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Children's own names influence their spelling

REBECCA TREIMAN
Washington University

BRETT KESSLER
Wayne State University

DERRICK BOURASSA
Acadia University

ADDRESS FOR CORRESPONDENCE
Rebecca Treiman, Psychology Department, Washington University, Campus Box 1125, One Brookings Drive, St. Louis, MO 63130-4899. E-mail: rtreiman@artsci.wustl.edu

ABSTRACT
We analyzed spellings that were produced by children in kindergarten ($N = 115$), first grade ($N = 104$), and second grade ($N = 77$) in order to determine whether children's own names influence their spellings of other words. Kindergartners overused letters from their own first names (or commonly used nicknames) when spelling. Kindergartners with longer names, who had more own-name letters available for intrusions, tended to produce longer spellings than did children with shorter names. Moreover, the spellings of kindergartners with long names tended to contain a lower proportion of phonetically reasonable letters than did the spellings of children with short names. These effects appeared to be confined to children who read below the first grade level. The results support the view that children's own names play a special role in the acquisition of literacy. They further show that children choose letters in a way that reflects their experience with the letters.

The names that parents give to children play an important role in the children's development. Infants frequently hear the spoken forms of their names, and they prefer to listen to their own first names rather than to the names of others by as early as 4½ months of age (Mandel, Jusczyk, & Pisoni, 1996). As children get older, they see the printed forms of their own names on a regular basis. In day care centers, for example, children's cubbyholes and art projects are often labeled with their first names. As early as 2 years of age, some children can identify their printed names without any contextual cues (Villaume & Wilson, 1989). Children's own names also play an important role as they learn to write. A child's name is often the first word that he or she attempts to write (Clay, 1975; Temple, Nathan, & Buriss, 1982). Children's earliest signatures may be unrecognizable scribbles. By the age of 5 or 5½, however, children can usually print their first name in a conventional or largely conventional manner (Ferreiro & Teberosky, 1982; Hildreth, 1936).

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Our interest here is in the role of names in the acquisition of literacy. Given children's frequent exposure to the printed forms of their names, and given the importance of the name to children, it has been hypothesized that names play a special role in literacy development (e.g., Bloodgood, 1999; Ferreiro & Teberosky, 1982; Villaume & Wilson, 1989). Empirical evidence for the idea that names are especially important in early literacy development comes from a study that assessed children's knowledge about letters (Treiman & Broderick, 1998). When children were shown the letters of the alphabet and were asked to provide the name of each letter, they did better on letters that were in their own first name (or commonly used nickname) than on letters that were not. Across three samples of children (preschoolers from the United States, kindergartners from the United States, and first graders from Australia), a significant advantage for the first letter of the first name was found. Tendencies in the same direction were generally observed for the second, third, and fourth letters of the first name, but these were not significant. Thus, children named Eva or Ethan were more likely to know the name of the letter *e* than were children named Sam or Maya. An advantage for the initial letter of the first name was also found in a letter production task. Children named Dan or Donna, for example, could produce better quality *d*s than could children named Chuck or Sarah.

Thus, there is evidence that children's own names influence their ability to label and form letters. Do personal names affect the way in which children actually spell words? A number of researchers have suggested that they do. These suggestions are based on observations of children from the United States (Sulzby, 1985; Temple et al., 1982), Israel (Levin, Share, & Shatil, 1996), and France (Gombert & Fayol, 1992). According to these researchers, the child's own name is a repertoire of learned letters. Children often use the letters from this familiar set to write new words. Most of the studies, however, failed to adopt stringent statistical techniques in order to determine whether own-name letters occur more often in children's spellings than would be expected by chance. If a child named Emily writes "pelot" for *potato*, for example, is she really using *e* and *l* because they are letters from her own name? *E* and *l* are common letters, and it may be that Emily uses them no more often than other children. Given isolated examples such as these, it is difficult to pinpoint the cause of the intrusions.

The best quantitative evidence to date on own-name intrusions in spelling was provided by Bloodgood (1999). She studied spellings produced by 30 children aged 4 or 5, who, according to her description, were not able to connect letters and sounds with any degree of consistency. Bloodgood's analyses focused on the letters *l, n, r*, and *s*: the consonants that most commonly appeared in the children's first names. For each of these four letters, children who had the letter in their first name used the letter more often in their spellings than children who did not have the letter in their first name. These results support the idea that children use the letters from their own first names when spelling other words. However, the conclusions are limited by the fact that the statistical analyses were performed for only four letters, all of them consonants.

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Bloodgood (1999) claimed that, as well as reproducing the specific letters from their own names, children imitate other aspects of the name's spelling when they attempt to write other words. For example, she stated that children whose names contained doublets, such as Brittany, used many doublets in their spellings of other words. However, Bloodgood did not present quantitative support for this observation. Nor did this researcher carry out quantitative analyses to determine whether intrusions were more likely to involve the first letter of the first name than to involve subsequent letters. Such a difference might be expected given the finding of Treiman and Broderick (1988) that own-name effects on knowledge of letter names were primarily apparent for the first letter of the first name.

To gather firmer and more comprehensive evidence on how children's own names affect their spellings, we analyzed spellings that were produced by American children at three different grade levels: kindergarten, first, and second. We looked at own-name intrusions for a wide range of letters, and we also carried out quantitative analyses to examine other ways in which children's own names may influence their spellings. To obtain good estimates of the effects of children's names on their spelling, one needs data from a large number of children whose names contain a variety of letters. We therefore analyzed three sets of data that had been collected in our laboratory. The first, here called Sample 1, was from Experiment 1 of Treiman and Bourassa (2000). The second data set, Sample 2, was the real word spelling test used in Experiments 2 and 3 of Cassar and Treiman (1997). Sample 3 was the real words from Experiment 1 of Treiman, Berch, Tincoff, and Weatherston (1993). These were all of the studies from our laboratory that included children from each of the kindergarten, first, and second grades and in which children spelled entire real words that were dictated to them. In all, we analyzed data from 115 kindergartners, 104 first graders, and 77 second graders.

METHOD

Participants

Background information about the children in each of the three samples is provided in Table 1.

Stimuli and procedures

The children in Sample 1 were asked to spell 10 words in writing and another 10 words orally. The words are listed in the Appendix of Treiman and Bourassa (2000). There were two lists of words, and each child spelled one list in each modality. Assignment of lists to modalities was balanced across children. The children in Sample 2 spelled 15 words in writing. The words are listed in table 4 of Cassar and Treiman (1997). The children in Sample 3 spelled 20 words in writing. The words are listed in the appendix of Treiman et al. (1993). Further details about the studies are available in the original reports.

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Table 1. *Characteristics of children in the three samples*

Sample characteristic	Grade level		
	Kindergarten	First	Second
1			
N	30 (15 M, 15 F)	28 (12 M, 16 F)	33 (17 M, 16 F)
Mean age (years;months)	5;8	6;7	7;9
Age range	5;1–6;3	6;2–7;3	7;2–8;10
Time of testing	Oct.–Nov.	Oct.–Nov.	Dec.–Jan.
2			
N	64 (32 M, 32 F)	56 (23 M, 33 F)	24 (11 M, 13 F)
Mean age (years;months)	5;11	6;8	7;11
Age range	4;10–7;2	5;9–9;6	7;4–8;9
Time of testing	Feb.–May	Sept.–Feb.	Feb.
Reading level	Pre-first	Mid-first	Beginning third
3			
N	21 (9 M, 12 F)	20 (10 M, 10 F)	20 (9 M, 11 F)
Mean age (years;months)	6;2	7;0	7;11
Age range	5;7–6;10	6;6–7;11	7;5–8;10
Time of testing	May	Apr.–May	March
Reading level	Pre-first	End first	End second

Note: Reading level is grade equivalent on the reading subtest of the WRAT-R (Jastak & Wilkinson, 1984). Reading level is not available for Sample 1.

RESULTS

Our first analysis focused on intrusion errors in the children's spellings. Intrusions were defined as characters used by children that were not part of the conventional spelling of the word. Analyses were carried out to determine whether children's intrusion errors tended to be letters from their own first names. For each letter of the alphabet, we calculated how often pupils who had this letter in their first name (or commonly used nickname) used that letter in a word that does not contain the letter in its conventional spelling. For example, we calculated how often students with an *e* in their first name used an *e* when spelling words such as *jar* and *bump*, the conventional spellings of which do not contain *e*. This count was scaled by the total number of intrusions made by students with an *e* in their name. The result indicates the proportion of all intrusions made by students with an *e* in their name that were *e*s; it is referred to as the proportion of name intrusions. For each letter, we also calculated how often the letter was used intrusively by students who did not have that letter in their names. This count was scaled by the total number of intrusions made by students without that letter in their name, yielding a proportion of no-name intrusions for each letter. For example, we calculated the proportion of intrusions that were *e*s that were made by students who did not have an *e* in their own name, such as Chad. The proportions of name and no-name intrusions were then compared for each letter. In the Cassar and Treiman (1997) kindergarten data, for instance,

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Table 2. *Proportion of intrusions of letters by children who have the letters in their first names* (*name intrusions*) *and children who do not have the letters in their first names* (*no-name intrusions*)

	Grade level		
Sample	Kindergarten	First	Second
1			
Proportion name intrusions	.07	.06	.06
Proportion no-name intrusions	.04	.06	.06
p value for difference by *t* test	$p < .001$	*ns*	*ns*
p value for difference by Wilcoxon signed ranks test	$p < .001$	*ns*	*ns*
2			
Proportion name intrusions	.05	.04	.04
Proportion no-name intrusions	.03	.04	.04
p value for difference by *t* test	$p = .006$	*ns*	*ns*
p value for difference by Wilcoxon signed ranks test	$p = .004$	*ns*	*ns*
3			
Proportion name intrusions	.06	.05	.03
Proportion no-name intrusions	.04	.05	.05
p value for difference by *t* test	$p = .002$	*ns*	*ns*
p value for difference by Wilcoxon signed ranks test	$p = .020$	*ns*	*ns*
Combined			
Proportion name intrusions	.05	.04	.04
Proportion no-name intrusions	.03	.04	.05
p value for difference by *t* test	$p < .001$	*ns*	*ns*
p value for difference by Wilcoxon signed ranks test	$p < .001$	*ns*	*ns*

Note: The *p* values are for one-tailed tests across letters.

59 of the 788 total intrusions made by pupils with an *e* in their name were *e*s. The proportion of name intrusions is thus .075. For pupils without an *e* in their name, 47 of the 913 intrusions were *e*s, giving a no-name proportion of .051. For the letter *e*, then, the proportion of name intrusions is higher than the proportion of no-name intrusions for this sample.

Table 2 shows the proportions of name and no-name intrusions for each grade level in each sample. The results are pooled over all letters that were present in the name of at least one child in that grade level and that sample. For Sample 1, the data were additionally pooled over modality of response (oral versus written spelling) because statistical tests reported below indicated no difference between the two modalities on the variables of interest here.

For each sample, analyses of variance (ANOVAs) were carried out using letters as the unit of analysis. There were two within-factors variables: grade level and the presence versus absence of the letter in the child's name. The ANOVA for Sample 1 also included the factor of response modality. Letters that were not present in any of the children's names at one or more grade levels in a particular sample were excluded from the analyses. For Sample 1, the ANOVA showed a significant interaction between grade and letter presence,

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$F(2, 40) = 5.64$, $p = .007$. No other results reached the .05 level, although the main effect of letter presence narrowly missed significance, $F(1, 20) = 3.77$, $p = .067$. For Sample 2, the interaction between grade and letter presence did not reach the .05 level, $F(2, 36) = 2.46$, $p = .10$, but the main effect of letter presence was reliable, $F(1, 18) = 7.68$, $p = .013$. For Sample 3, the only significant effect was the interaction between grade and letter presence, $F(2, 30) = 8.13$, $p = .002$.

To increase the power of the analyses and the number of letters that could be included, we carried out an additional analysis in which the data for each letter were pooled across the three samples. These results are shown in the lower portion of Table 2. The main effect of letter presence was reliable in the analysis of the combined data, $F(1, 21) = 4.70$, $p = .042$. In addition, there was a significant interaction between grade and letter presence, $F(2, 42) = 10.71$, $p < .001$.

The interaction between grade and letter presence, which was statistically significant for two of the three samples and for the combined data, arose because intrusions of own-name letters were more common than intrusions of other letters for kindergartners, but not for first or second graders. To confirm this interpretation, we carried out statistical tests across letters to determine whether the proportion of name intrusions significantly exceeded the proportion of no-name intrusions. Letters that were not present in the name of any child at a particular grade level and in a particular sample were not included in the analysis. Both nonparametric tests (Wilcoxon signed ranks tests) and parametric tests (t tests) were performed. The results, shown in Table 2, reveal a small but significant effect for kindergartners in each of the three individual samples and in the combined sample. Kindergartners were more likely to use a letter intrusively when the letter was in their own first name than when it was not. The effect was relatively small, but it held for most of the letters of the alphabet. Indeed, 22 of the 25 letters that could be included in the combined analysis of the kindergarten data showed a difference in the predicted direction. The three letters that did not show the effect were letters for which relatively few intrusions were made. When we restricted the analysis to letters for which the denominator of the proportion of name intrusions was at least 50 (i.e., letters for which the proportion of name intrusions could be calculated with reasonable accuracy), the effect was present for all the 21 letters in the combined kindergarten data. Thus, the own-name effect was quite consistent for kindergartners.

Although the kindergartners were more likely to use a letter intrusively when the letter was in their own first name than when it was not, the first and second graders did not show this pattern. As Table 2 shows, the difference between the name and no-name cases was not significant in any of the analyses for first or second graders. This continued to be true when the analyses were restricted to letters for which the denominator of the proportion of name intrusions was at least 50.

Having documented the occurrence of own-name intrusions among kindergartners, we then asked whether the intrusions from the kindergartners' names tended to originate from any particular position within the name. For example, is a child named Emily especially likely to produce the letter *e* intrusively, reflecting the fact that this is the first letter of her name? Bloodgood (1999) implied that intrusions of letters that occurred early in the name were more

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common across children than intrusions of middle letters, but she did not present quantitative data on this point. For each letter, we calculated the proportion of intrusions by kindergartners who had that letter in the first, second, third, or fourth positions of their first name or commonly used nickname. (We did not go beyond the fourth letter in these analyses because a number of students' names were only four letters long.) An ANOVA using the factors of letter position (first through fourth) and letter presence (present versus absent), with letters as the unit of analysis, was carried out on the combined results for the three kindergarten samples. There was a main effect of letter presence, $F(1, 9) = 8.19$, $p = .019$, consistent with the findings reported previously. However, there was no effect of letter position and no interaction between letter position and letter presence. When the analyses were restricted to letters for which the denominator of the proportion of name intrusions was at least 50, the proportion of letters showing a difference in the predicted direction was slightly higher for the first letter than of the name than for the subsequent letters. Again, though, letter position did not enter into any statistically significant effects. Thus, it appears that intrusions of letters from the kindergartners' own names came from a variety of positions within the name, and not just from the first letter.

For Samples 2 and 3, data on the children's reading levels from the Wide Range Achievement Test–Revised (WRAT-R; Jastak & Wilkinson, 1984) were available. For these samples, we carried out an additional ANOVA using the factor of reading level (categorized as pre-first grade vs. first grade vs. second grade and above) and letter presence (letter present in child's first name or commonly used nickname vs. not present). The results of this analysis were consistent with the results reported previously. Specifically, there was an interaction between reading level and letter presence, $F(2, 40) = 4.60$, $p = .016$, and a main effect of letter presence, $F(1, 20) = 5.31$, $p = .032$. The children who read below the first grade level, most of whom were kindergartners, were more likely to use a letter intrusively when it was in their own name than when it was not (.06 versus 04, $p = .001$ by a t test; $p = .003$ by a Wilcoxon signed ranks test, both tests one-tailed). The children whose reading level was at or beyond first grade, who were mainly first and second graders, did not show a significant difference between the name and no-name cases.

The results so far show that kindergartners with low levels of reading skill tend to overuse letters from their own names when spelling other words. To get a better idea of how often children produce own-name intrusions relative to other types of spellings, we categorized each character used by each child into one of the four categories shown in Table 3. The first category, own-name intrusions, were letters from the child's own name that were neither in the conventional spelling of the word nor reasonable renderings of the sounds in the word's pronunciation. For example, Emily's use of *l* in "lmiluei," her spelling of *sank*, is an own-name intrusion. The letter *l* is from her first name, but it is not a plausible representation of any of the sounds in *sank*. The second category, phonetically reasonable spellings, consisted of correct letters and letters that, according to previous studies, are common and reasonable attempts to represent the phonemes in the spoken word. For a spelling to be placed in this second category, it had to be phonetically reasonable but not a letter from the child's

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Table 3. *Mean proportions of characters of various types for children in combined sample* (*standard deviations in parentheses*)

	Grade level		
Type of character	Kindergarten	First	Second
Own-name intrusion only	.15 (.13)	.07 (.07)	.02 (.02)
Phonetically reasonable letter only	.45 (.24)	.60 (.13)	.65 (.09)
Neither	.24 (.18)	.10 (.11)	.02 (.04)
Ambiguous	.16 (.08)	.22 (.09)	.31 (.09)

first name. Confusions on the basis of voicing (e.g., *k* for /g/) and attempts to represent the affrication of /t/ and /d/ before /r/ (e.g., *g* for /d/ before /r/) were counted as phonetically reasonable spellings because such errors have been well documented in previous studies (e.g., Read, 1975; Treiman, 1993). Errors based on letter names were also considered reasonable attempts at sound-based spelling. For example, /w/ is the first sound in the name of *y*, and young children sometimes spell /w/ as *y* for this reason (Treiman, Weatherston, & Berch, 1994). Emily's use of *p* in "pelot," her spelling of *potato*, falls into the category of phonetically reasonable spellings, as *p* is a conventional representation of the /p/ phoneme but not a letter from Emily's name. The *g* in "gp," Nicole's spelling of *drip*, was also placed in the phonetically reasonable category, being a reasonable representation of /d/ before /r/ but not a letter from Nicole's name. The third category of spellings consisted of characters that were neither letters from the child's own name nor phonetically reasonable spellings. The *u* in "lmiluei," Emily's spelling for *sank*, was put into this third category because it does not appear to be an attempt to represent either a sound of the spoken word or a letter from the child's name. In the fourth category were spellings that were ambiguous, being both phonetically reasonable spellings and letters from the child's own name. For example, an *l* in Emily's spelling of *belly* falls into the ambiguous category. It is both a reasonable (and, in fact, a correct) spelling of /l/ and a letter from Emily's name.

Pooling across the three samples, 15% of the characters in kindergartners' spellings could be explained only as intrusions of letters from the children's own names. The proportion of such errors decreased markedly across the three grade levels, $F(2, 293) = 47.22$, $p < .001$. In contrast, the proportion of characters that fell into only the phonetically reasonable category increased with grade level, $F(2, 293) = 36.48$, $p < .001$. However, even the kindergartners used a number of spellings that were correct or phonetically well motivated. Pooling over all kindergartners, 45% of the characters that were used fell into this category. When we restricted the analysis to the 30 kindergartners who had the highest proportion of own-name intrusions ($M = 33\%$), we found that they, too, produced a nonnegligible number of phonetically reasonable characters ($M = 22\%$). Thus, it appears that phonetically reasonable letters and own-name intrusions coexist in a number of kindergarten children.

Children may overuse letters from their own name because these are letters

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that they encounter frequently. If so, other frequent letters should often appear as intrusions as well. We thus carried out additional analyses to determine whether the letters that children use intrusively in their own spellings tend to be the letters that are most frequent in English. As a measure of letter frequency in the words to which young children are exposed, we calculated the number of times each letter occurs in the entries for which Zeno, Ivenz, Millard, and Duvvuri (1995) report a first-grade *U* value (frequency adjusted for variation in distribution of words across different content areas) of 20 words per million or higher, weighting the entries by their frequency of occurrence. For kindergartners, the correlation between number of intrusions and letter frequency was .81. The correlation was .78 for first graders and .69 for second graders ($p < .001$ for all correlations). These results indicate that common letters, such as *t*, appeared more often as intrusions than did less common letters, such as *k*. The correlations between number of intrusions and letter frequency remained significant when we limited the analyses to intrusions that were not letters from a child's own name.

Further analyses examined other factors that, in addition to the frequencies of letters in printed words, could help explain the variation among letters in intrusion errors. One such factor was the position of the letter in the alphabet. Another was the type of letter (vowel or consonant). Regression analyses were carried out using the variables of order of the letter in the alphabet (coded as 1 to 26) and vowel (where *a, e, i, o, u*, and *y* were coded as vowels), in addition to letter frequency. For kindergartners, the regression accounted for 78% of the variance in intrusion errors ($p < .001$). A significant effect of letter order was found, such that intrusions were more likely to involve letters early in the alphabet than letters later in the alphabet ($p = .009$). In addition, intrusions were more likely to involve vowels than consonants ($p = .028$). There was also an effect of letter frequency, with more intrusions of common letters ($p < .001$). For first graders, the three variables together explained 73% of the variance ($p < .001$). All three variables had significant effects ($p = .042$ for order, $p = .035$ for vowel, $p < .001$ for letter frequency); the directions of the effects were the same as in the kindergartners. The percentage of explained variance was somewhat lower for second graders, 57% ($p < .001$). At this level, vowel letters were intruded more than consonants ($p = .046$), and frequent letters were intruded more than infrequent letters ($p < .007$). The order of the letter in the alphabet no longer had a significant effect.

Given that kindergartners tend to overuse letters from their own first names when attempting to spell other words, we might expect to find some differences in the spellings produced by children who have long first names compared to children with short first names. Children with long names, such as a child named Christopher who does not use the shortened form Chris, may produce longer spellings of all types of words than children with short names, such as a child named Sam. This may occur because Christopher has more letters from his name that he can use as own-name intrusions. Indeed, analyses of the combined kindergarten data showed a positive correlation between the number of letters in a child's first name or commonly used nickname and the average number of letters in the child's spellings ($r = .25$, $p = .006$, two-tailed test). For first and

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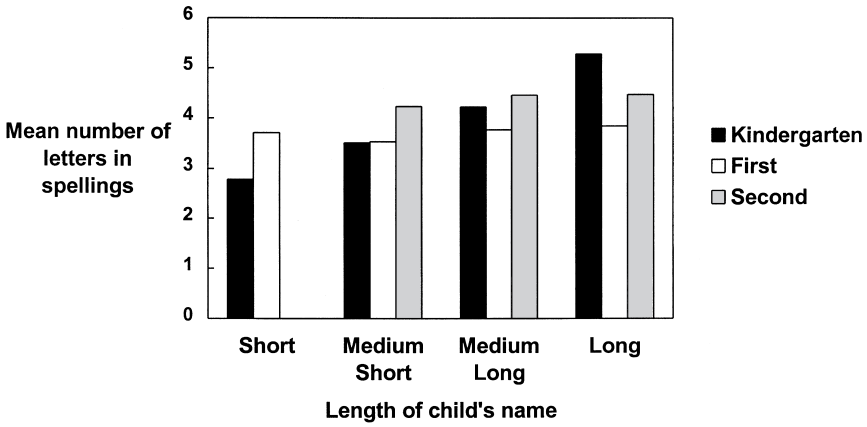


Figure 1. Mean number of letters in spellings produced by kindergarten, first grade, and second grade children with short (two or three letters), medium short (four or five letters), medium long (six or seven letters), and long (eight or more letters) first names, pooling over the three samples. No second grader had a name in the short category.

second graders, who produced few own-name intrusions, the correlations were not significant ($r = .10$ and .08 for first and second graders, respectively). Figure 1 depicts the relationship between the length of a child's name and the average number of letters in his or her spellings by dividing children into four groups: those with short (two or three letters) first names, those with medium short first names (four or five letters), those with medium long first names (six or seven letters) and those with long first names (eight or more letters). For kindergartners, there was an increase in length of spellings across the four groups, with a significant linear trend, $F(1, 111) = 9.14$, $p = .003$. No such effect was seen for the first or second graders. These results show that kindergartners with long first names tended to produce longer spellings of other words than kindergartners with short first names. There are several potential explanations for this phenomenon, but one contributor appears to be the fact that kindergartners add letters from their own names to their spellings, and kindergartners with long names have more own-name letters. Supporting this view is the significant correlation we observed between the length of a child's name and the proportion of letters in the child's spellings that could only be explained as intrusions from the name ($r = .28$, $p = .003$, two-tailed test).

If kindergartners with long first names tend to produce relatively long spellings that contain a number of intrusions from their own name, then the proportion of characters that are correct or phonetically well motivated, expressed as a proportion of all characters in the spelling, should be relatively low. Figure 2 shows the relationship between the length of the child's first name or commonly used nickname and the proportion of all characters used by that child that were phonetically reasonable (i.e., correct, close phonetic equivalents, or letter-name based errors). For kindergartners, the data in Figure 2 show a decrease in the

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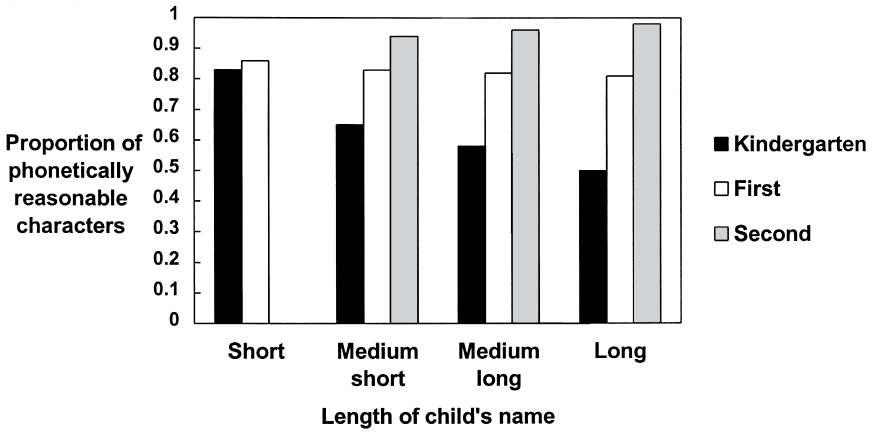


Figure 2. Mean proportion of characters in the phonetically reasonable category produced by kindergarten, first grade, and second grade children with short (two or three letters), medium short (four or five letters), medium long (six or seven letters), and long (eight or more letters) first names, pooling over the three samples. No second grader had a name in the short category.

proportion of phonetically reasonable characters with an increase in the length of the child's name. The linear trend was significant when name length was analyzed in terms of the four categories shown in Figure 2, $F(1, 111) = 5.90$, $p = .017$. Also, there was a reliable negative correlation between the proportion of phonetically reasonable characters and the length of the child's name ($r = -.21$, $p = .025$, two-tailed test). As compared to their classmates with short names, kindergartners with long names tended to produce spellings that contained a lower proportion of phonetically reasonable letters. However, no such relationship was observed for first or second graders. The length of a kindergartner's name is clearly not the main contributor to the phonetic accuracy of the child's spellings as measured here, as it accounts for only 4% of the variance. However, it is striking that this factor contributes at all.

The results so far show that kindergartners sometimes reproduce the specific letters from their own first name when they are attempting to spell other words. Bloodgood (1999) suggested that young children also reproduce more abstract aspects of their own names' spellings. In particular, young children who have double letters in their names, such as the *t*s in Brittany, tend to include more doublets in their writing than children without double letters in their names. Bloodgood did not provide quantitative support for this observation, however. To test the idea that children with doublets in their first names tend to use doublets when spelling other words, we compared the spellings of those 29 kindergartners in the combined sample whose name contained a doublet to the spellings of those 86 kindergartners whose name did not contain a doublet. For kindergartners whose name contained a double letter, the proportion of spellings of words that did not have a double letter in their standard spelling and for

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which the student's response included doubled letters not found in the student's own name was .12. The figure was .10 for kindergartners whose name did not contain a doublet. The difference was not significant, $t(113) = .62$. (We focused on cases in which the doublet was not found in the child's own name because the production of a doublet from a child's name could have reflected a tendency to use the specific letter strings from the name rather than a tendency to use a general orthographic pattern.) Nonsignificant results were found, as well, at the first and second grade levels. Our results thus do not support the idea that children who have double letters in their name tend to overuse double letters when spelling other words. Kindergartners' own-name intrusions and the longer spellings of children with longer names appear to reflect young children's tendency to spell with letters from their own names. It may not be necessary to postulate that children form a scheme for what written words should look like based on fairly abstract properties of their own name.

DISCUSSION

It has been suggested that children's own names play an important role in the early development of literacy (e.g., Bloodgood, 1999; Ferreiro & Teberosky, 1982; Villaume & Wilson, 1989). In many cases, however, the support for this assertion has been primarily anecdotal or observational. The present study was designed to provide quantitative evidence on the role of children's own names in their early spelling. In previous work, we showed that children's experiences with their own first names boost their knowledge about the labels and printed forms of the individual letters within the name (Treiman & Broderick, 1998). In the present study, we went beyond the earlier work to show that children's experiences with their names affect their early spellings. Kindergartners tend to overuse letters from their own names when trying to spell other words. Children whose names contain many letters have more possibilities for own-name intrusions than do children whose names contain few letters. As a result, it appears that kindergartners with long names tend to produce spellings that are longer and contain lower proportions of phonetically motivated letters than do kindergartners with shorter names. If the proportion of phonetically motivated letters in a spelling is a reasonable metric of the quality of the spelling – and this metric is similar in spirit to those that have been used in the literature (Olson, 1985) – then it is interesting to note that name length is one contributor to this measure for beginning spellers. Of course, factors such as a child's phonological awareness skills are likely to be more important contributors (e.g., Byrne & Fielding-Barnsley, 1991).

Previous studies of children's spelling have focused on the phonetic factors that cause children to make the particular mistakes they do. For example, the *j* in a kindergartner's spelling of *drink* as "drjabronpq" is an error in the sense that no *j* is present in the conventional spelling of the word. The child's *j* may be more than a random error, however, for /d/ is affricated before /r/ and is pronounced similarly to /dʒ/ (e.g., Read, 1975; Treiman, 1993). The child who produced this error, it seems, at least began the spelling by trying to represent

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the sounds in the spoken word. As another example, the use of *a* in "yat" for *wet* reflects the similarity in sound between the vowels /æ/ and /ɛ/ (e.g., Read, 1975; Treiman, 1993). Still other intrusions can be explained by considering the names of the English letters. The use of *y* for /w/ in the preceding example reflects the fact that the name of *y*, /wai/, begins with the phoneme /w/ (Treiman et al., 1994). The kindergartners in the present study produced a number of errors of these kinds. Nearly half of their characters, 45%, were either correct letters or phonetically reasonable errors of the sort documented in previous studies.

If almost half of the letters that kindergartners used in their spellings made sense on the basis of the word's sound, what is the origin of the other half? Most previous researchers have considered such errors to be completely random and unmotivated. Children who produce a large number of such errors are thought to be in the precommunicative (Gentry, 1982) or prealphabetic (Ehri, 1997) stage of writing development, which involves stringing letters together in a haphazard fashion. The present results show that errors that are not phonetically motivated are not necessarily haphazard. Some of them, instead, are letters from the child's own name. In Emily's production of "pelot" for *potato*, for example, the *l* does not have a ready explanation based on the sounds in the spoken word. Emily seems to have used this letter because it is a familiar symbol from her own name. Such errors occur for a reason, but not for the phonological reasons on which previous studies have focused.

Were this study to be repeated with younger children, we suspect that the proportion of own-name intrusions would be higher than that found here. Indeed, Gombert and Fayol (1992) reported a developmental difference of this kind in their study of French children. In that study, productions with a high proportion of letters from the child's first name were more common among 4- and 5-year-olds than among 5- and 6-year-olds. What is particularly interesting about our kindergarten data is the suggestion that own-name intrusions can coexist with phonetically motivated spellings. Kindergartners who are beginning to grasp the alphabetic principle and move into phonetically based spelling may continue to use letters from their own name when they spell. They may do this to fill out a spelling that is perceived to be too short or to stand in for parts of a spelling that are difficult to construct on a phonetic basis. An early strategy – using letters from a well-learned set to spell other words – is not immediately abandoned when a more advanced strategy – using the sounds in a word to derive its spelling – begins to emerge. This outcome supports Siegler's wave model of cognitive development, which was recently applied to spelling (Rittle-Johnson & Siegler, 1999).

The tendency that we found for intrusion errors to involve vowels rather than consonants probably has a phonetic explanation. Children learning to spell in English have more difficulty with vowels than consonants because the links between sounds and spellings are more complex for vowels (e.g., Treiman, 1993). A child who is not sure how to spell a word may be more likely to include, for example, an extra *u* or *e* than an extra *t* or *m* because he or she is less knowledgeable about spelling–sound correspondences for vowels than for

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consonants and because letters such as *e* are sometimes silent. Indeed, Reece and Treiman (2001) documented that children often overuse *e*s in spellings such as "sire" for *sir*.

Although phonetic factors often drive spelling, familiarity with letters is important, too. Supporting this view is the strong relationship that we found between the frequency of a letter in reading materials targeted at young children and children's tendency to use this letter intrusively in their own spellings. For instance, the letter *t*, which is very common in printed materials, is more familiar and accessible to children than is the letter *k*. As a group, then, children are more likely to use *t*s than *k*s in their spellings. These results support the view that even young children encode information about frequency of occurrence (Hasher & Zacks, 1984). Some studies, indeed, have reported no developmental improvement in frequency judgments after the age of kindergarten (e.g., Hasher & Zacks, 1979). Other studies have found differences between children aged 4 and 5 and children aged 6 to 8 (e.g., Ellis, Palmer, & Reeves, 1988; McCormack & Russell, 1997). In all of these studies, though, even the youngest children were able to discriminate differences in frequency. Our findings add to this body of research by demonstrating that young children are sensitive to frequency differences that are experienced outside of the laboratory. This affects their behavior in situations that are arguably more natural than those studied in previous research.

To explain kindergartners' overuse of letters from their own names, we postulate that letter frequency is an individual matter for young children. Consider a kindergartner named Karen who sees her printed name every day on her cubbyhole, art projects, and drinking glass but has relatively little exposure to, or interest in, other printed words. For her, the letter *k* has a higher frequency than it does for other children. As a result, Karen is more likely to use *k*s when she tries to write. As Karen learns to read and is exposed to increasing numbers of printed words, the effects of exposure to her own name are swamped by the effects of exposure to other words. By first and second grade, individual children's frequency metrics become more similar to one another and less influenced by the children's own names and other idiosyncratic characteristics.

The tendency of kindergartners and first graders to overuse letters from the beginning of the alphabet probably reflects differences in experienced frequency as well. With young children, teachers and parents may focus more intensively on the early letters of the alphabet than the later letters. Because *a, b*, and *c* are at the beginning of alphabet books and charts and at the beginning of the alphabet song, their subjective frequency may be higher than otherwise expected. However, the effect of alphabet order declines as reading experience becomes the main contributor to experienced letter frequency. By second grade, then, position in the alphabet no longer has a measurable effect in our data. Previous findings indicate that order in the alphabet does not affect adults' judgments of letter frequency, either (Marshall & George, 1983).

In sum, the evidence that kindergartners use letters based on print frequency, their own name, and the letters' order in the alphabet has a unified explanation: Children retrieve letters for use in their own spellings in a way that reflects their frequency of exposure to the letters. Frequency of exposure is a somewhat

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idiosyncratic matter for younger children, but children converge as reading experience increases. These results support the idea that frequency information is encoded from an early age and plays an important role in a variety of situations (Hasher & Zacks, 1979, 1984).

In conclusion, we must look beyond phonology to understand the logic behind young children's spelling errors. We should not be too quick to label a child's early spellings as haphazard or unmotivated. Some errors that seem at first to make no sense in fact reflect children's tendency to use the letters that are most frequent and important in their experience.

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REFERENCES

Bloodgood, J. W. (1999). What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly, 34,* 342–367.

Byrne, B., & Fielding-Barnsley, R. (1991). Evaluation of a program to teach phonemic awareness to young children. *Journal of Educational Psychology, 83,* 451–455.

Cassar, M., & Treiman, R. (1997). The beginnings of orthographic knowledge: Children's knowledge of double letters in words. *Journal of Educational Psychology, 89,* 631–644.

Clay, M. M. (1975). *What did I write?* Auckland: Heinemann.

Ehri, L. C. (1997). Learning to read and learning to spell are one and the same, almost. In C. A. Perfetti, L. Rieben, & M. Fayol (Eds.), *Learning to spell: Research, theory, and practice across languages* (pp. 237–269). Mahwah, NJ: Erlbaum.

Ellis, N. R., Palmer, R. L., & Reeves, C. L. (1988). Developmental and intellectual differences in frequency processing. *Developmental Psychology, 24,* 38–45.

Ferreiro, E., & Teberosky, A. (1982). *Literacy before schooling*. New York: Heinemann.

Gentry, J. R. (1982). An analysis of developmental spelling in GNYS AT WRK. *Reading Teacher, 36,* 192–200.

Gombert, J. E., & Fayol, M. (1992). Writing in preliterate children. *Learning & Instruction, 2,* 23–41.

Hasher, L., & Zacks, R. T. (1979). Automatic and effortful processes in memory. *Journal of Experimental Psychology: General, 108,* 356–388.

(1984). Automatic processing of fundamental information: The case of frequency of occurrence. *American Psychologist, 39,* 1372–1388.

Hildreth, G. (1936). Developmental sequences in name writing. *Child Development, 7,* 291–303.

Jastak, S., & Wilkinson, G. (1984). *The Wide Range Achievement Test – Revised*. Wilmington, DE: Jastak Associates.

Levin, I., Share, D. L., & Shatil, E. (1996). A qualitative-quantitative study of preschool writing: Its development and contribution to school literacy. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences, and applications* (pp. 271–293). Mahwah, NJ: Erlbaum.

Mandel, D. R., Jusczyk, P. W., & Pisoni, D. B. (1996). Infants' recognition of the sound patterns of their own names. *Psychological Science, 6,* 314–317.

Marshall, P. H., & George, C. E. (1983). Knowledge of the alphabet: A comparison between letter counts and subjective reports. *Behavior Research Methods & Instrumentation, 15,* 577–579.

McCormack, T., & Russell, J. (1997). The development of recency and frequency memory: Is there a developmental shift from reliance on trace-strength to episodic recall? *Journal of Experimental Child Psychology, 66,* 376–392.

https://doi.org/10.1017/S0142716401004040 Published online by Cambridge University Press

Olson, R. K. (1985). Disabled reading processes and cognitive profiles. In D. Gray & J. Kavanagh (Eds.), *Biobehavioral measures of dyslexia* (pp. 215–243). Parkton, MD: York Press.

Read, C. (1975). *Children's categorization of speech sounds in English* (NCTE Research Report No. 17). Urbana, IL: National Council of Teachers of English.

Reece, C., & Treiman, R. (2001). Children's spelling of syllabic /r/ and of letter-name vowels: Broadening the study of spelling development. *Applied Psycholinguistics, 22,* 139–165.

Rittle-Johnson, B., & Siegler, R. S. (1999). Learning to spell: Variability, choice, and change in children's strategy use. *Child Development, 70,* 332–348.

Sulzby, E. (1985). Kindergartners as readers and writers. In M. Farr (Ed.), *Advances in writing research: Vol. 1: Children's early writing development* (pp. 127–199). Norwood, NJ: Ablex.

Temple, C., Nathan, R., & Buriss, N. (1982). *The beginnings of writing*. Boston, MA.: Allyn & Bacon.

Treiman, R. (1993). *Beginning to spell: A study of first-grade children*. New York: Oxford University Press.

Treiman, R., Berch, D., Tincoff, R., & Weatherston, S. (1993). Phonology and spelling: The case of syllabic consonants. *Journal of Experimental Child Psychology, 56,* 267–290.

Treiman, R., & Bourassa, D. (2000). Children's written and oral spelling. *Applied Psycholinguistics, 21,* 183–204.

Treiman, R., & Broderick, V. (1998). What's in a name? Children's knowledge about the letters in their own names. *Journal of Experimental Child Psychology, 70,* 97–116.

Treiman, R., Weatherston, S., & Berch, D. (1994). The role of letter names in children's learning of phoneme-grapheme relations. *Applied Psycholinguistics, 15,* 97–122.

Villaume, S. K., & Wilson, L. C. (1989). Preschool children's explorations of letters in their own names. *Applied Psycholinguistics, 10,* 283–300.

Zeno, S. M., Ivenz, S. H., Millard, R. T., & Duvvuri, R. (1995). *Educator's word frequency guide*. Brewster, NY: Touchstone Applied Science Associates.

https://doi.org/10.1017/S0142716401004040 Published online by Cambridge University Press