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Contributions of Emergent Literacy Skills to Name Writing, Letter Writing, and Spelling in Preschool Children

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Abstract

The purpose of this study was to examine which emergent literacy skills contribute to preschool children's emergent writing (name-writing, letter-writing, and spelling) skills. Emergent reading and writing tasks were administered to 296 preschool children aged 4–5 years. Print knowledge and letter-writing skills made positive contributions to name writing; whereas alphabet knowledge, print knowledge, and name writing made positive contributions to letter writing. Both name-writing and letter-writing skills made significant contributions to the prediction of spelling after controlling for age, parental education, print knowledge, phonological awareness, and letter-name and letter-sound knowledge; however, only letter-writing abilities made a significant unique contribution to the prediction of spelling when both letter-writing and name-writing skills were considered together. Name writing reflects knowledge of some letters rather than a broader knowledge of letters that may be needed to support early spelling. Children's letter-writing skills may be a better indicator of children's emergent literacy and developing spelling skills than are their name-writing skills at the end of the preschool year. Spelling is a developmentally complex skill beginning in preschool and includes letter writing and blending skills, print knowledge, and letter-name and letter-sound knowledge.

Keywords

alphabet knowledge; emergent literacy; letter writing; name-writing; spelling

Writing is a difficult task, both for beginning and mature writers. Hence, it is a tremendous accomplishment when young children begin writing. Conventional writing begins with children either writing letters or writing their names. Although we have learned a great deal about the skills that contribute to or lay the foundation for early reading, we know less about the skills that contribute to young children's early writing. A few studies have examined the component skills that contribute to name writing, but no study to date has examined skills that contribute to letter writing. Also among children's early writing endeavors are their attempts to spell single words. The ability to spell words signals a major milestone in children's literacy acquisition. To be able to spell, children need to draw upon and use

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several emergent literacy skills, which is why spelling is considered a good reflection of children's understanding and learning of the alphabetic principle (Ehri, 2000; Shatil, Share, & Levin, 2000; Treiman, 2006) and a good predictor of their reading skills (McBride-Chang, 1998; Richgels, 1995; Richgels & Barnhart, 1992; Stage & Wagner, 1992; Tangel & Blachman, 1992). Although there is a sizeable amount of research on children's spelling, there have been few investigations of spelling in preschool children compared to the number of investigations of spelling in kindergarten or grade school children, and in these few investigations, spelling has been used primarily as a variable to predict current or later reading outcomes (e.g., McBride-Chang, 1998; Richgels, 1995; Richgels & Barnhart, 1992; Stage & Wagner, 1992). The few investigations of spelling in preschool children have focused on providing qualitative descriptions of their spelling abilities and have been "directed mainly at describing *what* children do, instead of *how* they do it" (Ouellette & Sénéchal, 2008, p.196, emphasis in the original). Hence, the primary purpose of this study was to examine if and how emergent literacy skills (alphabet knowledge, phonological awareness, print knowledge) contribute to preschool children's early writing attempts-name writing, letter writing, and spelling.

Contribution of Emergent Literacy Skills to Name Writing

Despite an interest in name-writing skills and its important role in the development of literacy, only a few studies have systematically investigated which emergent literacy skills contribute to children's abilities to write their names. Given that a child's name is among the first things that children write (Both-de Vries & Bus, 2008, 2010; Clay, 1975; Martens, 1999), examining what skills contribute to name writing will add to our current understanding of writing development. Blair and Savage (2006) reported that phonological awareness and letter-sound knowledge were strongly related to children's name-writing abilities; whereas Welsch, Sullivan, and Justice (2003) found that phonological awareness was not related to a child's name-writing ability when print-related knowledge was accounted for. Instead letter-name recognition and print knowledge predicted name writing. Bloodgood (1999) reported high concurrent correlations between name writing and letter writing. As is evident, there is no consensus on what component skills contribute to a child's name-writing ability and different skills appear to be related to a child's name-writing ability depending on what tasks were included in a study. We extend the findings of these previous investigations by including a comprehensive set of emergent literacy tasks to clarify the shared and unique contributions of emergent literacy skills to name writing.

Contribution of Emergent Literacy Skills to Letter Writing

In addition to examining which emergent literacy skills contribute to name writing in preschool children, we were also interested in examining which literacy skills contribute to letter writing. As mentioned previously, no study to date has examined skills that contribute to letter writing, so we investigated potentially important literacy skills (alphabet knowledge, print knowledge, phonological awareness, and name writing) that could contribute to the development of letter writing. Letter writing represents a child's attempt at retrieving the visual shapes and names of letters and as such should be facilitated by a child's alphabet knowledge. Children's print knowledge, was included because it is generally believed that children need to have some basic knowledge about print and understand how print functions before they begin writing (e.g., Clay, 1975; Mason, 1980; Sulzby, 1985). Finally, name writing was included because some researchers believe that one's first name is the first word that children attempt and learn to write.

Contribution of Emergent Literacy Skills to Spelling

According to the comprehensive review by National Early Literacy Panel (NELP; Lonigan, Schatschneider, & Westberg, 2008) four emergent literacy skills play an important role in the development of children's spelling skills include alphabet knowledge, phonological awareness, print knowledge, and name-writing. We briefly review the research below.

The term alphabet knowledge is generally used to refer to young children's ability to identify letter names and letter sounds, and it has been shown to be one of the best indicators of eventual reading and spelling achievement (Adams, 1990; Moats, 2005; Stevenson & Newman, 1986; Treiman, 2006). Children lacking alphabet knowledge have trouble recognizing and distinguishing between the letters of the alphabet, and they have difficulty learning letter-sound correspondences (Bond & Dykstra, 1967; Mason, 1980), which is the foundation for decoding and spelling. According to the National Early Literacy Panel report (NELP; Lonigan et al., 2008), measures of children's alphabet knowledge yielded a strong relation with spelling outcomes; $r = .54$ averaged across 18 studies involving 2,619 children in either preschool or kindergarten. Multivariate studies, including concurrent and longitudinal studies, examining the relation between alphabet knowledge and spelling revealed that alphabet knowledge was a significant predictor of spelling even after controlling for age, SES, oral language, phonological awareness, and IQ (Lonigan et al., 2008).

Considerable evidence exists on the important role of phonological awareness to the acquisition of spelling skills (Ehri, 1989; Ehri & Wilce, 1987; Moats, 2005; Snow, Burns, & Griffin, 1998). Researchers have suggested that the relationship between phonological awareness and spelling is bidirectional such that phonological awareness facilitates spelling abilities and learning how to spell in turn improves phonological awareness (Ehri, 2005; Martins & Silva, 2006). In fact, some researchers have suggested that measures of children's invented spelling could be used as a proxy for phonological awareness skills (e.g., Mann, 1993; McBride-Chang, 1998). According to the NELP report, measures of phonological awareness had an average correlation of $r = .40$ with spelling in 21 studies involving 2,522 preschool and kindergarten children (Lonigan et al., 2008). Multivariate studies, including concurrent and longitudinal studies, examining the relation between phonological awareness and spelling have shown that phonological awareness is a significant predictor of spelling even after controlling for age, SES, oral language, alphabet knowledge, and IQ (Lonigan et al., 2008).

Children's knowledge of the functions and conventions of print (referred to in the literature as print concepts, print awareness, or print knowledge) appears to be related to the development of both emergent and conventional literacy skills, including spelling (Chaney, 1998; Morris, Bloodgood, Lomax, & Perney, 2003; Storch & Whitehurst, 2002; Walpole, Chow, & Justice, 2004; Whitehurst & Lonigan, 1998). Children's print knowledge includes understanding the difference between print and pictures, the difference between letters and numbers, and conventions of print, which include knowledge that words are separated by spaces, and that writing is arranged linearly. Researchers generally agree that print knowledge is an important first step in the acquisition of literacy skills (Ferreiro & Teberosky, 1982; Fox & Saracho, 1990; Lomax & McGee, 1987; Mason, 1980; Tolchinsky-Landsman & Levin, 1985; Tolchinsky-Landsman & Levin, 1987). Developing an understanding of functions and conventions of print is an important precursor to understanding letter-sound relationships (Adams, 1990; Lomax & McGee, 1987). Measures of print knowledge have been shown to have an average correlation of .43 with spelling involving 534 preschool and kindergarten children across four studies (Lonigan et al., 2008).

Finally, name writing has received a fair amount of attention--perhaps because some literacy researchers, view name writing as a window into a child's emergent literacy development (Bloodgood, 1999; Ferreiro & Teberosky, 1982; Levin, Both-de Vries, Aram, & Bus, 2005) and as a foundation on which to build other literacy skills (Bloodgood, 1999). Name writing has also been shown to be a strong indicator of children's print-related knowledge and phonological awareness skills (Blair & Savage, 2006; Ferreiro & Teberosky, 1982), a good reflection of preschoolers' alphabet knowledge (Bloodgood, 1999; Molfese, Beswick, Molnar, & Jacobi-Vessels, 2006; Welsch et al., 2003), and a good indicator of children's conventional literacy skills (Badian, 1982; Levin & Aram, 2004; Strickland & Shanahan, 2004). In addition to its important role in the development of reading, name writing appears to play an important role in the development of spelling. According to the NELP report (Lonigan et al., 2008), name-writing abilities showed a moderate relation of $r = .36$ to spelling in preschool and kindergarten children.

In addition to the emergent literacy skills just described (i.e., phonological awareness, alphabet knowledge, print knowledge, and name writing), one specific emergent literacy skill that is also likely to contribute to the development of spelling and early writing is letter writing. As noted by Berninger et al., (2006) "Letter production is a fundamentally important process in written expression" (p. 87). Although alphabet knowledge has been shown to be an excellent predictor of spelling, assessment of alphabet knowledge has generally included children's naming of letters, recognition of letters, or examining letter sounds (e.g., Both-de Vries & Bus, 2010; Cassar & Treiman, 1997; Levin & Ehri, 2009; McBride-Chang, 1998; Treiman & Broderich, 1998), and children's letter-writing or letter-production skills are not considered when examining the relation between alphabet knowledge and spelling. However, spelling a word requires translating spoken language into print, (i.e., identifying phonemes and translating them to letters followed by the actual writing of the letter represented by that sound). To write letters successfully, children are required to retrieve names and visual shapes of letters, and visually encode letters with execution of fine-motor movements (Berninger, 1999). Hence, the ability to write letters may have some impact on a child's spelling proficiency over and above the ability to name letters and their associated sounds.

The rationale for including letter writing in investigations of spelling is further supported by research on writing with older children in elementary and middle school. Berninger and colleagues (e.g., Berninger, Cartwright, Yates, Swanson, & Abbott, 1994; Berninger, Yates, Cartwright, Rutberg, Remy, & Abbott, 1992; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997) have shown that letter-writing fluency constrains children's abilities to spell and compose text. Graham et al. (1997) suggested that children who are fluent at letter writing have more attentional and cognitive resources to divert to spelling and composing compared to children who are less fluent at letter writing. Furthermore, orthographic knowledge (knowledge pertaining to the visual recognition of allowable characters and specific sequences of graphemes representing written words), has been shown to make important contributions to spelling in beginning writers (Kim, 2010; Ouellette & Sénéchal, 2008) and letter writing skill is an excellent indicator of children's developing orthographic knowledge (Puranik & Apel, 2010). Thus, it is reasonable to hypothesize that the ability to write letters would influence preschool children's ability to spell. In other words, preschool children who are more proficient letter writers will have more attentional and cognitive resources to divert to spelling compared to children who are less proficient letter writers.

Present Study

To summarize, we have little understanding of the componential skills that contribute to name writing and letter writing--two of the earliest writing attempts of young children.

Hence, aims of this study included examining the componential skills that contribute to children's name writing and letter writing. Although several studies have investigated the contributions of various emergent literacy skills to spelling (see NELP 2008 report), the contribution of these various literacy skills to spelling has been examined in isolation and to date, no single study has evaluated the shared and unique contributions of a comprehensive set of emergent literacy skills with respect to spelling in preschool children. Additionally, some researchers contend that alphabet knowledge, specifically, letter name knowledge and some degree of phonological awareness are sufficient for children to spell (Juel, 1988, Silva & Martens, 2003). However, these previous studies have not considered the contribution of children's letter writing abilities when examining spelling. So, the final aim of this study was to examine the shared and unique concurrent contributions of various emergent literacy skills to spelling, including letter writing.

We hypothesized that preschool children's letter writing skills would uniquely contribute to their spelling skills, because it is a reflection of their emergent orthographic knowledge (Puranik & Apel, 2010). Whereas orthographic knowledge has been shown to play an important role in spelling for older children (e.g., Kim, 2010; Ouellette & Sénéchal, 2008), its role has not been examined in preschool children's spelling. We also hypothesized that name writing would not make a unique contribution to spelling after accounting for children's letter-writing skills although previous research indicates that name writing plays an important role in early spelling (Bloodgood, 1999; Both-de Vries & Bus, 2010; Levin et al., 2005; Treiman & Broderick, 1998). We hypothesized that name writing reflects knowledge of some letters (contained in one's name) rather than the broader orthographic knowledge of letters needed to support spelling.

In this study, preschool children were assessed on their alphabet knowledge, phonological awareness, print knowledge, name writing, letter writing, and spelling. Specific research questions we examined in this study were as follows: (a) Which emergent literacy skills (i.e., phonological awareness, alphabet knowledge, print awareness, and letter writing) uniquely contribute to preschool children's name writing? (b) Which emergent literacy skills (i.e., phonological awareness, alphabet knowledge, print awareness, and name writing) uniquely contribute to preschool children's letter-writing skills? (c) Which emergent literacy skills (i.e., phonological awareness, alphabet knowledge, print awareness, name writing, and letter writing) uniquely contribute to preschool children's spelling?

Method

Participants

Participants for this study were recruited from 30 different private preschools and public and private child-care centers in a moderate-sized city in north Florida. These preschools and centers served students from a diverse range of socioeconomic status (SES); six schools were categorized as high-SES (less than 25% of students receive subsidies), 11 schools as mid-SES (25–49% students receive subsidies), and 13 schools as low-SES (75% + students receive subsidies). Informed consent forms were distributed to parents of all children in the participating centers through their classroom teachers. Only children whose parents or guardians returned signed consent forms participated in this study. Results are reported for 296 children who ranged in age from 51 to 65 months, with a mean age of 58.5 months ($SD = 3.56$). Based on parent report, ethnicities of these children were: White (48.9%), Black/African-American (42.2%), Asian (2.4%), Hispanic (3.1%), and other (3.4%). The sample included 168 males (56.8%) and 128 females (43.2%). Children's parents were asked to complete a questionnaire that included information about family socio-economic status (SES; i.e., education, income). Questionnaires were completed by 64% of the sample. Based on these responses, parental education in the sample was normally distributed and ranged

from “did not complete high school” to “postdoctoral degree.” The median level of education reported was in the range of “completed some college” to “completed AA degree.” Only 10% of the sample reported completing a BA or above, and less than 10% reported less than a high school diploma or GED. Median reported income was in the \$31,000 to \$40,000 range.

Because we were interested in assessing a diverse group of preschoolers, no exclusionary criteria (such as cut-off scores) were used to screen children. However, we used teacher-report to confirm that none of the children had a history of frank neurological, motor, or uncorrected visual deficits, or had developmental delays that might have hindered typical literacy development or made it difficult for them to participate in the assessments. Procedures and routines at the participating preschools were comparable and included a variety of activities seen in typical preschool classrooms. These included painting, drawing, puzzles, toys, dress-up clothes, books, music, and activity centers. All preschools reported activities involving identifying children’s names and learning the letters of the alphabet.

Procedure and Materials

Trained research assistants tested each child individually at their child-care centers or preschools. The assessment was conducted in a quiet room and completed in two to three sessions that lasted approximately 20 to 40 minutes each depending on the child’s tolerance level. Children were assessed within a 2- to 3-week period in the spring of the school year.

Measures

Alphabet knowledge—The Alphabet subtest of the *Test of Early Reading Ability-3rd Edition* (TERA-3; Reid, Hresko, & Hammill, 2001) was administered as a measure of alphabet knowledge. The TERA-3 is a standardized, norm-referenced assessment. The Alphabet subtest includes 29 items, which measure letter-name and letter-sound knowledge, and letter/word identification skills. Sample items include questions such as, “what letter is this?” “This word says *blue*. What letter does it start with?” Internal consistency coefficients for the subtest, as reported by the authors, range from .88 to .97.

Phonological awareness—Two subtests from the *Preschool Comprehensive Test of Phonological and Print Processing* (Pre-CTOPPP; Lonigan, Wagner, Torgesen, & Rashotte, 2002) were administered. The Pre-CTOPPP was the development version of the *Test of Preschool Early Literacy* (Lonigan, Wagner, Torgesen, & Rashotte, 2007) and was designed as a downward extension of the *Comprehensive Test of Phonological Processing* (CTOPP; Wagner, Torgesen, & Rashotte, 1999). The elision subtest included 18 items that assess analysis and the blending subtest included 21 items that assess synthesis skills across the developmental continuum of phonological awareness (Anthony, Lonigan, Burgess, Driscoll, Phillips, & Bloomfield, 2002). Sample items for the analysis subtest included asking children to respond to questions such as “Look at these pictures. My word is (sunflower). Say (sunflower). Now point to sunflower without flower”. The child is expected to point to the picture of (sun) from an array of four pictures. Sample items for the blending subtest included asking children to respond to questions such as, “What words do these make: hot-dog, air-plane”. The two phonological awareness (PA) tasks chosen for this study were based on theoretical conceptualizations of the development of PA and extensive research with preschool children indicating the importance of these skills for learning to read (Anthony et al., 2002; Wagner & Torgesen, 1987). Reliabilities for the blending and elision subtests of the Pre-CTOPPP for 3-, 4-, and 5-year-old children are reported to be high ($\alpha = .86$ to $.88$).

Print knowledge—We developed a measure that included 24 items to assess children’s knowledge about print conventions. The measure included questions to assess knowledge regarding the universal principles of print (e.g., which one is drawing? which one is writing?), environmental print (e.g., which one says Wal-Mart™? which one says Coca Cola™?), functions of print (e.g., show me a map? what do people do with a map?), and concepts regarding writing (e.g., which one is a word? which is the best way to hold a pencil?). Children were shown a set of four pictures and had to point to the correct picture for all the items except for portions of the functions of print subtest where they had to also answer specific questions (e.g., what do people do with a newspaper?).

Name writing—The examiner gave the child paper and pencil and asked the child to write his or her name. Children’ name writing was scored on a 9-point scale using a modified version of the rubric used by Levin et al. (2005) to score name writing. On this scale, children were progressively awarded a higher score based on the number of the writing features they display. Inclusion of specific writing features was compiled from findings of previous investigations examining children’s name writing (e.g., Ferreiro & Teberosky, 1982; Hildreth, 1936; Levin & Bus, 2003; Levin et al., 2005; Lieberman, 1985; Puranik & Lonigan, 2010; Saracho, 1990). Scores were awarded as follows: 0- No response or a scribble produced by scratching generally distributed over the page; 1-A scribble which is linear, i.e., organized in a horizontal or vertical line; 2-Writing contains distinguishable/separate units (e.g., circles, dots, or lines that are separated). Child needed to have at least 2 to receive credit with the exception of a cursive line that goes up and down repeatedly; 3-Writing contains simple characters—units are simple forms including dots, circles, square and triangle like forms, short lines and symbols-that are separated; 4-Writing contains simple characters and is written demonstrating left-to-right orientation; 5-Writing contains first letter of name and other letters may be represented by simple characters; 6-Writing contains first letter of name and other letters may be represented by complex characters—the units are not simple, but include pseudo and real letters; 7-Writes name using correct first letter and represents other sounds in name with random letters; 8-Writes more than half of the letters contained in their first name; 9-Correctly spells first name using conventional spelling.

Letter writing—To assess letter-writing skills, children were asked to write each of 10 letters named by the examiner (B, D, S, T, O, A, H, K, M, C). The number of letters was based on recommendations made by Mason and Stewart (1990). Particular letters were chosen based on previous research documenting the letters known most frequently by preschool children (e.g., Justice, Pence, Bowles, & Wiggins, 2006; Phillips, Lonigan, & Graham, 2006). Letters of low to moderate difficulty were chosen to ensure that some children could write some of the letters but there was little redundancy. The examiner said a letter in the same random order and the children were asked to write the letter. Children’s responses were scored as 0, 1, or 2 depending on if, and how well or poorly, the letters were formed. Although no specific directions regarding case were given, the majority of children wrote upper case letters. Children were given points for correct letters they wrote irrespective of the case. Children obtained a score of 0 if they did not respond or wrote an unrecognizable letter. A score of 1 was given if the letter was reversed or was poorly formed and recognized only in context. A score of 2 was given if the letter was written accurately and could be recognized out of context.

Spelling—The spelling task included six items that required children to write common consonant-vowel-consonant (CVC) words (i.e., mat, bed, duck, cat, fell, hen). The spelling task was scored on a 7-point scale using a modified version of the Tangel and Blachman (1992) spelling rubric. According to this scale, children receive points for the number of

phonemes they represent in writing. Children were given a score of 1 if they responded verbally with random letters, 2 if they produced a scribble, 3 if they used random letters to spell a word (e.g., “toh” for “bed;” “ka for “fell”), 4 if they wrote the correct initial or last letter (e.g., “mob” for “mat;” “tad” for “bed”), 5 if their spelling contained the correct initial and last letter (e.g., “fl” for “fell;” “hn” for “hen”), 6 if they had the first and last letter but the incorrect vowel (e.g., “hin” for “hen;” “bad” for “bed”) or used phonetically acceptable but not conventional spelling (e.g., “duc” for “duck;” “fel” for “fell”), and 7 if they had the correct/conventional spelling.

Inter-rater Reliability

The alphabet knowledge, print knowledge, and phonological awareness tasks were scored separately by two research assistants and entered into the database twice. After practice and establishing coding guidelines, two research assistants and the first author coded the name-writing, letter-writing, and the spelling tasks. To calculate inter-rater reliability, approximately 25 percent ($n = 74$) of the written samples were randomly chosen. Inter-rater reliability was 94% for the letter-writing task, 95% for the name-writing task, and 91% for the spelling task. All scoring differences were settled by consensus following discussion.

Results

Means and standard deviations for the emergent literacy measures are presented in Table 1. Internal reliability coefficients (α s) for all measures for the sample included in this study are also shown in Table 1. Large variation was observed in children’s alphabet knowledge, letter-writing skills, and their spelling skills. The scores for the spelling task were normally distributed (skewness = .24, kurtosis = $-.55$). As expected, some ceiling effects were noted in children’s name-writing skills. The majority of children (57%) wrote their names using conventional spelling, and they received a perfect score of 9. Given the fact that older children were substantially more likely to score at or near ceiling levels on the name writing task, prior to data analyses, we computed and compared correlations between the 4-year-old ($N = 173$) and 5-year-old ($N = 123$) children. Results of these analyses revealed that the correlations were similar for spelling (r s = .47, .48), letter writing (r s = .61, .61), and alphabet knowledge (r s = .45, .42), and were higher in the 4-year-old subsample for print knowledge (r s = .60, .45), blending (r s = .49, .34), and elision (r s = .44, .34); however, none of these differences were statistically significant. Hence, all data were analyzed as one group.

Correlations between children’s age and the emergent literacy and writing measures were small but significant for most variables: Spelling ($r = .22, p = .001$), Letter writing ($r = .26, p = .001$), Name writing ($r = .25, p = .001$), Alphabet Knowledge ($r = .03, p = .61$), Print Knowledge ($r = .26, p = .001$), Blending, and Elision ($r = .15, r = .18$ respectively, p s = .01). Hence, partial correlations, controlling for age were computed (Table 1). All the measures were significantly and positively related to each other. Letter writing, alphabet knowledge, and print knowledge were strongly related to children’s performance on the spelling task (r s $\geq .56$), whereas name-writing and phonological awareness tasks were moderately related to spelling (r s $\geq .44$). Children’s name writing, alphabet knowledge, and print knowledge were highly related to letter writing (r s = .60, .68 & .59, respectively).

The last correlation analysis was conducted for socio-economic factors such as income and parental education and variables included in the study (shown in Table 1). Because parent surveys were only available for 64% of the sample, we imputed parent education and income for the other 36% of the sample. As seen in Table 1, there were only minor differences in correlations with and without imputation. Similar results were obtained for reported income; however, the partial correlations were generally lower for income than for

parental education. Consequently, parental education was used in subsequent analyses to control for the influence of SES on children's measured skills.

To examine the joint and unique predictive variance of the emergent writing and reading skills to name writing, letter writing, and spelling abilities, we employed multilevel modeling because children were nested within classrooms. These models included both chronological age and parental education as control variables because they were significantly correlated with the outcome variables. Because parental education was imputed for 36% of the sample, multilevel models restricted to participants for whom data from parent surveys were available were also evaluated. These models yielded results similar to those using the imputed values of parental education; therefore, only results from the latter are reported. A true *R*-squared is not available in multilevel modeling; therefore, pseudo *R*-squared was obtained using the method described by Bickel (2007).

Intraclass correlations from unconditional models showed that variance attributable to differences across classrooms was .14, .26, and .29 for the name-writing, letter-writing, and spelling outcomes, respectively. Table 2 displays results for the name-writing outcome. Based on previous research, in Model 1, emergent literacy skills such as alphabet knowledge, print knowledge, and phonological awareness (i.e., blending and elision) were included as predictors. Model 2 additionally included letter writing to examine the unique relation between letter writing and name writing. Children's print knowledge ($p < .001$) was uniquely and positively related to name writing after accounting for phonological awareness, alphabet knowledge, and letter writing (Models 1 & 2). In contrast, children's phonological awareness (blending [$ps > .053$], elision [$ps > .34$]) was not uniquely related to name writing after accounting for alphabet knowledge and print knowledge (Model 1) or letter writing (Model 2). The unique relation between alphabet knowledge and name writing was not statistically significant once letter writing was taken into consideration in addition to print knowledge and phonological awareness (Model 2). Children's performance on the letter-writing task was positively and uniquely related to name writing after accounting for alphabet knowledge, print knowledge, and phonological awareness (Model 2). The predictors in Models 1 and 2 for the name-writing outcome explained 29% and 38% of the explainable variance, respectively. An examination of variance components suggested that there was statistically significant variation in the observed outcome at the child level but not at the classroom level after accounting for the predictors included in the models.

When the outcome was letter writing (Table 3), both alphabet knowledge and print knowledge ($ps < .001$) were uniquely and positively related whereas blending and elision abilities were not ($ps \geq .26$; Models 1 & 2). Name writing was uniquely related to letter writing after accounting for alphabet knowledge, print knowledge, and phonological awareness (Model 2). The predictors in Models 1 and 2 for the letter-writing outcome explained 46% and 52% of the variance, respectively. An examination of variance components suggested that there was statistically significant variation in the observed outcome at the child level but not at the classroom level after accounting for the predictors included in the models.

To evaluate the joint and unique contributions of the various emergent literacy skills to spelling, three multilevel models were evaluated (see Table 4). Guided by previous research, Model 1 included alphabet knowledge, print knowledge, and phonological awareness. Name writing was entered in Model 2 and letter writing was added in Model 3. Children's alphabet knowledge, print knowledge, and blending skills were positively and uniquely related to spelling ($ps < .03$), but elision was not ($ps > .18$; see Models 1 – 3). Name writing was positively related to spelling after accounting for the variables in Model 1 (see Model 2); however, name writing was no longer related to spelling once letter writing was taken into

consideration (see Model 3). In contrast, letter writing was uniquely related to spelling ($p < 0.001$) even when taking name writing and alphabet knowledge, print knowledge, and phonological awareness into account (see Model 3). The predictors in Models 1 – 3 for the spelling outcomes explained 36%, 37%, and 39% of the variance, respectively. Similar to the results for name writing and letter writing, results for the variance components for spelling suggested that there was statistically significant variation in the observed outcome at the child level after accounting for the predictors included in the models.

Discussion

The goals of this study were to examine the shared and unique contributions of emergent literacy skills to name-writing, letter-writing, and spelling skills, as well as the concurrent interrelations between these writing skills in preschool children. The analyses revealed that print knowledge and letter writing were both uniquely related to children's name-writing skills. In addition, print knowledge, alphabet knowledge, and name writing made unique contributions to children's letter-writing skills. Both name-writing and letter-writing skills, respectively, made significant contributions to spelling after accounting for age, parental education, print knowledge, phonological knowledge, and letter-name and letter-sound knowledge. However, only letter-writing ability made a significant unique contribution to the prediction of spelling when both letter-writing and name-writing skills were considered together. This was the first study to date to examine simultaneously the shared and unique contributions of an extensive array of emergent literacy skills to spelling in preschool children.

Predictors of Name Writing

Young writers in the present study showed remarkable skill concerning writing their names, a finding consistent with results of other studies of name writing in preschool children (e.g., Bloodgood, 1999; Both-de Vries & Bus, 2008, 2010; Levin et al., 2005; Welsch et al., 2003). Our results indicated that children's name-writing ability is dependent on their print knowledge and their letter-writing skills. These findings are consistent with the findings of Bloodgood (1999) who reported high correlations between name writing and letter writing. Our results are also consistent with the Welsch et al. (2003) study, which showed that children's name-writing ability was closely linked to their print-related knowledge. Whereas the simple correlational analyses appear to be consistent with prior research, more sophisticated analyses of the data reveal a different picture. For example, Welsch et al. reported that children's name-writing ability was closely linked to their letter-name recognition, and Blair and Savage (2006) found that children's name-writing ability was closely linked to their letter-sound knowledge. Although children's alphabet knowledge (letter-name and letter-sound) was positively related to their name-writing abilities in this study, alphabet knowledge was not a significant predictor once letter-writing skill was considered. This result suggests that the contribution of alphabet knowledge to name writing is largely shared with letter writing. Neither the Welsch et al. study nor the Blair and Savage study included letter writing in their assessments. Finally, our results are not consistent with Blair and Savage who reported that phonological awareness significantly and uniquely contributed to children's name-writing abilities. One reason for the differences in findings may have to do with the different tasks used to measure PA. In the Blair and Savage study, children's knowledge of onset-rime was assessed, whereas in this study, examination of PA included blending and elision tasks. A second and perhaps more important reason is that we examined a comprehensive set of emergent literacy skills and their contribution to name writing simultaneously using multi-level modeling; hence, we were able to clarify the joint and unique concurrent contributions of specific emergent literacy skills to name writing.

Predictors of Letter Writing

As noted previously, examination of letter writing has received little attention, and we are unaware of any previous studies that have examined the component skills that contribute to letter-writing skills in preschool children. Findings of this study indicated that children's print knowledge, alphabet knowledge, and name-writing skills contribute to their letter-writing skills. To be able to write letters, children need to understand that print conveys meaning and have alphabet knowledge. Writing one's name is a child's first attempt at writing letters and provides children practice in letter writing. Perhaps children with more advanced name-writing skills have more knowledge about print and are more likely to be motivated to learn to write letters and to learn about letter names and letter sounds. Alternatively, children who know more letter names and letter sounds are more likely to learn how to write their names or write letters. Additionally, children who know more about print conventions--perhaps due to frequent exposure to print and literacy-related activities--may be more motivated to learn to about letter names and letter sounds, write letters, and to write their names. This might help explain the statistically significant variation observed at the child level for the letter writing and the name-writing outcomes.

Of particular note was the finding that alphabet knowledge (as measured by the TERA-3) made a significant contribution to letter writing but alphabet knowledge was not a significant contributor to name writing. This finding may be due to the fact that letter writing encompasses letter-name knowledge but includes the added dimension of not only being able to match letters to their names but also being able to produce them. However, with regard to name writing, researchers have suggested that children initially learn their names as logograms, as strings of letters, or write their names by rote (Ferreiro & Teberosky, 1982; Villuame & Wilson, 1989). Our results are consistent with research findings indicating that although children know how to write their names, it does not *necessarily* mean that they can name the letters (Drouin & Harmon, 2009) or know the sounds of the letters contained in their names (Treiman & Broderick, 1998).

Predictors of Spelling

The multilevel analyses examining the component skills that underlie preschooler's spelling abilities indicated that letter-writing skills, alphabet knowledge, print knowledge, and blending skills were unique contributors to spelling. This result aligns well with the requirements of spelling. Spelling a word requires a child to have an understanding of how print functions, knowledge of letter-name and letter-sound relationships, the ability to write specific letters, and, finally, blending skills to put the sounds together to write out the word. The positive roles of alphabet knowledge and phonological awareness (blending) are consistent with previous findings (e.g., Cassar, Treiman, Moats, Pollo, & Kessler, 2005; McBride-Chang, 1999; Moats, 2005). However, the results of this study extend the findings of previous research by delineating the important and unique role of letter writing to spelling. The ability to write letters has an impact on a child's spelling proficiency over and above their alphabet knowledge and phonological awareness skills.

The importance of letter writing with older children has been well established. Spelling and composing in later grades requires students to write the letters of the alphabet fluently and automatically so that cognitive resources can be used for higher-order writing processes such as text generation (e.g., Berninger, 1999; Berninger et al., 1992, 1994; Graham et al., 1997). As hypothesized, our results demonstrate that letter writing is an important ability in determining spelling proficiency in preschool children, and has significant implications for writing proficiency, even for emergent writers.

The findings of this study raise questions about the sufficiency of the current definition of the term alphabet knowledge at least within the context of examining early writing. Letter writing requires that the motor aspects of handwriting become associated and integrated with the perceptual aspects of alphabet knowledge; therefore, letter writing may capture different elements or more sophisticated levels of alphabet knowledge than does the manner in which it has been traditionally measured (i.e., letter-name and/or letter-sound identification tasks). Thus, writing letters (compared to recognizing letters) may more explicitly draw attention to both the names and the sounds of the letters. In fact, some evidence for this comes from intervention studies. Longcamp, Zerbato-Poudou, and Velay (2004) compared teaching letter recognition in preschool children through handwriting and typing letters. They found that handwriting training resulted in better letter recognition than typing training; writing out letters drew greater attention to the names of the letter. Similarly, Cunningham and Stanovich (1990) showed that having children write out words lead to better spelling performance compared to conditions that involved typing on a computer or manipulating letter tiles. The message here is not that letter writing is more important than letter-name or letter-sound knowledge but, rather, it is to draw attention to the fact that previous investigations examining the relationship between alphabet knowledge and spelling or writing have not included letter writing. Our results indicate that letter writing has an impact on spelling and writing from a very early age and at the very least encourages further research on letter writing.

Past research has highlighted the important role of name writing in the development of children's spelling skills. For example, the NELP reported a moderate relationship of .36 between children's name writing and spelling. Other research has shown that children with more advanced name-writing skills spell more words (e.g., Bloodgood, 1999; Both-de Vries & Bus, 2010; Levin et al., 2005; Treiman & Broderick, 1998) leading some to suggest that name writing be used as a screener for children's literacy skills (Haney, 2002; Haney, Bissonnette, & Behnken, 2003). However, previous studies examining the relationship between name writing and spelling have not included or examined children's letter-writing skills. A moderate correlation between name writing and spelling ($r = .46$) was also noted in this study, however, as hypothesized, our results also indicated that name writing did not make a unique contribution to spelling after accounting for letter-writing. As previously mentioned, researchers have noted incongruities in children's knowledge regarding the letters in their name and that it is not unusual for children to write their names by rote. However, one cannot begin to spell by learning a string of letters by rote or if lacking knowledge about letter names and letter sounds. Being able to spell requires an understanding of the relationship between letters and the symbolic function letters serve (i.e., the alphabetic principle; Bialystok, 1995). Knowing how to write one's name appears to be an important achievement; it is often the first word children learn to write, and at the start of the writing process, children use the first letters of their names to spell other words (e.g., Both-de Vries & Bus, 2008 e.g., Both-de Vries & Bus, 2010). However, name writing requires children to learn only the few letters in their names and does not mean that children are prepared for the more challenging task of spelling words. One needs to write more than just one's name to begin to develop the knowledge base that aids spelling development. Name writing reflects knowledge of some letters rather than a broader knowledge of letters that may be needed to support early spelling. Thus, name writing may provide the initial motivation to begin the writing process, promote the development of writing in general, and capture important variance from emergent literacy skills (e.g., phonological awareness, print knowledge, and alphabet knowledge), but it is children's letter writing, phonological awareness (namely blending), letter-name and letter-sound knowledge, and print knowledge that uniquely contribute to their spelling ability.

Limitations and Future Directions

Although these data present compelling information concerning the emergent literacy skills that contribute to spelling in preschool children, a few limitations do exist. Results for the variance components of the multilevel models for spelling indicated that there was statistically significant variation in the observed outcome at the child after accounting for the predictors included in the models. Child-level factors could include other cognitive-linguistic skills such as IQ, orthographic awareness and oral language that have been shown to play an important role in the development of spelling in beginning writers (Kim, 2010; Ouellette & Sénéchal, 2008). Understanding how orthographic awareness develops and including these cognitive-linguistic skills when examining spelling in preschool children has the potential of improving our understanding of spelling development. It should be noted that some of the questions included in our print knowledge task might have tapped orthographic knowledge. For example, we had questions such as “Which is the correct way to hold a pencil” and “Which is the best way to write milk?” The former may have tapped print awareness whereas the later may have tapped orthographic knowledge. Assessing the contributions of these two types of knowledge separately will add to our understanding about the development of spelling and writing.

Our assessment of alphabet knowledge included the alphabet subtest of the TERA-3. In this subtest, letter name knowledge and letter sound knowledge were assessed jointly and no separate scores are available for these measures. In future investigations, separating these two skills may shed light on their separate contributions to spelling, especially given that different factors are involved in their learning and that they have different developmental patterns (Foulin, 2005; McBride-Chang, 1999; Treiman & Broderick, 1998).

This study was cross-sectional, which limits the conclusions that can be drawn regarding the developmental nature of the relationship between emergent literacy skills and spelling (e.g., correlation versus causation). Also, the relationship between emergent literacy skills and emergent writing skills (name writing, letter writing, and spelling) could vary depending on when these skills were measured—beginning or end of preschool. Future studies that examine these skills longitudinally or at more than one time point during the preschool year will be crucial in understanding how early reading and writing skills contribute to the development of spelling longitudinally or bidirectionally.

Three potential criticisms of this study, one of which pertains to the assessment of spelling, must be mentioned. It could be argued that, given the age of the children, some children may have known the shape of a letter but may have had difficulty writing the letter. Assessing word spelling through alternative measures such as oral spelling or using letter tiles to spell may have helped circumvent some of those difficulties. However, in a recent study, Puranik and Apel (2010) reported their findings using such alternative measures in which children’s spelling was compared using letter tiles, spelling orally, and spelling by writing. Their results indicated that the output modality did not affect children’s ability to spell; children who could spell did equally well in the oral, tile, and written spelling conditions.

The second potential criticism concerns the different scales used to score name writing and spelling—the two writing tasks in this study. The scoring for both items was based on current scales available, which have been used widely by researchers (e.g., Levin et al., 2005; Tangel & Blachman, 1992; Welsch et al., 2003). Spelling was scored on a developmental scoring system that credits children’s attempts to represent phonemes in various word positions (initial, medial, final). Also, all children were administered the same spelling words with simple grapheme-phoneme correspondences. Children’s names however, could vary in length and complexity and do not always follow straightforward grapheme-phoneme

mappings (e.g., Samantha, John, Iiona). Unlike spelling, it is not appropriate to measure grapheme-phoneme correspondences in children's names since evidence suggests that children do not use knowledge of letter-sound correspondences to write their names. They use a different strategy for name writing and inventing spellings of other words. The difference in the two writing tasks necessitates the use of different scoring scales.

Third, some ceiling effects were noted for the name writing task. The reduced variance in name writing may have contributed to its nonsignificant contribution to spelling. Considering the diverse nature of the sample, some ceiling effect in the name writing task demonstrates remarkable skills in preschooler's abilities to write their first names. Our results are consistent with those reported in other studies (Bloodgood, 1999; Both-de Vries & Bus, 2008, 2010; Cabell, Justice, Zucker, & McGinty, 2009; Levin et al., 2005; Welsch et al., 2003) in that children do remarkably well on this measure compared to other emergent literacy measures. For example, in the Both-de Vries and Bus (2010) study, of the 60 participants, 39 (65%) "wrote their name readably, i.e., they produced at least invented spelling" (p. 179) of their names (for example, Slva for Silva). Furthermore, correlations between name writing and other emergent literacy variables obtained in this study are similar to those obtained in other studies including those reported in the NELP report (Lonigan et al., 2008). Even so, given the fact that older children were substantially more likely to score at or near ceiling levels on the name-writing task, potentially resulting in attenuated correlations between scores on the name-writing measure and other measures, we compared the correlations obtained between name writing and various emergent literacy measures for the younger and older children. As noted, none of these differences were statistically significant. Consequently, there were only limited effects of children scoring at or near ceiling on the name-writing measures in terms of the relations between measures. Perhaps the name-writing measure is not a good indicator of early literacy/writing skills--both because of its empirical relations with other measures and because name writing is a task that is mastered relatively early in the process of learning to read and write. The use of a name-writing measure for predicting may be better suited to a time period earlier in the preschool year when these skills are just developing. Comparing the contributions of emergent literacy skills to spelling at the beginning and the end of the preschool year might help clarify this issue.

Conclusion

Writing development is not an all-or-none phenomenon. Perhaps knowing how to write one's name signals the start of a developing knowledge of the alphabetic principle (Adams, 1990; Both-de Vries & Bus, 2008; Treiman & Broderick, 1998); whereas knowing how to write letters beyond or apart from one's name may signal an increased sensitivity to and knowledge about the alphabetic principle. The results of this study lend further support to the fact that letter writing is a good reflection of the beginnings of orthographic knowledge (Puranik & Apel, 2010), and this knowledge has been shown to be important to spelling in older children (Abbott & Berninger, 1993; Kim, 2010; Ouellette & Senechal, 2008). Our results suggest that children's abilities to write their names serve as a proxy for their letter-writing abilities. Thus, it is not name writing per se that is important; rather, it is the fact that to be able to write one's name, one has to be able to write letters. Children's letter-writing skills may be a better indicator of children's emergent literacy and developing conventional literacy skills (i.e., spelling) than are their name-writing skills at the end of the preschool year. The results of this study suggest that letter-writing instruction and activities that encourage writing letters (beyond the letters in one's name) at the preschool level may prove to be promising avenues for interventions to enhance emerging literacy skills.

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References

- Abbott RD, Berninger VW. Structural equation modeling of relationships among development skills and writing skills in primary- and intermediate-grade writers. *Journal of Educational Psychology*. 1993; 85:478–508.
- Adams, MJ. *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press; 1990.
- Anthony JL, Lonigan CJ, Burgess SR, Driscoll K, Phillips BM, Bloomfield BG. Structure of preschool phonological sensitivity: Overlapping sensitivity to rhyme, words, syllables, and phonemes. *Journal of Experimental Child Psychology*. 2002; 82:65–92. [PubMed: 12081460]
- Badian N. The prediction of good and poor reading before kindergarten entry: A 4-year follow-up. *The Journal of Special Education*. 1982; 16:309–318.
- Berninger V. Coordinating transcription and text generation in working memory during composing: Automatic and constructive processes. *Learning Disabilities Quarterly*. 1999; 22:99–112.
- Berninger V, Abbott R, Abbott S, Jones J, Wolf B, Gould L, ...Apel K. Early development of language by hand: Composing, reading, listening, and speaking connections; three letter-writing modes; and fast mapping in spelling. *Developmental Neuropsychology*. 2006; 29:61–92. [PubMed: 16390289]
- Berninger V, Cartwright A, Yates C, Swanson HL, Abbott R. Developmental skills related to writing and reading acquisition in the intermediate grades: Shared and unique variance. *Reading and Writing: An Interdisciplinary Journal*. 1994; 6:161–196.
- Berninger VW, Yates C, Cartwright A, Rutberg J, Remy E, Abbott R. Lower-level developmental skills in beginning writing. *Reading and Writing: An Interdisciplinary Journal*. 1992; 4:257–280.
- Bialystok E. Making concepts of print symbolic: Understanding how writing represents language. *First Language*. 1995; 15:317–338.
- Bickel, R. *Multilevel Analysis for Applied Research*. New York: Guildford Press; 2007.
- Blair R, Savage R. Name writing but not environmental print recognition is related to letter-sound knowledge and phonological awareness in pre-readers. *Reading and Writing: An Interdisciplinary Journal*. 2006; 19:991–1016.
- Bloodgood J. What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly*. 1999; 34:342–367.
- Bond GL, Dykstra R. The cooperative research program in first-grade reading instruction. *Reading and Writing*. 1967; 5:69–85.
- Both-de Vries A, Bus AG. Name writing: A first step to phonetic writing? Does the name have a special role in understanding the symbolic function of writing? *Literacy Teaching and Learning*. 2008; 12:37–55.
- Both-de Vries A, Bus AG. The proper name as starting point for basic reading skills. *Reading and Writing*. 2010; 23:173–187. [PubMed: 20157350]
- Cabell R, Justice L, Zucker T, McGinty A. Emergent name-writing abilities of preschool-age children with language impairment. *Language, Speech, and Hearing Services in Schools*. 2009; 40:53–66.
- Cassar M, Treiman R. The beginnings of orthographic knowledge: Children's knowledge of double letters in words. *Journal of Educational Psychology*. 1997; 89:631–644.
- Cassar M, Treiman R, Moats L, Pollo T, Kessler B. How do spellings of children with dyslexia compare with those of nondyslexic children? *Reading and Writing: An Interdisciplinary Journal*. 2005; 18:27–49.
- Chaney C. Preschool language and metalinguistic skills are linked to reading success. *Applied Psycholinguistics*. 1998; 19:433–446.
- Clay, M. *What did I write?*. Auckland, New Zealand: Heinemann; 1975.

- Cunningham A, Stanovich K. Early spelling acquisition: Writing beats the computer. *Journal of Educational Psychology*. 1990; 82:159–162.
- Drouin M, Harmon J. Name writing and letter knowledge in preschoolers: Incongruities in skills and the usefulness of name writing as a developmental indicator. *Early Childhood Research Quarterly*. 2009; 24:263–270.
- Ehri L. The development of spelling knowledge and its role in reading acquisition and reading disability. *Journal of Learning Disabilities*. 1989; 22:356–365. [PubMed: 2738469]
- Ehri L. Learning to read and learning to spell: Two sides of a coin. *Topics in Language Disorders*. 2000; 20:19–36.
- Ehri L. Learning to read words: Theory, findings, and issues. *Scientific Studies of Reading*. 2005; 9:167–188.
- Ehri L, Wilce L. Does learning to spell help beginner learn to read words? *Reading Research Quarterly*. 1987; 18:47–65.
- Ferreiro, E.; Teberosky, A., editors. *Literacy before schooling*. Exeter, NH: Heinemann; 1982.
- Foulin J. Why is letter-name knowledge such a good predictor of learning to read? *Reading and Writing*. 2005; 18:129–155.
- Fox B, Saracho O. Emergent writing: Young children solving the written language puzzle. *Early Child Development and Care*. 1990; 56:81–90.
- Graham S, Berninger V, Abbott R, Abbott S, Whitaker D. The role of mechanics in composing of elementary school students: A new methodological approach. *Journal of Educational Psychology*. 1997; 89:170–182.
- Haney M. Name writing: A window into the emergent literacy skills of young children. *Early Childhood Education Journal*. 2002; 30:101–105.
- Haney M, Bissonette V, Behnken KL. The relationship between name writing and early literacy skills in kindergarten children. *Child Study Journal*. 2003; 33:99–115.
- Hildreth G. Developmental sequences in name writing. *Child Development*. 1936; 7:291–303.
- Juel C. Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology*. 1988; 80:437–447.
- Justice L, Pence K, Bowles R, Wiggins A. An investigation of four hypotheses concerning the order by which 4-year-old children learn the alphabet letters. *Early Childhood Research Quarterly*. 2006; 21:374–389.
- Kim YS. Componential skills of spelling in Korean. *Scientific Studies of Reading*. 2010; 14:137–158.
- Levin H, Ehri L. Young children's ability to read and spell their own and classmates' names: The role of letter knowledge. *Scientific Studies of Reading*. 2009; 13:249–273.
- Levin, I.; Aram, D. Children's names contribute to early literacy: A linguistic and social perspective. In: Rabid, D.; Bat-Shyldkrot, H., editors. *Perspectives on language and language development*. Dordrecht, The Netherlands: Kluwer; 2004. p. 219-239.
- Levin I, Both-de Vries D, Aram D, Bus A. Writing starts with own name writing: From scribbling to conventional spelling in Israeli and Dutch children. *Applied Psycholinguistics*. 2005; 26:463–477.
- Levin I, Bus A. How is emergent writing based on drawing? Analysis of children's products and their sorting by children and mothers. *Developmental Psychology*. 2003; 39:891–905. [PubMed: 12952401]
- Lieberman, E. *Dissertations Abstracts International*. Vol. 46/12. 1985. Name writing and the preschool child. (Doctoral dissertation, University of Arizona, Tucson, 1985); p. 3593A
- Lomax R, McGee L. Young children's concepts about print and reading: Toward a model of work reading acquisition. *Reading Research Quarterly*. 1987; 22:237–256.
- Longcamp M, Zerbato-Poudou M, Velay J. The influence of writing practice on letter recognition in preschool children: A comparison between handwriting and typing. *Acta Psychologica*. 2004; 119:67–79. [PubMed: 15823243]
- Lonigan, C.J.; Schatschneider, C.; Westberg, L. *Developing early literacy: Report of the National Early Literacy Panel*. Washington, DC: National Institute for Literacy; 2008. Identification of children's skills and abilities linked to later outcomes in reading, writing, and spelling. National Early

- Literacy Panel; p. 55-106. Retrieved from <http://www.nifl.gov/earlychildhood/NELP/NELPreport.html>
- Lonigan, C.; Wagner, R.; Torgesen, J.; Rashotte, C. Preschool Comprehensive Test of Phonological & Print Processing (Pre-CTOPP). Department of Psychology, Florida State University; 2002.
- Lonigan, CJ.; Wagner, RK.; Torgesen, JK.; Rashotte, C. Test of Preschool Early Literacy. Austin, TX: ProEd; 2007.
- Mann V. Phoneme awareness and future reading ability. *Journal of Learning Disabilities*. 1993; 26:259–269. [PubMed: 8515190]
- Martens PA. Mommy, how do you write—Sarah?: The role of name writing in one child’s literacy. *Journal of Research in Childhood Education*. 1999; 14:5–15.
- Martins MA, Silva PA. The impact of invented spelling in phonemic awareness. *Learning and Instruction*. 2006; 16:41–56.
- Mason J. When children begin to read: An exploration of four year old children’s letter and word reading competencies. *Reading Research Quarterly*. 1980; 15:203–227.
- Mason, JM.; Stewart, JP. Emergent literacy assessment for instructional use in kindergarten. In: Morrow, LM.; Smith, JK., editors. *Assessment for instruction in early literacy*. Englewood Cliffs, NJ: Prentice Hall; 1990. p. 155-175.
- McBride-Chang C. The development of invented spelling. *Early Education & Development*. 1998; 9:147–160.
- McBride-Chang C. The ABCs of the ABCs: The development of letter-name and letter-sound knowledge. *Merrill-Palmer Quarterly*. 1999; 45:285–308.
- Moats LC. How spelling supports reading. *American Educator*. 2005; 29(4):12–22.
- Molfese V, Beswick J, Molnar A, Jacobi-Vessels J. Alphabetic skills in preschool: A preliminary study of letter naming and writing. *Developmental Neuropsychology*. 2006; 25:5–19. [PubMed: 16390286]
- Morris D, Bloodgood J, Lomax R, Perney J. Developmental steps in learning to read: A longitudinal study in kindergarten and first grade. *Reading Research Quarterly*. 2003; 38:302–328.
- Ouellette GP, Sénéchal M. A window into early literacy: Exploring the cognitive and linguistic underpinnings of invented spelling. *Scientific Studies of Reading*. 2008; 12:195–219.
- Phillips, B.; Lonigan, C.; Graham, L. Now I know my ABC’s: Alphabetic order and first name predict letter knowledge development in young children. Paper presented at the 13th Annual Meeting of the Society of the Scientific Study of Reading (SSSR); Vancouver, Canada. 2006 July.
- Puranik C, Apel K. Effect of assessment task and letter writing ability on preschool children’s spelling performance. *Assessment for Effective Intervention*. 2010; 36:46–56.
- Puranik C, Lonigan C. From scribbles to scrabble: Preschool children’s developing knowledge of written language. *Reading and Writing*. 2010 Advance online publication. 10.1007/s11145-009-9220-8
- Reid, DK.; Hresko, WP.; Hammill, DD. Test of Early Reading Ability. 3. Austin, TX: Pro-Ed; 2001.
- Richgels D. Invented spelling ability and printed word learning in kindergarten. *Reading Research Quarterly*. 1995; 30:96–109.
- Richgels, DJ.; Barnhart, JE. Literacy development in preschool and kindergarten children: Patterns between groups and across tasks. Paper presented at the annual meeting of the National Reading Conference; San Antonio, TX. 1992 December.
- Saracho O. Developing sequences in three-year-old children’s writing. *Early Child Development and Care*. 1990; 56:1–10.
- Shatil E, Share DL, Levin I. On the contribution of kindergarten writing to grade 1 literacy: A longitudinal study in Hebrew. *Applied Psycholinguistics*. 2000; 21:1–21.
- Silva C, Martens MA. Relations between children’s invented spelling and development of phonological awareness. *Educational Psychology*. 2003; 23:3–16.
- Snow, C.; Burns, MS.; Griffin, P. Preventing reading difficulties in young children. Washington, D.C: National Academy Press; 1998.
- Stage SA, Wagner R. Development of young children’s phonological and orthographic knowledge as revealed by their spelling. *Developmental Psychology*. 1992; 28:287–296.

- Stevenson HW, Newman RS. Long-term prediction of achievement and attitudes in mathematics and reading. *Child Development*. 1986; 57:646–659. [PubMed: 3720396]
- Storch S, Whitehurst G. Oral language and code-related precursors to reading: Evidence from a longitudinal structural model. *Developmental Psychology*. 2002; 38:934–947. [PubMed: 12428705]
- Strickland DS, Shanahan T. Laying the groundwork for literacy. *Educational Leadership*. 2004; 61:7–77.
- Sulzby, E. Kindergarteners as writers and readers. In: Farr, M., editor. *Advances in writing research, Volume 1. Children's writing development*. Norwood, NJ: Ablex; 1985. p. 127–199.
- Tangel DM, Blachman BA. Effect of phoneme awareness instruction on kindergarten children's invented spelling. *Journal of Reading Behavior*. 1992; 24:233–261.
- Tolchinsky-Landsmann L, Levin I. Writing in preschoolers: An age-related analysis. *Applied Psycholinguistics*. 1985; 6:319–339.
- Tolchinsky-Landsmann L, Levin I. Writing in four-to-six-year olds: Representation of semantic and phonetic similarities and differences. *Journal of Child Language*. 1987; 14:127–144. [PubMed: 3558520]
- Treiman, R. Knowledge about letters as a foundation for reading and spelling. In: Joshi, RM.; Aaron, PG., editors. *Handbook of orthography and literacy*. Mahwah, NJ: Erlbaum; 2006. p. 581–599.
- Treiman R, Broderick V. What's in a name: Children's knowledge about the letters in their own names. *Journal of Experimental Child Psychology*. 1998; 70:97–116. [PubMed: 9729451]
- Villaume S, Wilson L. Preschool children's explorations of letters in their own names. *Applied Psycholinguistics*. 1989; 10:283–300.
- Wagner RK, Torgesen JK. The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin*. 1987; 101:192–212.
- Wagner, R.; Torgesen, J.; Rashotte, C. *Comprehensive Test of Phonological Processing*. Austin, TX: Pro-Ed; 1999.
- Walpole S, Chow SM, Justice L. Literacy achievements during kindergarten: Examining key contributions in an at-risk sample. *Early Education and Development*. 2004; 15:245–264.
- Welsch J, Sullivan A, Justice L. That's my letter! What preschoolers' name writing representations tell us about emergent literacy knowledge. *Journal of Literacy Research*. 2003; 35:757–776.
- Whitehurst G, Lonigan C. Child development and emergent literacy. *Child Development*. 1998; 69:848–872. [PubMed: 9680688]

Table 1

Descriptive statistics and partial correlations among measures controlling for age

	1	2	3	4	5	6	7
1. Spelling	---						
2. Letter writing	.63	---					
3. Name writing	.46	.60	---				
4. Alphabet knowledge	.61	.68	.41	---			
5. Print Knowledge	.56	.59	.54	.56	---		
6. Blending	.50	.43	.41	.45	.52	---	
7. Elision	.44	.44	.40	.40	.55	.58	---
8. Parental Ed. Imputed (w/o imputation $n = 189$)	.21 (.21**)	.22 (.20**)	.12* (.08 ^{ns})	.25 (.26)	.29 (.32)	.22 (.23)	.13* (.13 ^{ns})
Mean (SD)	17.26 (10.53)	10.60 (6.91)	7.53 (2.37)	7.60 (5.99)	13.90 (5.16)	14.85 (4.37)	10.58 (4.37)
Range	0 – 42	0 – 20	0 – 9	3 – 20	1 – 24	0 – 21	0 – 18
Total possible	42	20	9	29	24	21	18
α	.96	.93	.96	.92	.84	.84	.85

Note. $N = 296$, except for Elision for which $N = 295$. Except where noted, all correlation coefficients are statistically significant at $p < .001$ level (^{ns} $p > .08$; * $p < .05$; ** $p < .01$). Parental Ed. = Reported level of parental education completed. α = internal consistency of scores.

Table 2

Multilevel modeling results for name writing

Measures	Model 1		Model 2	
	Coefficient (s.e.)	<i>p</i>	Coefficient (s.e.)	<i>p</i>
<i>Fixed effects</i>				
Intercept	0.40 (1.86)	0.83	1.63 (1.75)	0.35
Chronological age	0.06 (0.03)	0.06	0.04 (0.03)	0.21
Parent Education	-0.12 (0.09)	0.17	-0.12 (0.08)	0.15
Alphabet knowledge	0.05 (0.02)	0.03	-0.03 (0.03)	0.19
Print knowledge	0.17 (0.03)	0.001	0.12 (0.03)	0.001
Blending	0.06 (0.03)	0.056	0.06 (0.03)	0.053
Elision	0.03 (0.03)	0.34	0.02 (0.03)	0.62
Letter writing			0.15 (0.02)	0.001
<i>Variance components</i>				
Classroom	0.15 (0.12)	0.23	0.07 (0.09)	0.44
Child	3.34 (0.29)	0.001	2.94 (0.26)	0.001
<i>Pseudo R</i> ²	0.29		0.38	

Table 3

Multilevel modeling results for letter writing

Measures	Model 1		Model 2	
	Coefficient (s.e.)	<i>p</i>	Coefficient (s.e.)	<i>p</i>
<i>Fixed effects</i>				
Intercept	-9.13 (4.48)	0.04	-9.65 (4.18)	0.02
Chronological age	0.17 (0.08)	0.03	0.12 (0.07)	0.11
Parent Education	-0.05 (0.23)	0.84	0.07 (0.21)	0.73
Alphabet knowledge	0.54 (0.06)	0.001	0.49 (0.07)	0.001
Print knowledge	0.34 (0.07)	0.001	0.19 (0.07)	0.007
Blending	0.03 (0.08)	0.75	-0.03 (0.07)	0.70
Elision	0.09 (0.08)	0.26	0.07 (0.08)	0.36
Name-writing			0.88 (0.13)	0.001
<i>Variance components</i>				
Classroom	2.03 (1.05)	0.053	1.47 (1.72)	0.10
Child	18.90 (1.85)	0.001	16.59 (1.45)	0.001
<i>Pseudo R</i> ²	0.46		0.52	

Table 4

Multilevel modeling results for spelling

Measures	Model 1			Model 2			Model 3		
	Coefficient (s.e.)	p		Coefficient (s.e.)	p		Coefficient (s.e.)	p	
<i>Fixed effects</i>									
Intercept	-7.14 (7.27)	0.33		-7.54 (7.22)	0.30		-3.85 (7.13)	0.59	
Chronological age	0.12 (0.12)	0.33		0.09 (0.12)	0.46		0.05 (0.12)	0.71	
Parent Education	0.16 (0.37)	0.66		0.23 (0.37)	0.54		0.20 (0.36)	0.58	
Alphabet knowledge	0.60 (0.09)	0.001		0.58 (0.09)	0.001		0.39 (0.10)	0.001	
Print knowledge	0.43 (0.12)	0.001		0.35 (0.12)	0.005		0.27 (0.12)	0.02	
Blending	0.32 (0.13)	0.01		0.29 (0.13)	0.02		0.31 (0.13)	0.02	
Elision	0.18 (0.13)	0.18		0.16 (0.13)	0.22		0.14 (0.13)	0.28	
Name-writing				0.51 (0.23)	0.03		0.17 (0.24)	0.48	
Letter writing							0.38 (0.10)	0.001	
<i>Variance components</i>									
Classroom	7.41 (3.35)	0.13		4.94 (2.49)	0.13		3.87 (2.24)	0.12	
Child	49.24 (4.30)	0.001		48.63 (4.26)	0.001		46.75 (4.10)	0.001	
Pseudo R ²	0.36			0.37			0.39		