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Componential skills of beginning writing: An exploratory study

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Abstract

The present study examined the components of end of kindergarten writing, using data from 242 kindergartners. Specifically of interest was the importance of spelling, letter writing fluency, reading, and word- and syntax-level oral language skills in writing. The results from structural equation modeling revealed that oral language, spelling, and letter writing fluency were positively and uniquely related to writing skill after accounting for reading skills. Reading skill was not uniquely related to writing once oral language, spelling, and letter writing fluency were taken into account. These findings are discussed from a developmental perspective.

Keywords

Component skills; Kindergartners; Oral language; Structural equation modeling; Beginning writing

1. Introduction

The ability to comprehend and communicate one's ideas in written text is critical in school, in the work place, and in civic life. Competent literate people are not only able readers but also able writers (Jenkins, Johnson, & Hileman, 2004). Over two decades ago, Juel (1988) demonstrated that just as first graders with reading difficulties tended to remain poor readers at the end of fourth grade, so too children with writing difficulties tended to remain poor writers. Concern about the intractability of reading and writing difficulties has led researchers to examine what important component skills influence children's reading and writing development early on in order to inform early intervention efforts to prevent reading and writing difficulties.

Hence, the primary goal of the present exploratory study was to advance the limited knowledge base about early writing by examining the shared and unique relations of component skills to beginning written expression assessed at the end of kindergarten, which is when most children begin to write. Informed by the developmental component view of reading (Meyer & Felton, 1999), we examined multiple sources of influence and hypothesized that even young children would bring important language and cognitive skills to the task of writing. This hypothesis was informed by previous studies examining early

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spelling and handwriting and by research examining written composition conducted with students in grade one and above. Specifically, we provided a story prompt in which children were asked to write about what they had learned in kindergarten, which is a similar task/process used in other studies involving curriculum based measurement of writing with older students (c.f., Lembke, Deno, & Hall, 2003; McMaster & Espin, 2007; Fewster & MacMillan, 2002). Students' written responses were coded for the number of words, number of ideas, and number of sentences they wrote.

1.1. Oral language as a potential component skill of beginning writing

According to the simple view of writing (Juel, 1988; Juel, Griffith, & Gough, 1986), writing consists of lower order skills such as spelling and transcription and higher order skills such as ideation (i.e., the generation and organization of ideas). Ideation includes complex, high-level cognitive processes such as planning, translating, and review/revision of writing for adult skilled writers (Hayes & Flower, 1980; Scardamalia & Bereiter, 1986). Planning includes generating and organizing ideas, which then needs to be translated to language representations in memory (Berninger, 1999). Thus, at the heart of ideation are oral language skills (e.g., semantics, morphology, and syntax) that are needed to generate ideas in a coherent, organized manner. Thus, it is reasonable to hypothesize that individual differences in children's sophistication in oral language may be related children's writing skills.

Despite the evident and assumed importance of oral language to written language, to date surprisingly little systematic and consistent research has examined the relation between oral language and early writing (Bromley, 2007; Shanahan, 2006). Much of the previous research on oral language has focused on mean performance differences in lexical and grammatical skills for older students with learning or specific language disabilities compared to normally developing students (e.g., Anderson, 1982; Englert & Thomas, 1987; Scott & Windsor, 2000; Windsor, Scott, & Street, 2000). Some interesting qualitative work has used case study methods to conduct more lengthy observations of kindergartener's oral discourse about their own emergent writing during writing center time to describe the importance of situated language and context early in children's writing development (e.g., Dyson, 2009; Genishi & Dyson, 2009). Dyson (2009) described changes in how children used talk during their early attempts at writing, but their focus was not on understanding the relation between formal language assessments and written expression per se.

Furthermore, only a few studies have used multivariate analytic approaches and these studies suggest a positive contribution of oral language to writing, at least among typically developing, older children. Abbott and Berninger (1993), for example, showed that children's oral language skills (composed of verbal reasoning, phonological awareness, and sentence memory) were related to writing fluency among second and third grade students and to writing quality for first and sixth grade students. In addition, Olinghouse (2008) showed that third grade students' grammatical understanding was positively related to overall writing quality, after controlling for word reading, IQ, compositional fluency, and spelling. In the present study, we extend this line of research using multivariate methods to further investigate the relation of a broader range of potentially important oral language

skills (i.e., vocabulary, syntactic knowledge, and sentence imitation) to writing at an early point of development.

1.2. Spelling as a potential componential skill of beginning writing

Proficiency in spelling is the other critical component of writing in the simple view of writing. It is hypothesized that to the extent which children can spell words accurately, their working memory and attentional capacity are released to focus on idea and text generation (Abbott & Berninger, 1993; Moats, 2005–2006). Thus, spelling is often considered a lower level, mechanical skill that is necessary to allow higher level composition processes such as generating content and planning during writing (Graham, 1990; Scardamalia, Bereiter, & Goleman, 1982). For example, children who have difficulty spelling may forget their already developed ideas and plans, which, in turn, may limit the complexity and coherence of content integration (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997). Previous studies of older children have supported this speculation (Berninger, Nielsen, Abbott, Wijman, & Raskind, 2008; Graham, Harris, & Chorzempa, 2002). A relation between spelling and writing fluency (i.e., number of words written) was positive for normally developing students in grades one to three (Graham et al., 1997), and for children (and their parents) with dyslexia (Berninger et al., 2008). Furthermore, in the interest of identifying components that are malleable to early intervention, spelling instruction improved second grade students' writing fluency (Graham et al., 2002). Children's spelling ability may be even more important for beginning writers as many children at this stage are still developing spelling skills and thus, spelling ability might constrain generation of text to an even larger extent (e.g., Ehri, 2000; Treiman & Bourassa, 2000).

In the present study we also examined whether traditional scoring of spelling as right or wrong would be differentially related to writing than a method of scoring that incorporated an error analysis used in prior work (Tangel & Blachman, 1992). Given that kindergartners are in the beginning stage of developmental spelling skills, conventional dichotomous scoring may be less sensitive in capturing children's developing knowledge of spelling. We used Tangel and Blachman's (1992) developmental scoring (see below).

1.3. Letter writing fluency as a potential component skill related to beginning writing

Another lower level component skill that has been examined for writing is letter writing fluency (i.e., number of alphabet letters students write from memory within a specified period). If letter writing becomes automatized, this automaticity could free attentional resources for the higher level nonautomatic ideation aspects of the writing process (Graham et al., 1997; Graham & Harris, 2000; McCutchen, 1988, 2006). For example, if a child can not retrieve and produce letters quickly enough to keep up with his or her thoughts, his or her idea generation will be compromised because of interferences with already developed and planned ideas held in working memory (Graham et al., 1997). Although both spelling and letter writing fluency are theoretically hypothesized to constrain attentional resources, they appear to tap into somewhat different cognitive processes. Letter writing fluency would assess low level "automaticity" whereas spelling captures integration of knowledge about print, speech sounds, and meaning, and detailed whole word orthographic knowledge (Moats, 2005–2006). Although researchers differ somewhat in how letter writing fluency is

assessed and coded, Berninger and colleagues (Berninger, 1999; Graham et al., 1997) have shown that letter writing fluency (assessed within a fifteen second window, and which they refer to as handwriting fluency) was moderately related to spelling (*r*s=.64 and .44 for primary and intermediate grade students), and both were uniquely related to composition quality and fluency after accounting for the effect of each other. In fact, spelling was no longer statistically significant for composition quality when handwriting fluency (composed of letter writing and sentence copying) was taken into consideration. In the present study, we examined whether letter-writing fluency and spelling would be considered a single construct, or related but dissociable constructs for beginning writers at the end of kindergarten. If they are dissociable, it would be important to examine whether letter writing fluency would be uniquely related to writing after accounting for other potential component skills for writing (i.e., oral language, spelling, and reading).

1.4. Reading as a potential componential skill or skills related to beginning writing

Reading is another potential skill that might be uniquely related to writing. Reading and writing are multidimensional processes and are likely to be related as a function of these common component skills (e.g., phonological and semantic systems or short- and long-term memory; Berninger et al., 2006; Fitzgerald & Shanahan, 2000; Shanahan, 1984; Shanahan, 2006). Although a recent review showed that writing has a causal influence on reading development (Graham & Hebert, 2010), the authors noted that attention to the role of reading in writing development has been limited and mostly conducted with students in second grade and older. Further, the relations between reading and writing have typically been addressed using a bivariate approach examining rather narrow aspects of reading (e.g., word reading) and writing (e.g., spelling) (see also Fitzgerald & Shanahan, 2000). There are a few exceptions that have looked more broadly at reading and writing skills; for example, in a study of students in second and fifth grade, Shanahan and Lomax (2006) found that reading-related skills (e.g., word analysis, vocabulary size, and comprehension) interactively influenced writing-related skills (e.g., spelling, vocabulary use, syntactic knowledge, and knowledge of story structure). Abbott and Berninger (1993) used a multivariate approach in a relatively large sample of children and showed that reading skill, composed of word reading and reading comprehension, was consistently related to composition fluency and quality for first through fourth grade students, after accounting for oral language skills. More recently, Olinghouse (2008) reported that third graders' word reading ability (i.e., word identification) was positively related to compositional quality, after accounting for gender, compositional fluency, IQ, and grammatical understanding. The unique contribution of reading skill to beginning writing would suggest that reading should be considered as a correlate and potential cause of individual differences in writing beyond language and spelling skills in early stage of writing development as reading and writing may have a bidirectional relation, developing in tandem (Shanahan, 2006).

In summary, the primary purpose of this study was to expand the current understanding of writing development by simultaneously addressing several potentially important component skills of beginning writing. That is, we examined the shared and unique relations of oral language, spelling (scored conventionally and using a developmental scoring), letter writing fluency, and reading (i.e., accuracy, fluency, and comprehension) skills to writing fluency

assessed at the end of kindergarten. Kindergarten is a critical, yet not well researched period to examine beginning writing skills (i.e., beginning composition). Kindergarteners will be expected to compose a few sentences on a topic under the new Common Core State Standards (http://www.corestandards.org), which have been adopted by most states. Furthermore, beginning in first grade, many schools administer story prompts to screen and monitor progress in writing (McMaster, Xiaoqing, & Pestursdottir, 2009). Hence, it is not uncommon that kindergartners produce meaningful texts that are beyond one word (i.e., beginning composition), particularly by the end of kindergarten which is when we collected writing samples for this study.

2. Method

2.1. Context for the study and participants

The present study was part of a large-scale project investigating the efficacy of core reading instruction within a response to treatment (RTI) framework (Al Otaiba et al., 2011). The larger study included 14 schools, 44 teachers, and 556 students; due to limited resources, we recruited roughly half of these teachers and students to participate in spelling and writing assessments for the present study (i.e., 21 teachers from 9 schools and 242 students).

The participating schools had been recruited with the help of the District Reading Office because they served students from a diverse range of socioeconomic status (schools ranged in free and reduced price lunch eligibility from 14% to 74%). The percentage of the students identified as Limited English Proficient (LEP) was notably small within this district, and thus represented no more than 1% to 5% of the participants within these 21 classrooms. For the larger study, schools were matched on salient factors (percent of students receiving free and reduced price lunch, Reading First participation, and school reading grades based upon the percent of students passing the states' high stake third grade reading test) and then assigned randomly to either the kindergarten version of Connor and colleagues' Individualized Student Instruction (ISI; Connor et al., 2009) or to a wait-list comparison professional development condition. Teachers in both conditions were trained in a 2-day summer workshop about the need to individualize reading instruction, to conduct reading centers, and more broadly, about response to intervention. Teachers in both conditions received screening and progress monitoring data about their students' reading performance from the district. By contrast, only teachers in the ISI condition received ongoing professional development related to individualization of reading, biweekly in-class support by research assistants, and used a web-based Assessment to Instruction software that used student language and literacy data to provide recommendations for optimal amounts and types of reading instruction (see Al Otaiba et al., 2011).

As was required by the district, the kindergarten programs were full-day and had an academic focus. Children were provided a minimum uninterrupted block of 90 minutes of instructional time for reading and language arts. All schools utilized the same core reading curriculum or program (Open Court, Bereiter et al., 2002), which is an explicit and systematic curriculum that emphasizes teaching of phonological awareness and phonics as well as vocabulary and comprehension. As Al Otaiba et al. (2011) reported, for purposes of the larger study, classroom instruction was observed and videotaped in fall and winter.

Teachers in both conditions provided similar levels of organization of instruction, warmth and sensitivity, and ensured similar levels of on task behaviors among their students. However, although the intervention of the larger study was aimed at helping teachers individualize their reading instruction, and was not specifically aimed at changing spelling or writing instruction, teachers in the ISI condition tended to provide more individualized instruction.[1]

In the present study, notably the vast majority of the students (203 of our 242 students and 2 of our 21 teachers) were from the ISI-K treatment condition. We therefore included treatment condition as a control variable in the structural regression model (see Fig. 1). Participating children's mean age at the time of spring testing was 5.83 (SD=0.61). Slightly more than half of the sample was male (56.20%) and a majority were African American (64.05%), about one third were Caucasian (33.06%), less than 2% were Hispanic and a similar percentage were Asian or Multi-racial.

2.2. Measures

2.2.1. Oral language skills—Children's word- and syntax-level oral language skills were assessed by expressive vocabulary, grammatical knowledge, and sentence imitation measures. Expressive vocabulary and word knowledge were assessed by the Picture Vocabulary subtest of the Woodcock Johnson, third edition (WJ-III; Woodcock, McGrew, & Mather, 2001), which requires students to identify pictured objects. Cronbach's alpha was reported to be .76 for 5-year-old children. Children's grammatical knowledge was measured by the Grammatic Completion subtest of the Test of Language Development—Intermediate, third edition (TOLD-I: 3; Hamill & Newcomer, 1997). The Grammatic Completion test assesses children's ability to recognize accuracy of syntactic structures. The child listens to a sentence read aloud and is asked to determine whether the sentence is grammatically correct or incorrect. The 28 items include various syntactic features such as noun–verb agreement, pronoun use, plurals, and negatives (e.g., Joe likes to cook everyday; yesterday he *cooked*). Reliability was reported to be .90 for 5-year-old children (Hamill & Newcomer, 1997). The Sentence Imitation subtest of TOLD (30 items) requires students to repeat sentences that increase in length and complexity. Reliability was reported to be .91 for 5-year-old children (Hamill & Newcomer, 1997). Previous studies have shown that a sentence imitation task measures various aspects of oral language skills such as grammatical comprehension, auditory short-term memory, and phonological working memory (e.g., Eadie, Fey, Douglas, & Parsons, 2002; Gillam, Cowan, & Day, 1995; Rescorla, 2002). Research by Catts, Fey, Zhang, and Tomblin (2001) has indicated that sentence imitation measured in kindergarten was among the five variables that predicted reading outcomes in second grade.

2.2.2. Spelling—Children's performance on spelling real- and non-words served as two indicators of a spelling latent construct, using an untimed spelling task employed in prior

[1]Instructional effectiveness ratings (phonological awareness, alphabetics, decoding, vocabulary, spelling, writing, and comprehension) were on a 0–3 scale, where 0 indicated not observed, 1 indicated not effective, 2 indicated effective, and 3 indicated highly effective. An analysis of variance (ANOVA) revealed there were significant differences favoring the ISI condition (fall M=2.22; SD=.90; winter M=1.70; SD=.88) over the comparison condition (fall M=1.10; SD=1.00 and winter M=.86; SD=.57) on writing instructional effectiveness during classroom observations in fall and winter (respective ps<.001).

early literacy studies (Byrne & Fielding-Barnsley, 1993; Byrne et al., 2005). The task includes 15 real words (e.g., dog, man, plug, limp, tree, one, said, blue, come, went) and 4 nonsense words (i.e., ig, sut, frot, yilt). Following Byrne and colleagues' (2005) standard protocol, research assistants introduced the spelling task by pointing to the answer sheet and saying *I would like you to spell some words. Some are real and some are made-up words. If you don't know how to spell a word, sound it out and do your best. First I am going to say the word, then I will use it in a sentence, and then I will say the word one more time. Ready, begin. Remember to write the word next to the correct number on your answer sheet.* Then the research assistant read each word, read the sentence with the word, and then repeated the spelling word (e.g., "dog." "I took my dog to the park." "dog"). The nonsense words were repeated three times (e.g., *Next word* "ig" "ig" "ig"). Cronbach's alpha for this sample was . 86 for the real words, and .83 for the pseudo-words. The high internal consistency reliabilities obtained suggest that students' performance on the items was highly correlated.

2.2.3. Letter writing fluency—To assess students' ability to write all the letters in the alphabet, we used a handwriting automaticity task to measure how well children access, retrieve, and write letter forms automatically. Berninger and her colleagues used a similar task with students in grades one to six, but they used students' performance within 15 seconds in their analyses (e.g., Berninger et al., 1992; Berninger & Rutberg, 1992; Graham et al., 1997). In the present study, we used students' performance within 1 minute similar to previous studies with first graders (Jones & Christensen, 1999) and first and fourth grade students (Wagner et al., 2011). Research assistants asked children to write all the letters in the alphabet in order, using lower case letters. The directions were: *We're going to play a game to show me how well and quickly you can write your abc's. First, you will write the lowercase of small abc's as fast and carefully as you can. Don't try to erase any of your mistakes, just cross them out and go on. When I say "ready begin", you will write the letters. Keep writing until I say stop. Ready, begin.* After 1 minute, tell the students: "*Stop and put down your pencils*". Children received a score for the number of correctly written letters. The possible range of scores was 0 to 26; with one point awarded for each correctly formed and sequenced letter. Given that children were in kindergarten, we allowed a 0.5 for each poorly formed letter that could only be recognized in context or was reversed. The following responses were scored as incorrect and earned a score of zero: (a) letters written in cursive; (b) letters written out of order; or (c) uppercase letters.

2.2.4. Reading skills—Children's performance on five measures of word reading accuracy and fluency, and passage comprehension served as indicators of reading skill. Children's word reading accuracy was assessed by the Letter Word Identification subtest of WJ-III (Woodcock et al., 2001). This subtest consists of 76 increasingly difficult items beginning with identifying letters and then words. Testing is discontinued after 6 consecutive incorrect items. Reliability was reported to be .99 for 5-year-old children (Woodcock et al., 2001). Children's word reading fluency was assessed by the Sight Word Efficiency and Phonemic Decoding Efficiency subtests of the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999). The TOWRE requires students to read as many words on two lists (a sight word and a phonetic decoding list) as they can (45 seconds per list) (test-rest reliability of .97 for 6–9 year olds). Because the TOWRE had

relatively few simple sight words, students' ability to read first grade sight words was also assessed by the Word Identification Fluency task (Fuchs, Fuchs, & Compton, 2004). In this task, students see an array of 50 first grade sight words that were selected randomly from the Dolch word list of 100 frequent words and an educator's guide of 500 frequently used words in reading (Zeno, Ivens, Millard, & Duvvuri, 1995). Alternate form reliability from two consecutive weeks was reported to be .97 and validity evidence was sufficient as well (Fuchs et al., 2004). Reading comprehension was assessed using the norm-referenced Passage Comprehension subtest of the WJ-III (47 items; Woodcock et al., 2001). Students are asked to identify a missing key word that is consistent with the context of a written passage. For kindergarten, the first tasks begin with the examiner reading the sentence and initially the items have pictures. Then, students are expected to read the sentence or passage and identify the missing key word. Reliability was reported to be .96 for 5-year-old children (Woodcock et al., 2001).

2.2.5. Writing—To assess students' ability to compose a brief narrative text, a researcher-created story prompt was administered (Lembke et al., 2003; McMaster et al., 2009). This task was designed to be similar to state-wide curriculum-based writing assessments. Research assistants introduced the task and attempted to orient children to task expectations through a brief group discussion. *You have been in kindergarten for almost a whole year. Today we are going to write about kindergarten. Let's think about what you enjoyed about being in kindergarten. What did you learn in school? Did anything special happen to you in kindergarten?* Research assistants were instructed not to write these questions, or any student responses on the board. Next, research assistants instructed children to keep writing until they were told to stop. They said, *If you get to a word you do not know how to spell, sound it out and do your best. I'm not going to help you with spelling today. If you make a mistake, cross out the word and keep writing. Don't erase your mistake. Keep writing until I say stop.* Students had 15 minutes to complete the task. Some students stopped before the end and were not forced to continue. Using the coding scheme developed by Puranik, Lombardino, and Altmann (2007, 2008), three variables were derived from students' writing: total number of words (TNW), number of ideas (Ideas), and number of sentences (Sentences). TNW is a commonly used measure of compositional fluency and productivity in writing and has been used extensively in previous research (e.g., Abbott & Berninger, 1993; Berman & Verhoevan, 2002; Lembke et al., 2003; Mackie & Dockrell, 2004; McMaster et al., 2009; Nelson, Bahr, & Van Meter, 2004; Puranik et al., 2007, 2008; Scott & Windsor, 2000). Words in the present study were defined as real words recognizable in the context of the child's writing despite some spelling errors. By contrast, random strings of letters or sequences of nonsense words (both were very rare in the sample) were not counted as words. Ideas was a count of the total number of propositions (i.e., predicate and argument) included in the child's writing sample. For example, "I love kindergarten" was counted as one idea. Finally, Sentences was the count of the number of sentences included in the writing sample. Sentence structure was used to determine the number of sentences when punctuation and capitalization are not used, which is not uncommon for kindergartners.

2.3. Procedures—For the larger study, data were collected in Fall, Winter, and Spring and all reading and language assessments were individually administered. The data used in the

present study were from Spring assessments because writing was administered only at this time. Spelling and writing measures were group-administered (whole class) in late spring two weeks prior the Spring assessments collected for the larger study. Trained research assistants administered all assessments.

For the letter-writing fluency and spelling measures, inter-scorer agreement was established by a three-step process. First, the third author created a scoring rubric for the two measures. The rubric for the handwriting automaticity task related mostly to penmanship and letter formation. A score of 0 indicated a letter was missing, incorrect, or not recognizable; a .5 indicated a letter was recognizable but poorly formed or reversed; a 1.0 indicated a letter was well formed. In contrast, the spelling rubric indicated each word and was used Tangel and Blachman (1992) to create a developmental score; these ranged from 0 to 6 (highest). A 0 indicated a random string of letters or no response; 1 was a single phonetically related letter (e.g., for “dog” student wrote an “o” or a “g”); 2 was a correct first letter followed by other unrelated letters (e.g., “dib” or “d” random letters and a “g”); 3 was more than one phoneme that was phonetically correct (e.g., “do”); 4 was all letters represented and phonetically correct (e.g., “dawg”); 5 was all letters represented and phonetically correct and the student made an attempt to mark a long vowel (e.g., for the word “blue” if the student wrote “blew” or “bloo”); 6 was the word was spelled correctly (e.g., “dog”). In addition, spelling was also scored in standard fashion with one point for each correct word and a 0 for each incorrect spelling (see Table 1).

Then, the research assistants were trained to use the rubric with a small subset of children. Once they reached 100% agreement, each individually scored 15% of the entire data set. For the letter writing fluency, inter-rater agreement was 99% and spelling inter-rater agreement was 94.75%. For the writing task, two research assistants blind to the condition were trained by the third author to follow scoring rules for the writing variables and used the first 40 writing samples to practice and discuss any issues with scoring. After the initial discussion, the two research assistants independently scored all of the written narratives. To ensure uniformity in scoring, approximately 20% (n=48) of the written samples were chosen to obtain a measure of inter-rater reliability. Inter-rater reliability was calculated for each of the writing variables scored and ranged from 85 to 88%. All discrepancies were resolved through discussion.

3. Data analytic strategies

We used covariance structure modeling (i.e., structural equation modeling) to analyze the structural relations between predictors and the outcome (writing) using latent variables. Latent variable structural equation modeling improves reliability of measures by modeling common variance among multiple indicators and thus, minimizes the measurement error. In addition, structural equation modeling is a multivariate approach which allows us to examine shared and unique contributions of latent variables by taking into account the covariance among variables. Model fits were evaluated by multiple indices including chi-square, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residuals (SRMR). However, chi-square statistics tend to be sensitive to sample size. Instead, RMSEA values below .085,

CFI and TLI values greater than .95, and SRMR below .05 indicate a excellent model fit (Kline, 2005). Because children were nested within classrooms and thus are not independent, we used a CLUSTER option with TYPE=COMPLEX using MPLUS 5.1 (Muthén and Muthén, 2006). Because our main research question is about the relations at the individual level, we conducted an aggregate analysis (Muthén and Satorra, 1995), not at multilevel. Additionally, typically 40–50 cluster sizes are recommended for multilevel analysis (http://www.statmodel.com), thus not appropriate for the present study of cluster size of 21. In addition, given that 25% of the sample scored zero in the writing skills (see below), we used maximum likelihood robust estimator to adjust for standard error.

4. Results

Descriptive statistics (i.e., means, standard deviations, minimum and maximum scores) for observed variables are presented in Table 1. Standard scores are also reported when available. Children in the sample were in the average range in their language skills although their means for Sentence Imitation and Grammatic Completion tended to be in the low average range. The sample children's word reading ($98.49 \leq M \leq 104.93$) and Passage Comprehension ($M=98.08$) were also in the average range compared to the national norm. Finally, large variations were observed in writing outcomes. On average, the children in the sample produced 16 words (SD=19.82), 4 ideas (SD=3.66), and 3 sentences (SD=4.19) in their writing. Some floor effects were observed in the various aspects of writing such that approximately 27% of children ($n=65$) produced no words and ideas and 29% of children ($n=69$) produced zero sentences. Finally, intraclass correlations ranged from .07 to .23 for language, reading, and spelling observed variables whereas intraclass correlations ranged from .42 to .45 for writing variables (i.e., number of words, ideas, and sentences), indicating that a large portion of variation in writing skills was due to differences across classrooms. Similar patterns of results were found for children in grades two to four (Mehta, Foorman, Branum-Martin and Taylor, 2005).

Correlations between pairs of observed variables are shown in Table 2. Word reading ($.22 \leq rs \leq .40$), reading comprehension ($.40 \leq rs \leq .47$), and spelling measures ($.40 \leq rs \leq .50$) were positively related to various aspects of writing. Using these observed variables, the following four latent variables were constructed: oral language, reading, spelling, and writing. An observed variable was used for letter writing fluency in the subsequent analysis because there was only one measure of letter writing fluency. Similarly, treatment condition was a dichotomous (1=treatment, 0=control), observed variable.

The model fit was significantly better when considering letter writing fluency as a separate variable from the spelling latent variable ($\Delta \chi^2 [4]=35.38$, $p<.001$). Because the maximum likelihood robust estimator was used, we conducted a Satorra–Bentler scaled chi-square test (Muthén and Muthén, 2005) instead of a chi-square difference test which is used for maximum likelihood estimator. Table 3 shows correlations among latent variables and letter writing fluency observed variable. Reading and spelling were highly related ($r=.74$, $p<.001$). Writing was moderately related to other language and literacy skills ($.41 \leq rs \leq .50$, $ps<.001$).

In order to examine shared and unique relations, we fitted a structural regression model. The treatment condition was included as a control variable. The hypothesized model showed a good fit for the data: χ^2 (76)=190.67, p<.001; CFI=.98; TLI=.98; RMSEA=.079 (confidence interval=.06 to .09); and SRMR=.04. As shown in Fig. 1, oral language, reading, spelling, and letter writing fluency were all positively related to each other (.73≥φ≥.36, ps<.001). Treatment condition was not related to any predictors or the writing outcome (ps≥.26). Oral language (γ=.16, p=.03), spelling (γ = .30, p<.001), and letter writing fluency remained positively and uniquely related to writing (γ=.26, p=.003) whereas reading was not (γ=.001, p=.99). These predictors explained 33% of total variance in the writing outcome.

When analysis was conducted with traditional dichotomous scoring for spelling, the spelling was not related to writing in the structural regression model (p >.05). This is likely due to the constrained variation in the spelling with a dichotomous scoring.

5. Discussion

The present study investigated the shared and unique relations of potential component skills of writing for beginning writers (i.e., beginning composition). The results suggest that oral language, spelling, and letter writing fluency were uniquely related to end of kindergarten writing performance. Furthermore, once these three component skills were entered into the model, variation in students' reading skills was not significantly related to their writing performance.

As writing requires generation and production of ideas and content, children's language proficiency would constrain their writing (McCutchen, 2000). Although it is reasonable to assume, and it has been previously argued, that oral language skills provide the foundation for writing development, empirical evidence has been sparse, particularly for early writing development. The present study demonstrated that variation in children's oral language skills (composed of vocabulary, grammatical knowledge, and sentence imitation) was positively related to writing for children at the end of kindergarten in a bivariate examination (r=.41) and after accounting for spelling, letter writing fluency, and reading. This result suggests that although kindergarten typically is an important period to develop word level decoding and encoding skills, it is also critical to attend to building their oral language skills. Disproportionate attention to word level skills at the expense of attention to oral language may eventually disserve children's literacy development, given the importance of oral language skills for connected text comprehension (i.e., reading comprehension) and production (writing) (e.g., Storch & Whitehurst, 2002; Abbott & Berninger, 1993). This is particularly true because oral language is a large domain or "a large problem space" (Snow & Kim, 2006), has a protracted period of development, and is slower to develop (Paris, 2005). Also, language is not a unitary, simple construct; oral and written language are separate, but draw on common brain processes (Berninger et al., 2006; Berninger & Abbott, 2010). Yet, too frequently, researchers have conceptualized of vocabulary as simply oral language and have not typically considered other important aspects such as grammatical knowledge.

It should be noted that although oral language is an essential skill for ideation specified by the simple view of writing (Juel et al., 1986), oral language in the present study captured only a partial aspect of ideation. According to the classic model of writing for proficient adults (Hayes & Flower, 1980), ideation involves a broad spectrum of writing processes such as planning, reflection, translation, and revision. Thus, according to this definition, "ideation" of beginning writers is likely to involve a much broader set of skills such as oral language, cognitive skills, and metacognitive skills. The present study showed that one critical aspect of ideation, oral language skill, is positively related to text generation for young children. Future studies should examine development of these other aspects of ideation such as planning and translation for young writers across time. For example, it would be possible to complement writing assessments with interviews or think-alouds to examine students through these processes while writing or reflecting on their writing samples.

The present study also confirmed that individual differences in writing are uniquely related to proficiency in transcription skills (i.e., spelling and letter writing fluency) for beginning writers. These results suggest that automaticity in letter writing skills, and developmental competence in spelling may afford young children more opportunity to focus on higher order, meaning making processes. Spelling and letter writing fluency are both mechanical aspects of writing, and theoretically hypothesized as lower level skills that constrain high level, meaning making processes if not automatized. However, the moderate correlation between spelling and letter writing fluency (r=.47), the results of Satorra–Bentler scaled chi-square test, and unique contributions of both spelling and letter writing fluency suggest that spelling (developmental scoring rather than dichotomously as right-wrong) and letter writing fluency appear to capture somewhat different aspects of mechanical elements of writing. Spelling, perhaps particularly the way we scored it developmentally using Tangel and Blachman (1992), captures children's phonological, alphabetic, and orthographic knowledge to encode sounds into letters (Cassar, Treiman, Moats, Pollo, & Kessler, 2005; Kim, 2010; Moats, 2005–2006). On the other hand, letter writing fluency requires and measures "retrieval of letter forms from long-term memory with planning and execution of fine-motor movements under time-limited conditions" (Berninger, 1999, p. 103). In particular, although motor skills contribute to handwriting (or letter writing in the present study), particularly for young children, their effect on letter writing is indirect while orthographic coding (i.e., one's knowledge of letters and ability to encode them rapidly) is more directly related to handwriting development (Abbott & Berninger, 1993). Thus, beginning writers with automatized letter writing, who can both retrieve and produce letters, have the motoric and orthographic coding skills in a rapid manner to devote memory and attention to various higher order aspects of writing (e.g., planning, translating, and revising) (Berninger et al., 1992). Perfetti (2007) has argued that "Efficiency is not the same as speed. Efficiency is a ratio of outcome to effort, with time as a proxy for effort" (Perfetti, 2007, p. 359). Although Perfetti (2007) was speaking of the relation between fluent word reading and comprehension, the same principle may apply to how the ease of letter writing supports early proficient spelling and writing.

The present study revealed that individual differences in reading were not related to their writing achievement once other skills were accounted for. There are several plausible interpretations for divergence between our findings and those of previous studies which showed a positive relation of reading with writing (e.g., Abbott & Berninger, 1993; Mehta et al., 2005; Olinghouse, 2008). One interpretation could be that differences are related to the extent to which other potential predictors were included in the previous studies and the present study. For example, reading was uniquely related to writing in a previous study, but it was after accounting for only oral language (Abbott & Berninger, 1993) whereas in the present study, spelling and letter writing fluency were included in addition to oral language. It appears that the contribution of reading to writing may largely overlap with that of spelling in this early stage of writing development, given the strong correlation between the spelling and reading latent variables (r=.74). A second interpretation involves the specific reading comprehension measure used. In other words, given that passage comprehension task used in the present study tends to be more related to word reading skills than language comprehension (Keenan, Betjemann, & Olson, 2008), our measures of kindergarten reading could have addressed mainly word level reading rather than comprehension, which conceivably would be more related to ideation within writing, for example. A final interpretation could be that the relations among these latent variables may change over time as children develop a clearer awareness of how alphabetic and orthographic knowledge are used in writing (e.g., Apel, 2010).

It should be noted that the results in the present study are from beginning writers at the end of kindergarten, and so the associations we report may change along a developmental continuum of children's writing in an analogous fashion to reported changes in relations among word reading and oral language skills as reading comprehension develops (Catts, Hogan, & Adlof, 2005; Francis, Fletcher, Catts, & Tomblin, 2005; Gough, Hoover, & Peterson, 1996; Storch & Whitehurst, 2002). For instance, the relative contributions of oral language and mechanical skills to writing may change at a later developmental stage (Berninger, 1994)—that is, oral language skills may play a greater role in writing and the role of mechanical skills (spelling and letter writing fluency) may be reduced—because demands in writing may change in upper grades as there are higher expectations for the structural and compositional aspects of writing. Although it has been shown that handwriting fluency was consistently related to students' writing fluency and quality for students in intermediate grades (grades four to six) after accounting for spelling (Graham et al., 1997), the relative contributions of oral language and mechanical skills (i.e., spelling and handwriting fluency) across developmental phases remain an empirical question. As we continue to track these students' longitudinally, it will be illuminating to explore the unique relation of reading, including more comprehension measures, with writing after accounting for spelling at a later developmental time point.

It was notable that the predictors included in the present study explained a relatively small amount of variance in writing. This suggests the importance of investigating other potential predictors such as home literacy and classroom instructional factors (Moats, Foorman, & Taylor, 2006; Puranik, Al Otaiba, Folsom, & Greulich, 2010). In a recent article describing what is known about writing, Graham and Perin (2007) expanded upon their meta-analysis

of intervention studies of older students to describe several qualitative studies that involved observations of elementary schools that were selected for having higher than expected rates of writing achievement. Although none of these reviewed studies specifically examined kindergarten writing instruction, findings were consistent that effective teachers dedicated time to writing and to teaching writing through a small group process that involved modeling of planning, revision, and editing. Students who were successful were in environments that were scaffolded but also allowed them to work independently. The instructional quality ratings from our observations of writing instruction, along with the large intraclass correlations suggest that there was large variation in writing instruction, which is consistent with Mehta et al., (2005). Furthermore, that we did not observe much systematic writing instruction in kindergarten may not be surprising in light of other studies that have included primary grades (Cutler & Graham, 2008). A recent observational study described considerable variation in amounts and types of writing instruction and in students' writing outcomes both across and within schools (Puranik et al., 2010). Further systematic research is needed on the variation and impact of writing instruction on students' writing achievement and growth.

Several limitations in the present exploratory study should be mentioned. First, our writing sample came from one piece of writing. In the future, we plan to administer multiple probes and to track students longitudinally. Although researchers have begun to examine how many probes and what amount of text is needed to obtain high reliability for beginning writers (c.f., McMaster & Espin, 2007), future study is warranted. Work is also needed to compare performance on story prompts to writing production in a task such as journaling and on a standardized writing assessment. Additionally, although spelling and writing measures used in the present study were all significantly related (see Table 2) providing validity evidence for those measures, a future study could study the relations of these measures with nationally normed measures (e.g., Test of Early Written Language 2, Hresko, Herron, & Peak, 1996). Second, in the present study we only examined writing fluency, not quality, primarily because the number of sentences and clauses were limited, which may reflect a developmental constraint. Others have shown that writing fluency was strongly related to writing quality in older, primary grade, writers (r=.60) (Abbott & Berninger, 1993; Graham et al., 1997). Third, approximately 27 to 29% of children produced no written words, scoring zero in the three aspects of writing examined in the present study. This restricted variation in the outcome and might have underestimated the strengths of relations. However, it should be noted that maximum likelihood robust estimator was used to adjust for standard error estimation. Although the floor effect appears to be a consequence of developmental constraint, future studies with more writing samples (including both researcher prompted ones and naturalistic writing samples) might alleviate this problem to some extent. Fourth, we had only one measure of handwriting fluency (i.e., letter writing fluency), and it would be important to include multiple indicators of handwriting fluency in the future studies. Finally, a future study should measure more diverse dimensions of children's oral language skills including oral language skills and discourse knowledge. This will allow a more nuanced understanding of the relation between oral language and writing.

In summary, the findings of the present exploratory study suggest the importance of attending to both oral language and mechanical aspects for beginning writing. We consider the findings to be preliminary, but they also provide an important initial step toward more fine-grained and nuanced understanding about writing development.

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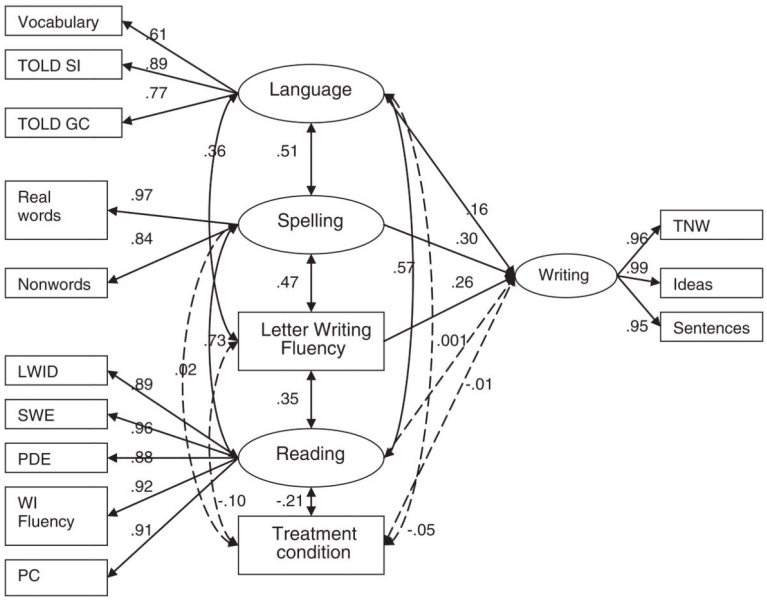

Fig. 1.

Standardized structural regression weights for oral language, reading, spelling, letter writing fluency, and writing (*N*=242). Solid lines represent statistically significant relations and dotted lines, statistically significant relations. Variables in rectangles represent observed variables whereas those in ovals represent latent variables. Vocabulary: WJ-III Picture Vocabulary; TOLD SI=Test of Oral Language Development Sentence Imitation; TOLD GC=Test of Oral Language Development Grammatical Closure; LWID=Woodcock Johnson III Letter Word Identification; SWE=Sight Word Efficiency; PDE=Phonemic Decoding Efficiency; WI Fluency=Word Identification Fluency; PC=Passage Comprehension; TNW=total number of words.

Table 1

Descriptive statistics (mean, standard deviation, minimum and maximum, *N*=242).

	***M* (SD)**	**Min–max**
Writing		
Total number of words	15.93 (19.82)	0–139
Total number of ideas	3.66 (4.56)	0–39
Total number of sentences	2.84 (4.19)	0–38
Oral language		
Vocabulary – raw score	17.85 (2.67)	9–26
Vocabulary – standard score	99.86 (9.09)	67–126
TOLD SI – raw score	9.00 (5.91)	0–27
TOLD SI – standard score	8.31 (3.07)	1–17
TOLD GC – raw score	8.10 (6.07)	0–23
TOLD GC – standard score	8.13 (2.95)	2–15
Word reading		
Letter Word Identification – raw score	22.44 (7.60)	4–47
Letter Word Identi3cation – standard score	104.93 (14.72)	61–142
Sight Word Efficiency – raw score	15.87 (12.91)	0–66
Sight Word Efficiency – standard score	98.49 (11.61)	65–140
Phonemic Decoding efficiency – raw score	6.40 (6.42)	0–33
Phonemic Decoding efficiency – standard score	101.75 (9.77)	75–130
Word Identification Fluency	17.81 (19.21)	0–94
Passage Comprehension – raw score	9.68 (4.81)	0–24
Passage Comprehension – standard score	98.08 (16.25)	51–137
Spelling		
Real words (developmental)	34.30 (15.57)	0–60
Nonwords (developmental)	13.00 (7.29)	0–24
Real words (dichotomous)	3.00 (2.47)	0–10
Nonwords (dichotomous)	1.35 (1.26)	0–4
Letter writing fluency	10.06 (6.19)	0–26

Table 2

Correlations between observed variables.

		1	2	3	4	5	6	7	8	9	10	11	12	13
Oral language	1. Vocabulary	–												
	2. TOLD SI	.52	–											
	3. TOLD GC	.50	.65	–										
Spelling	4. Spelling: real words	.32	.43	.35	–									
	5. Spelling: nonwords	.30	.41	.31	.79	–								
Letter writing fluency	6. Letter writing fluency	.16	.30	.23	.49	.41	–							
	7. LWID	.41	.48	.34	.69	.59	.32	–						
Reading	8. Sight Word Efficiency	.41	.46	.31	.69	.57	.33	.86	–					
	9. Phonemic Decoding E.	.41	.51	.40	.60	.53	.35	.76	.86	–				
	10. Word Identification Fluency	.36	.43	.27	.62	.47	.30	.82	.93	.81	–			
	11. Passage Comprehension	.44	.49	.36	.67	.55	.34	.81	.87	.79	.85	–		
Writing	12. Writing: number of words	.22	.38	.31	.50	.45	.42	.40	.40	.40	.34	.47	–	
	13. Writing: number of ideas	.21	.39	.32	.49	.45	.39	.38	.38	.37	.33	.46	.95	–
	14. Writing: number of sentences	.15	.33	.24	.40	.44	.30	.27	.27	.28	.22	.40	.91	.95

All coefficients are statistically significant at .05 level.

TOLD SI=Test of Oral Language Development Sentence Imitation; TOLD GC=Test of Oral Language Development Grammatical Completion; LWID=Woodcock Johnson III Letter Word Identification; Phonemic Decoding E.=Phonemic Decoding Efficiency.

Table 3

Correlations among language skills, word reading, spelling, letter writing fluency, and writing.

	Oral language skills	Reading	Spelling	Letter writing fluency
Reading	.58	–		
Spelling	.52	.74	–	
Letter writing fluency	.37	.36	.47	–
Writing	.41	.41	.50	.46

Note: letter writing fluency is observed variables while the rest are latent variables. All the coefficients are statistically significant at .01 level.