (4.90)	15.68 (2.97)
Syllable segmentation	6.33 (3.03)	8.84 (3.21)
	Spelling level	
Time 2	Prealphabetic (n = 44)	Partial alphabetic (n = 45)
Letter name	12.57 (6.78)	20.82 (3.63)
Letter sound	10.02 (4.94)	17.07 (3.52)
Syllable segmentation	8.84 (4.06)	10.29 (3.92)

prealphabetic and the partial alphabetic children in the present studies. Among the children who participated in Study 2, the results of a series of analyses of covariance, with the effect of differences in age and type of school (private vs. public) controlled for, revealed that the difference favoring the partial alphabetic children was statistically significant for both Time 1, $F(1, 116) = 26.43$, $p < .001$, $d = .19$ (for the letter name task); $F(1, 116) = 32.51$, $p < .001$, $d = .22$ (for the letter sound task), and Time 2, $F(1, 85) = 33.37$, $p < .001$, $d = .28$ (for the letter name task); $F(1, 85) = 35.15$, $p < .001$, $d = .29$ (for the letter sound task). Likewise, the partial alphabetic children performed significantly better than the prealphabetic children on the syllable segmentation task at both Time 1, $F(1, 116) = 14.91$, $p < .001$, $d = .11$, and Time 2, $F(1, 85) = 4.94$, $p < .05$, $d = .05$.

Given that the syllabic children were able to represent a greater number of sounds in the pronunciation of the words than were the partial alphabetic, nonsyllabic children, they might have been expected to know a relatively greater number of letter names and sounds. They also might have been expected to perform relatively better on the syllable segmentation task. In contrast to such a prediction, the two groups did not, in general, differ significantly with regard to letter name or letter sound knowledge. Nor did the syllabic spellers differ from the nonsyllabic, partial alphabetic spellers on the syllable segmentation task administered in Study 2.

These results are consistent with Cardoso-Martins and Batista's (2005) suggestion that syllabic spellings are an instance of the broader class of spellings that Ehri (1998) has called partial alphabetic spellings. This might account for the relatively low incidence of syllabic spellings per se in the present studies.

General Discussion

The goal of the present studies was to investigate the development of Brazilian Portuguese-speaking children's spelling development in light of two developmental models: Ferreiro's stage model and Ehri's phase model. We were particularly interested in testing which model might account more accurately for young children's early understanding of the connection between print and speech.

According to Ferreiro's (1989; 1990; Ferreiro & Teberosky, 1986) model, children's first understanding of the connection between print and speech grows out of their attempt to find a general criterion that enables them to regulate the number of letters necessary to spell different words. As a result of this search, they come up with the syllabic hypothesis—that is, that letters stand for whole syllables in the pronunciation of words. An important aspect of Ferreiro's argument is that the syllabic hypothesis is a result of a conceptual construction and, as such, is largely independent of young children's knowledge of letter names and sounds. In fact, Ferreiro and Teberosky (1986) have noted that syllabic spellings are observed even among children who do not know any letters and who, as a result, draw little circles or dashes when requested to write as well as they can.

In contrast to Ferreiro, Ehri (1992, 1998; Ehri & Wilce, 1985) has proposed that knowledge of letter names and sounds plays a crucial, determinant role in children's realization that print represents speech. As a matter of fact, Ehri has argued that the first manifestation of that understanding consists of spellings representing sounds in the pronunciation of words by phonetically appropriate letters. Initially, however, children are able to represent only a few sounds in the pronunciation of a word. In addition, they seem to rely almost exclusively on letter names in their early attempts to connect speech to print. For example, Treiman and her colleagues (e.g., Treiman et al., 1996) have shown that preschool children are more likely to spell a sound at the beginning of a word when the sound corresponds to a letter name (as in the word *beach*) than when the sound corresponds to a phoneme contained in the name of the letter (as in *bone*). As elaborated below, the results of the present studies suggest that young children's reliance on letter names to spell words early on may offer a more parsimonious explanation for the so-called syllabic spellings than does Ferreiro's conceptual explanation.

We found hardly any evidence that children attend only to the quantitative dimension when they spell syllabically. Indeed, most of the letters in the syllabic spellings of the children assigned to the syllabic stage in the present studies consisted of letters that stood for sounds in the pronunciation of the words. As shown in Table 3, the names of the letters were frequently detected in the pronunciation of

the words. In fact, in a great number of cases—for example, *CVA* for *cerveja* (/seh'veʒa/ [beer]), *ZA* for *zebra* (/'zebra/ [zebra]), *DU* for *dedo* (/'dedu/ [finger]), *AU* for *dado* (/'dadu/ [dice]), *AAA* for *barata* (/ba'rata/ [roach]), *IIEA* for *bicicleta* (/bisi'klɛta/ [bike]), *AAUA* for *tartaruga* (/tahta'ruga/ [turtle]), *GAIA* for *gelatina* (/ʒela'tina/ [jelly]), and so forth—the names of all letters in a syllabic spelling could be detected in the pronunciation of the target word, each name corresponding to a different syllable in the word (either to the whole syllable or to a sound contained in the syllable).

Furthermore, in contrast to Ferreiro's (1989, 1990) claim that the syllabic hypothesis constitutes the first manifestation of the understanding that print maps onto speech and, as such, constitutes a major landmark in the development of spelling, we found that a large number of children who had been classified as presyllabic according to Ferreiro's model were classified as partial alphabetic according to Ehri's model. Specifically, 29% and 45% of the children assigned to the presyllabic stage at Time 1 and Time 2 of Study 2, respectively, were assigned to Ehri's partial alphabetic phase. The corresponding figures for Study 1 ranged from 10% at Time 1 to 91% at Time 4. Together with the evidence that the letters in the syllabic spellings of the children assigned to the syllabic stage corresponded to sounds in the pronunciation of the words, these results strongly suggest that rather than being the result of children's construal that letters represent whole syllables, young children's syllabic spellings are an incidental result of their beginning understanding that letters stand for stable sounds in the pronunciation of words.

Perhaps more damaging to Ferreiro's model of early spelling development is the finding of a very low incidence of syllabic spellings. As described above, relatively few children were assigned to the syllabic stage. This was true for both Study 1 and Study 2 and for all evaluations.

We also found no evidence for a more lenient version of the syllabic hypothesis—that is, that children relate the number of letters in the spelling of words to the length of the words' pronunciation before they are able to process letter–sound relations. The prealphabetic children who participated in our studies produced about the same number of letters, regardless of the number of syllables in the target words.

Taken as a whole, our findings strongly favor Ehri's (1992, 1998) phase model of early spelling development. In particular, although Ferreiro's syllabic stage appeared as an intermediate stage for only 15% of the children who participated in the first study, 95% of them moved through Ehri's partial alphabetic level on their way toward the alphabetic level. Among the children who participated in Study 2 and who progressed toward more advanced levels from Time 1 to Time 2, only 19% progressed to Ferreiro's syllabic stage. In contrast, 75% progressed to Ehri's partial alphabetic phase.

Ehri's developmental model seems thus to offer a more parsimonious explanation of early spelling development than does Ferreiro's stage model. In fact, although Ehri's model seems capable of accommodating data from languages as diverse as English and Brazilian Portuguese, most evidence for the syllabic stage comes from observations of young speakers of Romance languages (e.g., Grossi, 1990; Pontecorvo & Zucchermaglio, 1990; Weisz, 2000). Ferreiro (1990) suggested that the paucity of syllabic productions among English-speaking children is attributable to the relatively high incidence of monosyllabic words in English. Presumably, this characteristic of the English language prevents young speakers of English from exploring the syllabic hypothesis. It is nonetheless possible that the absence of syllabic spellings among English-speaking children results from the fact that, relative to Romance languages like Brazilian Portuguese, English presents a larger number of vocalic sounds, only a minority of which corresponds to vowel names. Indeed, there is evidence that letter names in general, and vowel names in particular, are more abundant in the pronunciation of words in Portuguese than in English (Cardoso-Martins et al., 2002; Pollo, Kessler, & Treiman, in press). For example, Cardoso-Martins et al. (2002) observed that although only 17 of the 56 regular and irregular words in Seymour's (1986, List 2) list of high-frequency English words contained letters whose names can be heard in the pronunciation of the words, 51 of the 56 most frequent words in Brazilian books for kindergarten children (Pinheiro, 1996) contained at least one letter whose name can be heard in the pronunciation of the word. In most cases, the letter corresponded to a vowel. Because there is only one vowel per syllable, and because young children seem to rely on letter names to spell words (e.g., Levin et al., 2002; Treiman et al., 1996), it makes sense that syllabic spellings should be more prevalent in Brazilian Portuguese than in English.

Given the popularity of Ferreiro's hypothesis in Brazil (see, e.g., Cardoso-Martins, Capovilla, et al., 2005), the low incidence of syllabic spellings among our participants came as a surprising, unanticipated result. It is unlikely that these findings resulted from differences in the procedure we used to code a spelling as syllabic or not. It is true that we did not require that a child read the word syllabically for his or her spelling to be coded as syllabic. However, the same instructions that have been used by Ferreiro (1989) and her followers in Brazil (e.g., Weisz, 2000) were used in Study 1. That is, children were asked to spell each word in the list as well as possible. In addition, immediately after they wrote a word, they were asked to read it aloud and, at the same time, to pass their finger underneath it. Even though syllabic spellings were in general more frequent in Study 1 than in Study 2, they were nonetheless relatively infrequent.

The children who participated in the present studies were attending preschools that included literacy activities as part of their programs. For example, the children learned the letters of the alphabet and had ample exposure to printed material. It is unlikely, however, that we would have observed a higher incidence of syllabic spellings had the children been less mature or had they known fewer letters. In Study 1, in fact, increases in the incidence of syllabic spellings across the first three test times were paralleled by increases in letter knowledge, particularly letter name knowledge. Furthermore, we (Cardoso-Martins, Lemos, Corrêa, & Napoleão, 2005) have replicated that study's finding of very few syllabic spellings among 1st-year preschool children in a sample of 67 preschoolers ranging from 39 to 63 months of age ($M = 51.68$, $SD = 4.40$). Even though they knew relatively few letter names and sounds, they produced on average only 0.08 syllabic spellings. Finally, Ferreiro (1989, chap. 3) has claimed that even formal reading instruction does not preclude children from progressing through her sequence of stages.

An important task for future research will consist in determining the impact of different educational practices on children's propensity to spell syllabically. For example, teachers who believe that syllabic spellings are a major landmark in the development of

spelling could reinforce children's occasional syllabic spellings. Unfortunately, we did not assess teachers' beliefs regarding early spelling development in the present studies.

Even if it turns out that syllabic spellings occur more frequently than the findings of the present studies indicate, our results strongly suggest that they constitute a rather subtle and brief phenomenon. As a matter of fact, the relative paucity of syllabic spellings is even more surprising given the evidence of young children's reliance on letter names to spell words early on (Levin et al., 2002; Treiman et al., 1996). As can be seen in Appendixes B and C, letter names abounded in the pronunciation of the words that were included in the spelling tasks. In fact, in 75% of the words in Appendix C, one letter name could be heard in the pronunciation of each and every syllable in the word.

In summary, the results of the present studies question Ferreiro's (1989, 1990; Ferreiro & Teberosky, 1986) proposal that spelling development can be described as a conceptual construction process. Instead, they strongly suggest that it may be more appropriate to conceptualize early spelling development in terms of children's increasing ability to detect phonological units in the pronunciation of words and to map these sounds to phonetically appropriate orthographic units. Ehri's (1992, 1998) developmental model of reading and spelling development provides one such description. The results of the present studies suggest that her model, developed on the basis of her observations of children learning to read and spell in English, may be fruitfully extended to early spelling development in more transparent writing systems.

References

Cardoso-Martins, C. (2006). Beginning reading acquisition in Brazilian Portuguese. In M. Joshi (Ed.), *Handbook of orthography and literacy* (pp. 171–187). Mahwah, NJ: Erlbaum.

Cardoso-Martins, C., & Batista, A. C. E. (2005). O conhecimento do nome das letras e o desenvolvimento da escrita: Evidência de crianças falantes do Português [Letter name knowledge and spelling development: Evidence from Portuguese-speaking children]. *Psicologia: Reflexão & Crítica, 18,* 299–306.

Cardoso-Martins, C., Capovilla, F., Gombert, J., Oliveira, J. B. A., Morais, J., Adams, M. J., & Beard, R. (2005). *Os novos caminhos da alfabetização infantil* [New trends in childhood literacy instruction] (2nd ed.). São Paulo, Brazil: Memnon Edições Científicas Ltda.

Cardoso-Martins, C., Lemos, L., Corrêa, L. F., & Napoleão, R. F. (2005). A escrita de crianças matriculadas no 1°. período da pré-escola [The spelling of children enrolled in 1st-year preschool classes]. Unpublished manuscript, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.

Cardoso-Martins, C., Resende, S. M., & Rodrigues, L. A. (2002). Letter name knowledge and the ability to learn to read by processing letter–phoneme relations in words: Evidence from Brazilian Portuguese-speaking children. *Reading and Writing, 15,* 409–432.

Ehri, L. (1986). Sources of difficulty in learning to spell and read. In M. Wolraich & D. Routh (Eds.), *Advances in developmental and behavioral pediatrics* (pp. 121–195). Greenwich, CT: JAI Press.

Ehri, L. (1992). Reconceptualizing the development of sight word reading and its relationship to recoding. In P. Gough, L. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 107–143). Hillsdale, NJ: Erlbaum.

Ehri, L. (1998). Learning to read and learning to spell are one and the same, almost. In C. Perfetti, L. Rieben, & M. Fayol (Eds.), *Learning to spell: Research, theory, and practice across languages* (pp. 237–269). Mahwah, NJ: Erlbaum.

Ehri, L., & Wilce, L. (1985). Movement into reading: Is the first stage of printed word learning visual or phonetic*? Reading Research Quarterly, 20,* 163–179.

Ferreiro, E. (1989). *Reflexões sobre a alfabetização* [Reflections on literacy acquisition]. São Paulo, Brazil: Cortez.

Ferreiro, E. (1990). Literacy development: Psychogenesis. In Y. M. Goodman (Ed.), *How children construct literacy: Piagetian perspectives* (pp. 12–25). Newark, DE: International Reading Association.

Ferreiro, E., & Gomez Palacio, M. (1982). *Analisis de las perturbaciones en el proceso de aprendizaje escolar de la lectura y de la escritura* [Analysis of the difficulties in the process of learning to read and spell in school]. Mexico City, Mexico: Siglo XXI.

Ferreiro, E., & Teberosky, A. (1986). *Psicogênese da língua escrita* [Psychogenesis of the written language]. São Paulo, Brazil: Artes Médicas.

Grossi, E. P. (1990). Applying psychogenesis principles to the literacy instruction of lower-class children in Brazil. In Y. M. Goodman (Ed.), *How children construct literacy: Piagetian perspectives* (pp. 99–114). Newark, DE: International Reading Association.

Levin, I., Patel, S., Margalit, T., & Barad, N. (2002). Letter names: Effect on letter saying, spelling, and word recognition in Hebrew. *Applied Psycholinguistics, 23,* 269–300.

Pinheiro, A. M. V. (1996). *Contagem de freqüência de ocorrência de palavras expostas a crianças na faixa pré-escolar e séries iniciais do 1º. grau* [A word frequency count in books for kindergarten and early elementary school children]. São Paulo, Brazil: Associação Brasileira de Dislexia.

Pinheiro, A. M. V., & Keys, K. (1987). *A word frequency count in Brazilian Portuguese.* Unpublished manuscript, University of Dundee, Dundee, Scotland, United Kingdom.

Pollo, T. C., Kessler, B., & Treiman, R. (in press). Vowels, syllables, and letter names: Differences between young children's spelling in English and Portuguese. *Journal of Experimental Child Psychology.*

Pontecorvo, C., & Zucchermaglio, C. (1990). A passage to literacy: Learning in a social context. In Y. M. Goodman (Ed.), *How children construct literacy: Piagetian perspectives* (pp. 59–98). Newark, DE: International Reading Association.

Seymour, P. H. K. (1986). *Cognitive analysis of dyslexia.* London: Routledge & Kegan Paul.

Treiman, R., & Kessler, B. (2003). The role of letter names in the acquisition of literacy. In R. Kail (Ed.), *Advances in child development and behavior* (Vol. 31, pp. 105–135). San Diego, CA: Academic Press.

Treiman, R., Tincoff, R., & Richmond-Welty, D. (1996). Letter names help children connect print and speech. *Developmental Psychology, 32,* 505–514.

Weisz, T. (2000). *O diálogo entre o ensino e a aprendizagem* [The dialogue between instruction and learning]. São Paulo, Brazil: Ática.

(*Appendixes follow*)

Appendix A

Letter Names in Brazilian Portuguese

Letter	Letter name
A	/a/
B	/be/
C	/se/
D	/de/
E	/ɛ/
F	/ˈɛfi/
G	/ʒe/
H	/aˈga/
I	/i/
J	/ˈʒɔta/
K	/ka/*
L	/ˈɛli/
M	/ˈemi/
N	/ˈeni/
O	/ɔ/
P	/pe/
Q	/ke/
R	/ˈɛhi/
S	/ˈɛsi/
T	/te/
U	/u/
V	/ve/
W	/ˈdabliw/*
X	/ʃis/
Y	/ˈipisilõ/*
Z	/ze/

Note. Asterisks denote letters that are not part of the Portuguese alphabet.

Appendix B

Words Used at Test Time 1 of Study 1

Word	Number of syllables	Number of letter names in word's pronunciation	Frequency of occurrence in Pinheiro's (1996) word count
zebra (/ˈzebra/)	2	2	5
piano (/piˈãnu/)	3	2	0
xerife (/ʃeˈrifi/)	3	2	1
beterraba (/beteˈhaba/)	4	4	0
esquilo (/isˈkilu/)	3	3	7
cerveja (/sehˈveʒa/)	3	3	0
girafa (/ʒiˈrafa/)	3	3	0
dedo (/ˈdedu/)	2	2	0
sirene (/siˈreni/)	3	3	0
tartaruga (/tahtaˈruga/)	4	4	0
cavalo (/kaˈvalu/)	3	4	0
xícara (/ˈʃikara/)	3	4	0
pescoço (/pesˈkosu/)	3	1	0
cigarro (/siˈgahu/)	3	3	2
bicicleta (/bisiˈklɛta/)	4	4	0
chefe (/ˈʃɛfi/)	2	2	0
gelado (/ʒeˈladu/)	3	3	0
doce (/ˈdosi/)	2	1	0
isqueiro (/isˈkeru/)	3	3	1
zorro (/ˈzohu/)	2	1	0

Appendix C

Words Used at Test Time 1 of Study 2

Word	Number of syllables	Number of letter names in word's pronunciation	Frequency of occurrence in Pinheiro's (1996) word count
cavalo (/ka^{l}valu/)	3	4	0
chá (/ʃa/)	1	1	9
flor (/floh/)	1	0	0
cigarro (/si^{l}gahu/)	3	3	2
bico (/^{l}biku/)	2	2	0
dedo (/^{l}dedu/)	2	2	0
tartaruga (/tahta^{l}ruga/)	4	4	0
pé (/pɛ/)	1	1	66
barata (/ba^{l}rata/)	3	3	0
bicicleta (/bisi^{l}klɐta/)	4	4	0
lobo (/^{l}lobu/)	2	1	16
telefone (/tele^{l}foni/)	4	2	0

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