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2015

Developmental Trajectories of Writing Skills in First Grade: Examining the Effects of SES and Language and/or Speech Impairments

Young-Suk Kim, Cynthia Puranik and Stephanie Al Otaiba



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Kim, Y.-S., Puranik, C. & Al Otaiba, S. (2015). Developmental trajectories of writing skills in first grade: Examining the effects of SES and language and/or speech impairments. *Elementary School Journal*, 115, 593 – 613.

Abstract

We examined growth trajectories of writing and the relation of children's socio-economic status, and language and/or speech impairment to the growth trajectories. First grade children ($N = 304$) were assessed on their written composition in the fall, winter, and spring, and their vocabulary and literacy skills in the fall. Children's SES had a negative effect on writing quality and productivity. Children with language and/or speech impairment had lower scores than typically developing children in the quality and productivity of writing. Even after accounting for their vocabulary and literacy skills, students with language and/or speech impairment had lower scores in the quality and organization of writing. Growth rates in writing were not different as a function of children's SES and language/speech impairment status. Theoretical and practical implications are discussed.

Word count: 149

Key words: Developmental trajectories; Language impairment, Speech impairment, SES, Writing

Writing is an essential skill for success in school as well as in the work place. Competent literate people are not only able readers but also able writers (Jenkins, Johnson, & Hileman, 2004). However, NAEP data show that the majority of children write at a basic or below basic level and only 35% of students in eighth graders write at proficient level (National Center for Education Statistics, 2003) indicating that many students are not prepared to meet academic demands or the demands of the workplace. Writing (written composition) is a particularly challenging literacy skill to achieve, taking years to develop (Kellogg, 2008). Thus, understanding development of writing skills is critical, particularly at the early stages (e.g., first grade). Longitudinal studies examining writing growth trajectories are lacking. In the present study, we examined the impact of children's socio-economic status (SES) and of language and/or speech impairment on writing developmental trajectories of narrative writing skills in first grade, and the extent to which vocabulary and literacy (reading and spelling) skills mediate these relations using year-long longitudinal data from first grade students.

Understanding early writing performance for this population is important given the increasing emphasis for writing within the widely-adopted Common Core standards (CCSS, 2010). The CCSS recognize the importance of children's writing skills and specified three focal areas for early writing across kindergarten through second grade – (1) creating different text types for different purposes (e.g., describe and discuss a series of events or create informative/explanatory texts), (2) producing and describing writing (e.g., answer questions about their own writing, respond to peers, and use various tools to publish their writing), and (3) using research to build and to present knowledge (e.g., participate in research projects, expressing opinions about texts, gather information from a provided

source). The expectations increase across the grades. For example, in the narrative domain, first graders are expected to write two or more events in a sequence, provide some details, include some temporal words and indicate closure. By second grade, they are expected to also include actions, thoughts and feelings in their narratives. The ultimate goal of the CCSS is for high school and college graduates to be career ready and be able to communicate in various genres of writing in a clear and organized fashion, synthesizing research findings from an array of sources and for a range of discipline areas.

Despite expanded interest and focus on writing as exemplified by the CCSS, however, we have a limited understanding about steps toward achieving this ultimate goal in part due to the limited research about the development of writing skills in the beginning phase, particularly for children who are potentially at risk for poor writing including those from low socio-economic status (SES) families and children with language and/or speech impairment. Therefore, it is critical to investigate whether there are any differences in growth trajectories in writing for children from varying SES backgrounds, and for children with language and/or speech impairment compared to typically developing children. Furthermore, if there are gaps, it is important to identify areas in which writing gaps are found, and the nature of gaps – whether the gap is in the status, differences in growth rates, or in both. Research in reading development has provided evidence for both, such that children with initial low reading skills continue to exhibit lower reading skills at a later time point but with similar growth rates (e.g., Shaywitz, Holford, Holahan, Fletcher, Stuebing, & Francis, 1995).

The Impact of SES and Speech and/or Language Impairment on Writing Growth Trajectories

Several studies have shown that poverty and its common correlates of lower parental education strongly influence children's writing achievement (Coker, 2006; Persky, Daane, & Jin, 2003; Walberg & Ethington, 1991). For instance, children in grades 4, 8, and 12 who were not eligible for free and reduced lunch had higher writing scores in the National Assessment of Educational Progress (NAEP) than those who were eligible for free and reduced lunch (Persky et al., 2003). The gap in writing as a function of SES may be attributed to many potential factors. For instance, children from lower SES backgrounds tend to have lower phonological awareness and print knowledge (Lonigan, Burgess, Anthony, & Barker, 1998) as well as smaller expressive and receptive vocabulary (Arriaga, Fenson, Cronan, & Pethick, 1998) than children from middle income homes. The disadvantage in these foundational literacy skills puts children from low SES backgrounds at risk for literacy acquisition because sublexical skills such as phonological awareness and print knowledge negatively impact children's development of transcription skills such as spelling, whereas a smaller vocabulary negatively impacts the message the writer is trying to convey (Berninger & Swanson, 1994; Kim et al., in press). It has further been suggested that sublexical skills and writing have a bidirectional relation (Diamond, Gerde, & Powell, 2008).

Several studies have shown that children with learning or specific language disabilities perform more poorly on lexical, grammatical, and structural aspects of written composition than typically developing children (e.g., Anderson, 1982; Dockell, Lindsay, & Connelly, 2009; Dockrell, Lindsay, Connelly, & Mackie, 2007; Englert & Thomas, 1987; Fey et al., 2004; Mackie & Dockrell, 2004; Puranik, Lombardino, & Altmann, 2007; Scott & Windsor, 2000; Windsor, Scott, & Street, 2000). For instance, children with learning

disabilities had poorer text structure knowledge, and their written composition tended to lack structural aspects (e.g., inclusion of more irrelevant information and less elaborations) compared to typically developing peers (Englert & Thomas, 1987). In addition, children with language learning disabilities had greater difficulty with tense and plurality in written composition (i.e., greater number of errors) compared to typically developing children (Windsor et al., 2000). Given the importance of oral language skills in writing (see below), the challenges of written composition for children with language impairments are not particularly surprising.

Children with speech impairment might also experience challenges in writing as these children have articulation disorders such as substituting /w/ for /r/ as in “wabbit” for “rabbit” or /t/ for /k/ as in “tup” for “cup”, which have been linked to phonological processes (Castiglione-Spalten & Ehri, 2003; Hesketh, Adams, Nightingale, & Hall, 2000; Roberts, 2005), which then is likely to influence one of the critical component skills of writing, and spelling (see below). Despite detailed documentations of the features of the writing of children with language and learning disorders, however, few studies have yet compared developmental trajectories of writing for typically developing children to those with language and/or speech impairment. One exception is Dockrell and her colleagues (2009) who studied children with language impairment and their performance in language and literacy including writing longitudinally from ages 8 to 16. Their study showed that children with language impairment produced short texts that had poor ideas, organization, and sentence structure. Furthermore, children’s concurrent spelling and vocabulary skills were significant predictors of their writing skill at age 16.

In the present study, we expand Dockrell et al.'s (2009) study in several ways. First, we examined younger, first grade children. Given the stability of reading and writing skills (Juel, 1988; Dockrell et al., 2009), it is important to closely investigate children's writing development in the beginning phase. Second, we employed growth modeling to examine whether there were differences in status and growth rate in writing skill between typically developing children and children with language and/or speech impairment. Furthermore, we examined growth trajectories of children's writing skills in two primary areas: (1) writing quality indicators such as idea development and organization; (2) writing productivity such as number of words and number of ideas (Abbott & Berninger, 1993; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Kim et al., in press; Olinghouse & Graham, 2009). To examine how children's risk factors such as SES and language and/or speech impairment status are related to the growth trajectories in these writing outcomes, we tested whether there were mean differences in initial status and growth rates after accounting for children's demographic variables such as racial/ethnic backgrounds, gender, age, and intervention treatment status (see below). For example, a statistically significant negative interaction term between language and/or speech impairment status and growth rate would indicate that children with language and/or speech impairment have a lower growth rate than typically developing peers.

Predictors of Written Composition

If there are gaps in writing as a function of SES and language and/or speech impairment, an important corollary is what are the potential sources and mediators of these gaps. This information is critical to ultimately help children meet the CCSS in writing by targeting those mediating skills instructionally. Therefore, we examined the extent to

which component skills of writing mediated the impact of potential risks such as low SES and language and speech impairment. According to the developmental model of writing (Berninger, Abbott, Abbott, Graham, & Richards, 2002; Berninger & Swanson, 1994), component skills of writing include both high level skills such as language and revising, and low level neurodevelopmental transcription skills. Oral language contributes to writing because generated ideas have to be translated, using language, into words, sentences, and passages, which then need to be transcribed into text. Oral language and transcription skills are hypothesized to interact with each other such that transcription skills are necessary to release cognitive resources for higher order skills such as oral language and planning. Although both low and high level skills are expected to influence writing development, the relative weights should vary – low level skills should influence beginning writing skills to a greater extent and high level language and cognitive skills should influence later writing skills to a greater extent (Berninger & Swanson, 1994).

Oral language has been shown to be uniquely related to written composition for children in kindergarten (Kim et al., 2011), first grade (Kim, Al Otaiba, Folsom, Grulich, & Puranik, in press), third grade (Berninger & Abbott, 2010; Olinghouse, 2008), fifth grade (Berninger & Abbott, 2010), and adolescence (Dockrell et al., 2009). Evidence also supports the importance of transcription skills such as spelling and letter writing automaticity for children in the beginning stage (e.g., kindergarten, Kim et al., 2011, Puranik & Al Otaiba, 2012; first grade, Graham et al., 1997; Wagner et al., 2011) and even at more advanced stages (e.g., adolescent writers; Graham et al., 1997).

In addition to oral language and transcription skills, children's reading skills, reading comprehension in particular, appear to be another unique contributor to written

composition (see Shanahan, 2006 for a review), for beginning writers in first grade as well as more advanced seventh graders (Berninger & Abbott, 2010). In their longitudinal study, Abbott, Berninger, and Fayol (2010) found that reading comprehension explained unique variance in written composition for children from grades 2 through 6. Children's reading comprehension ability may influence writing skill via content knowledge and organization skill as children with better reading comprehension are likely to be exposed to written text more frequently than those with poor reading comprehension. For instance, children with poor reading comprehension had weaker story content and story structure in writing (Cragg & Nation, 2006). Expanding these previous studies, in the present study, we investigated whether oral language (vocabulary in the present study) and literacy skills such as letter writing automaticity, spelling, and reading comprehension mediated the relations between SES and writing, and between language and/or speech impairment and writing. If these language and literacy skills completely mediated these relations, once these language and literacy skills are included in the statistical models, performance differences due to SES backgrounds and language and speech impairment status should disappear, suggesting that it is language and literacy skills that drive the differences in performances for children.

Present Study

In the present study we examined growth trajectories of narrative writing, and we explored how these trajectories are influenced by children's SES backgrounds and language or speech impairment status. The following were specific research questions of the present study: (1) Are there differences in developmental trajectories in writing quality and productivity for children eligible for free and reduced lunch (proxy for SES) compared to

those who are not after accounting for demographic variables?; (2) Are there differences in developmental trajectories in writing quality and productivity for typically developing children vs. children with language and/or speech impairment after accounting for demographic control variables and SES?; and (3) If developmental trajectories are different, do children's language and literacy skills mediate the relations?

We used longitudinal data from a sample of first grade students who participated in a larger study ($N = 304$; fall, winter, and spring assessment) and multilevel growth models were used to address these questions. The written composition outcomes included quality indicators such as ideas and organization, and productivity indicators such as number of words written and number of ideas. The mediators were oral vocabulary, letter writing automaticity, spelling, and reading comprehension. Demographic control variables included children's age, sex, racial/ethnic backgrounds, and intervention treatment status.

Method

Participants

A total of 304 first grade students (147 boys; mean age = 6.18, $SD = .34$) in six public schools and 29 classrooms participated in the study. For the purpose of the larger study, schools had been recruited with consultation with the District Reading Specialist as having interest in Response to Intervention and as serving a student population at risk for struggling to read. Similar to their school population, the participants included 62% Black, 27% White, and 11% others (e.g., Hispanic, Multiracial, unknown/not reported). Approximately 72% of these children were eligible for free or reduced lunch. According to the school record, 46 children received speech or language services (23 children speech impairment, 13 with language impairment, and 10 with language and speech impairment)

and a total of 10 children received other Exceptional Education and Student services. Four children discontinued participating in the study in the winter and spring. Therefore, the sample size in the analysis was 304, 300, and 300 in the fall, winter, and spring, respectively.

As mentioned, these students were participating in a larger study investigating the efficacy of core reading instruction within a response to intervention (RTI) framework (Al Otaiba et al., 2011). All teachers in all schools used *Open Court* (Bereiter et al., 2002) as their core reading program for 90 minutes per day. Teacher interviews indicated that no additional writing curriculum was in place in these schools and our observations indicated that writing was not a predominant part of the literacy program.

Fifty two percent of children were in the treatment condition. Children were screened and then randomly assigned within their classrooms to one of two researcher-administered RTI conditions. In the Dynamic condition, students with the weakest initial skills received intervention immediately (Tier 2 or Tier 3; see Al Otaiba et al., in review for more details about the study details from the prior year of implementation). In the Typical condition, students began in Tier 1 and progressed to Tier 2 only if they did not respond to Tier 1. These same students progressed to Tier 3 only if they did not respond to Tier 2. In both conditions, focus was on reading and as such there was no teaching of handwriting or spelling.

Well-trained research staff conducted all interventions; Tier 2 was provided in 30 minute bi-weekly sessions (groups of 5-7 children) and Tier 3 was provided in 45 min sessions four days per week (groups of 1-3 children). The code-focused activities for Tier 2 were drawn from the first grade *Open Court Imagine It!* series (Bereiter et al., 2002) and

the Florida Center for Reading Research (FCRR) K-3 Center Activities and Tier 3 involved *Early Interventions in Reading (EIR; Mathes & Torgesen, 2005)*. The meaning-focused components for both Tiers changed each 8 weeks, beginning with dialogic shared book reading (Lonigan, Anthony, Bloomfield, Dyer, & Samwel, 1999; Lonigan & Whitehurst, 1998; Valdez-Menchaca & Whitehurst, 1992). Then, as students were able to read decodable books, they practiced reading fluently and answered sentence-level comprehension questions. Finally, students read decodable books that included elements of sequencing text structure (using the temporal words first, next, last). Tutors used graphic organizers to model and guide students in oral and written retells. In both treatment and control conditions, teachers received professional development about RTI and their school district provided them with data. In the data analysis, treatment conditions were included as a control variable.

Measures

Outcome: Written composition

A story prompt which was used in previous studies was used to ask students to compose a text (McMaster, Xiaoqing, & Pestursdottir, 2009). Pairs of trained graduate students administered this task to students while their classroom teachers were present in classrooms. Similar brief, timed prompts are widely used in writing research as global indicators of writing performance (Lembke, Deno, & Hall, 2003; McMaster et al., 2009) and this task was designed to be similar to state-wide curriculum-based writing assessments. The writing prompt was “One day, when I got home from school,…” and children were given 5 minutes to complete the task (McMaster et al., 2009). Students’ writing was

assessed three times, fall (September and early October), winter (January and February), and spring (April and May).

Students' written composition was evaluated on quality and productivity. Substantive quality was evaluated by the quality of ideas and organization aspects of the 6+1 Traits of Writing Rubric for Primary Grades (Northwest Regional Educational Laboratory, 2001). In the 6+1 Traits approach of writing evaluation, seven predetermined aspects of children's writing are evaluated (i.e., ideas, organization, word choice, sentence fluency, voice, conventions, and presentation). This is the most widely used writing evaluation approach in the US schools (Gansle et al., 2006). The quality of ideas was evaluated on the extent to which main ideas were developed and represented; the organization aspect was evaluated on the extent to which text structures (e.g., beginning, middle, and end) are present. These aspects were rated on a scale of 1 to 5 (Northwest Regional Educational Laboratory [NREL], 2011; see Kim et al., in press, for writing samples; also see the NREL website for further details). A score of 0 was assigned to unscorable texts in the quality of ideas and organization (e.g., unintelligible words written). A recent study showed that the 6+1 Trait coding can be highly reliable with sufficient training of coders, and the ideas and organization aspects of the 6+1 Trait scoring capture the quality dimension of the written composition, which is separate from a productivity dimension (Kim et al., in press). Note that ideas and organization aspects have been used as indicators of writing quality in previous studies, albeit without empirical confirmation (Graham, Berninger, & Fan, 2007; Graham, Harris, & Mason, 2005; Olinghouse, 2008).

Writing productivity was evaluated by total number of words written and total number of ideas (Kim et al., 2011, in press; Puranik et al., 2007, 2008; Wagner et al., 2011).

Words were defined as real words recognizable in the context of the child's writing despite some spelling errors. Random strings of letters or sequences of nonsense words (which rarely occurred) were not counted as real words. The number of ideas was a count of propositions (i.e., predicate and argument) included in the child's writing sample. For example, "I love baseball" was counted as one idea (Kim et al., 2011). Total number of words is a commonly used measure of compositional fluency and productivity in writing (e.g., Abbott & Berninger, 1993; Kim et al., 2011; Lemke et al., 2003; Mackie & Dockrell, 2004; McMaster et al., 2009; Nelson, Bahr, & Van Meter, 2004; Puranik et al., 2007; Scott & Windsor, 2000).

Graduate student coders were rigorously trained and double-coded independently 45 pieces of the writing sample to estimate reliability. The Cohen's kappa estimates were .84, .82, .99, and .86 in the quality of ideas, organization, total number words, and number of ideas, respectively.

Primary Predictors

Language and/or speech impairment status. Students' speech and language impairment status was determined by the schools. A total of 46 children were identified as having language and/or speech impairment (23 children with speech impairment, 13 with language impairment, and 10 with language and speech impairment). Four children did not have information on their language and/or speech information. Thus, approximately 15% of the sample children were identified as having language and/or speech impairment, which is higher than the typically 6-8% reported in the general population (Tomblin, Records, Buckwalter, Zhang, Smith, & O'Brien, 1997).

Although we did not have information about identification processes used in the school districts, the high rate might reflect a potential bias due to dialectal differences, particularly given the high proportion of children who were Black and might have been using African American Vernacular English (AAE). Several key features of language variation between AAE and standard English makes it challenging for clinicians to discern difference from disorder or impairment (Oetting & McDonald, 2001; Washington, 1996). Furthermore, other researchers have reported higher proportions of Black students than the general population were identified with speech and language impairment (Skibba, Ploni-Stadinger, Gallin, Simmons & Feggin-Azziz, 2006) and that language disorders may be more likely to be diagnosed when they co-occur with low SES. However, Pruitt, Garrity and Oetting (2010) found that Black children from low SES backgrounds were twice as likely to have a family history of language impairment than were Black children from middle SES backgrounds

Socio-economic status. Children's free and reduced lunch status was used as an indicator of their SES status ($n = 218$). This information was obtained from the school district. A dichotomous variable (free and reduced lunch eligible = 1) was used in the analysis.

Vocabulary and Literacy Predictors

Vocabulary. Expressive vocabulary was assessed by the Picture Vocabulary subtest of Woodcock Johnson-III (WJ-III; Woodcock, McGrew, & Mather, 2001), which requires students to identify pictured objects. Cronbach's alpha is reported to be .70 for six-year-olds. Each item was scored dichotomously following the protocol.

Spelling. A researcher-developed dictation task (20 items; e.g., nine, pool) was used in which students were asked to spell words that were of increasing difficulty. This was group administered. 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”). Students’ performance on each item was scored using the Spelling Sensitivity Score (SSS) system (Apel, Masterson, & Brimo, 2011). In the SSS system, each element of the word is scored for the following elements: correct phonemes, junctures, and affixes (Masterson & Apel, 2010). Two types of scores were available in the SSS system and in the present study, we used the overall score. The overall score is coded for accuracy of entire words: Omitted words are given zero points, words that contain illegal misspellings are given one point, words that are misspelled legally are given two points, and correct spellings are given three points (see Apel et al., 2011). The correlation between element and overall scores is very high ($r = .98$). Cronbach’s alpha was .95.

Letter writing automaticity. Students’ letter writing automaticity was also group-assessed by asking children to write as many alphabet letters as possible in one minute with accuracy (Jones & Christensen, 1999; Kim et al., 2011; Puranik & Al Otaiba, 2012, Wagner et al., 2011, but see Berninger et al., 1992 in which a similar task was used for a 15 sec period). This task assessed how well children access, retrieve, and write letter forms automatically. Research assistants asked children to write all the letters in the alphabet in order, using lower case letters. After 1 minute, tell the students: “*Stop and put down your pencils*”. Children received a score for the number of correctly written letters, adapting Berninger et al.’s (1992) study. The possible range of scores was 0 to 26; with one point awarded for each correctly formed and sequenced letter. Given that students were in first

grade, a 0.5 was used for each imprecisely formed letter (e.g., “n” must not be confused with “h” – must not have a long vertical line). 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. Inter-rater percent agreement was greater than .90.

Reading comprehension. Students’ reading comprehension was assessed using the Passage Comprehension subtest of WJ-III (Woodcock et al., 2001). Passage comprehension is an oral cloze task in which the child reads sentences and passages and is asked to fill in blanks. Students’ performance on each item was scored dichotomously. Cronbach’s alpha was reported to be .92.

Control variables

Children’s gender, racial backgrounds, age, and intervention treatment status were included as control variables.

Procedures

The measures such as WJ-III Picture Vocabulary and Passage Comprehension were individually administered in a quiet room at school, whereas spelling, letter writing automaticity, and writing were group-administered to all consented students in their classrooms. Children’s writing was assessed three times a year (fall, winter, and spring), whereas the language and literacy predictors (i.e., WJ-III Picture Vocabulary and Passage Comprehension, letter writing automaticity, and spelling) were assessed in the fall.

Results

Descriptive Statistics and Preliminary Analyses

The overall means for the various writing outcomes increased from fall to winter with sufficient variation around the means at each time point (see Table 1). Multivariate

Analysis of Variance (MANOVA) models revealed significant multivariate main effects for free and reduced lunch (Wilks' $\lambda = .80$, $F(30, 238) = 2.05$, $p = .002$) and children's language and speech impairment status (Wilks' $\lambda = .84$, $F(30, 234) = 1.51$, $p = .048$). Bonferroni correction ($p = .0028$) was applied in subsequent ANOVA results (see Table 1). Statistically significant differences were found between children with and without free and reduced lunch status in the quality of ideas in the spring and total number of words in the fall as well as fall reading comprehension (raw score) and vocabulary (raw and standard scores) (see Table 1). Furthermore, children with language and speech impairment had lower mean scores in quality of ideas and spelling in the fall, and organization in the spring than typically developing children.

Bivariate correlations among variables are presented in Table 2. Writing quality indicators (ideas and organization) were moderately to strongly related to one another at different time points ($.42 \leq r_s \leq .81$). Writing productivity indicators (number of words and number of ideas) were also moderately to strongly related to one another ($.35 \leq r_s \leq .89$). Vocabulary, reading comprehension, letter writing automaticity, and spelling were weakly to moderately related to one another ($.23 \leq r_s \leq .53$).

In order to address the research questions, multilevel growth models were employed because children were nested within classrooms, and multilevel models correct for standard errors and associated p-values (Hox, 2002; Raudenbush & Bryk, 2002). First, baseline models (also called unconditional models) were fitted to examine total variance attributable to child and classroom levels. Intraclass correlations, which reflect the proportion of variance in the outcome across different units of clustering, in children's written composition were as follows: .16 in the quality of ideas, .16 in the organization, .22

in the total number of words, .10 in the number of ideas, .13 in incorrect word sequences, .16 in the incorrect words, respectively. That is, approximately 10 to 22% of total variance in children's written composition was attributable to differences among classrooms.

Second, three multilevel growth models (using SAS 9.3 mixed procedure) were fitted for each written composition outcome to address the three corresponding research questions. The first model (Model 1) included children's free and reduced lunch status in addition to control variables, which were children's age, intervention treatment status, sex, racial backgrounds (White, Black, and Others; Black was the reference group). Interactions between Time and SES status were examined to determine whether growth rates in the outcome differed as a function of children's SES status. The second model (Model 2) included children's language and/or speech impairment status as a primary predictor after accounting for the control variables and SES status to address the second research question. The interaction between Time and children's language and/or speech impairment status was examined to examine whether growth rates differed as a function of children's language and/or speech impairment status. The final model (Model 3) included children's performance on the vocabulary and literacy tasks at the beginning of the year (fall) as well as all the variables in Model 2 in order to address the third research question. Raw scores were used for the language and literacy predictors to examine growth over time while controlling for differences in age in fall. It should be noted that random effect of growth rate was not estimated due to lack of variance for the number of words outcome and model 3 of the number of ideas outcome (see variance components in Table 3, 4, and 5).

Research Question 1: Are there differences in developmental trajectories in writing quality and productivity for children eligible for free and reduced lunch compared to those who are not after accounting for demographic variables?

When fitting models with Time in the model (not shown), children grew at .10 points per month, on average, in the quality of ideas and organization. The number of words in written composition grew approximately at a rate of 1.82 words per month whereas the number of ideas presented in written composition grew at a rate of .32 per month. The first set of models (M1) in Tables 3 and 4 shows the relation of children's SES status to the growth trajectories in the four aspects of written composition. Children's free and reduced lunch status was negatively related to their writing, after accounting for the control variables. That is, children with free and reduced lunch had lower quality of ideas and organization and fewer numbers of words and ideas in their written composition at the beginning of the year than children without free and reduced lunch status. The interaction between Time and free and reduced status was not statistically significant in any of the outcomes (not shown), indicating that growth rates in the four aspects of written composition did not differ as a function of free and reduced status.

Research Question 2: Are there differences in developmental trajectories in writing quality and productivity for typically developing children vs. children with language and/or speech impairment after accounting for control variables and SES?

Findings from M2 models in Tables 3 and 4 show that children with language and/or speech impairment have lower scores than typically developing children in the quality of ideas, organization, number of words, and number of ideas after accounting for control variables and free and reduced lunch status. For instance, children with language or

speech impairment had lower scores by .64 in the quality of ideas and wrote 7.32 fewer words, on average, than typically developing children. No statistically significant interactions were found between Time and language and/or speech impairment status, indicating that growth rates in the four aspects of written composition outcomes did not differ after accounting for other variables in the model.

Research Question 3: If developmental trajectories are different, do children’s vocabulary and literacy skills mediate the relations?

As seen in the third set of models (M3) in Tables 3 and 4, children’s reading comprehension was uniquely related to children’s performance in all the four aspects of written composition at the beginning of the year. Children’s letter writing automaticity was uniquely related to the quality of ideas, and number of words and ideas in written composition. Children’s spelling was uniquely related to the quality of ideas, organization, number of words, and number of ideas in written composition. In contrast, children’s expressive vocabulary was not uniquely related to the majority of outcomes and when it did, it had a suppression effect on the number of words and ideas after accounting for the other variables in the model.

Importantly, children with language and/or speech impairment had lower scores in the organization, the number of words and ideas after accounting for all these language and literacy skills, and the other demographic and free and reduced lunch status variables. Their average score in the quality of ideas was lower but did not reach the conventional statistical significance ($p = .07$). Free and reduced lunch status remained negatively related to the number ideas, but did not reach the statistical significance in number of words (p

= .06) after accounting for language and literacy skills, language and/or speech impairment status, and control variables.

Discussion

The overall goal of the present study was to examine how children's SES and language or speech impairment status were related to growth trajectories of first graders' narrative writing skills in writing quality and productivity, and whether vocabulary and literacy skills mediated the relations. As the Common Core Standards explicitly emphasize writing skills in several areas starting even in kindergarten, it was important to examine how potentially at-risk children might fare in writing in the beginning phase, and what skills mediated these relations.

Results of the present study revealed that children's free and reduced lunch eligibility was negatively associated with the vast majority of the writing outcomes after accounting for demographic control variables, indicating that first grade children from low SES families have lower scores in writing. However, the differences in the writing quality indicators appeared to be attributed to differences in vocabulary and literacy skills – the differences disappeared once vocabulary and literacy skills were included in the model. In particular, reading comprehension and spelling were uniquely and consistently related to writing quality and productivity, confirming previous studies (Abbott & Berninger, 1993; Graham et al., 1997). In contrast, vocabulary was not uniquely related to either writing quality or productivity in the present study, which is discrepant from previous studies (Coker, 2006; Juel, 1988). This discrepancy might be due to differences in study design such as different covariates included in these studies. One potential explanation for the lack of relation between vocabulary and writing was that the effect of vocabulary on writing

outcomes may have been shared with other predictors such as reading comprehension, given the role of vocabulary in reading comprehension (National Institute of Child Health and Human Development, 2000).

In contrast to writing quality, the gap in writing productivity was not explained away by the vocabulary and literacy skills included in the present study, such that children from poverty had lower performance in the number of ideas. For instance, children from low SES wrote, on average, .49 fewer ideas, after accounting for vocabulary and literacy skills, language and/or speech impairment status. This gap in the number of ideas might be partially explained by differences in background knowledge between children with and without free and reduced lunch status. Deficiencies in background knowledge have been documented for children from low SES backgrounds (Marzano, 2004), and thus, these children may not have as many different or rich ideas to draw on to include in writing.

Children with language and/or speech impairment lagged behind typically developing children in writing quality and productivity after accounting for children's demographic variables and SES backgrounds. Differences in idea development, however, disappeared once vocabulary and literacy skills were taken into account. In contrast, differences remained in the writing productivity and organization, such that children with language and/or speech impairment, on average, had .20 lower scores in organization, wrote 2.96 fewer words and .57 fewer ideas. These results are similar to Dockrell et al.'s (2009) study which found that adolescents with language impairment produced short texts and had poor organization. Our study further suggests that poorer organization in writing and shorter texts are apparent as early as in first grade for children with language and/or speech impairment. Previous studies suggest that this difference might be due to

information processing differences – children with language impairment have been shown lacking in effective coordination and management of different information (Ellis Weismer & Hesketh, 1996; Montgomery, 2000), which then interferes with text production (Berninger & Winn, 2006; Dockrell et al., 2009; Graham et al., 1997).

Our study further suggests that the impact of SES and language and/or speech impairment on writing skills is not uniform but depends on writing outcomes. It should be noted that we purposefully included various writing outcomes because they tap into different dimensions of writing skills, and have different goals and purposes. Writing quality and productivity are both important dimensions in determining overall quality of writing and have been used in many previous studies. In addition, the two writing quality indicators, ideas and organizations, are included in evaluating overall writing quality such as holistic scoring including National Assessment of Educational Progress (NAEP; Persky et al., 2003). The present study showed that although SES and language/speech impairment status do have an adverse impact on both writing quality and productivity, children from low SES and children with language/speech impairment are particularly vulnerable in the productivity dimension. Future replications are needed with different populations.

The present study also showed that differences in writing skills as a function of free and reduced lunch status, and language and/or speech impairment status were found only in the status, but not in the growth rates. That is, the gaps in various writing outcomes did not decrease or increase over the course of an academic year but remained constant. Thus, the disadvantages in writing skills faced by children from low SES and children with language and/or speech impairment in fall of first grade did not worsen during the school year. However, the nature of these relations and developmental patterns might change as

children's writing skills develop further when examined for a longer term – the gap in writing between children from low and high SES backgrounds might grow larger over their school careers because the influence of component skills of writing on children's written composition might change over time. For instance, language skills might have a larger role in written composition during a later phase of writing development, and thus differences in writing quality between children with high and low language skills, or for those with language impairment might grow larger over time. Future long-term longitudinal studies are needed to examine this possibility.

Limitation, Future Directions, and Implications

The present study followed children in first grade with assessment three times a year. This entailed several limitations. First, we were able to examine only linear, not nonlinear, trajectories. Longer term longitudinal studies with more than 3 waves of data will enable us to examine different patterns of trajectories (e.g., nonlinear). Second, the assessment was brief and limited to a single narrative prompt. Future studies in different genres (information, explanatory, or opinion) are needed. Also, the assessment of oral language was confined to an expressive vocabulary task. Given that oral language is a complex system with multiple components and a wide range of oral language skills have been suggested to be important for children's text production (Cragg & Nation, 2006; Craig & Washington, 2000; Dockrell et al., 2007), including other aspects of oral language at the sentence and discourse level would be informative. Fourth, the identification of children with language and/or speech impairment was determined by the school districts, and thus, the identification process and standards might be different from what has been used in previous research. However, given that children receive necessary services based on

district identification, findings of the present study provide useful information from an ecological perspective. Finally, we had combined the children of language impairment and speech impairment in the present study due to a limited number of children in each impairment type. A future study with a larger and more diverse sample would be needed to examine whether growth trajectories differ for children with language impairment, those with speech impairment, and those with language and speech impairment. A recent study with kindergarten children showed that children with language impairment did differ from children with speech impairment, who did not differ from typically developing children in writing (Puranik, Al Otaiba, & Ye, in press).

Given that the present study is correlational in nature, causal implications are precluded. However, the findings of the present study provide preliminary guidance for early instructional practice to meet the CCSS in writing for all students including those from low SES backgrounds and those with language and/or speech impairment. According to the findings in the present study, the gap in writing as a function of SES and language and/or speech impairment status is found early, in first grade, and does not increase over time, but is stable across first grade. Therefore, a timely targeted and intensive instruction or intervention is critical to narrow the initial gap in writing found in the beginning of first grade. It appears that effective instruction would incorporate basic foundational skills found in the present study – the language and literacy component skills of writing such as reading comprehension, spelling, and letter writing automaticity – with the three aspects of writing specified in the CCSS (i.e., creating different text types, describing writing, and using research). In other words, explicit, systematic, and intensive instruction in language and literacy component skills is needed to reduce the gap in writing quality between

typically developing children and their peers from high poverty backgrounds or who have language or speech impairment (see Myhill & Jones, 2009 for example). Although children's vocabulary was not uniquely related to written composition, this does not imply that vocabulary is not important, given accumulating evidence on the contribution of oral language to writing skills. In addition, children from low SES backgrounds might benefit from instructional attention to the productivity aspect of written composition. Although the amount of writing itself is not a goal of writing, certain amount of writing (number of words or ideas) is needed to sufficiently develop and elaborate ideas in written composition. Finally, children with language or speech impairment will likely need instruction support in various aspects of writing as well as in language and/or speech.

Acknowledgments

This work was supported by the grant P50 HD052120 from the National Institute for Child Health and Human Development. The opinions expressed are ours and do not represent views of the funding agencies. The authors wish to express appreciation to the participating schools, teachers, parents, and children.

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Table 1 Descriptive statistics

	N	Entire sample		FARL children	No FARL children	<i>F</i> (<i>p</i>)	Typically developing	Lang/ speech impairment	<i>F</i> (<i>p</i>)
		Mean (SD)	Min – Max	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
<i>Outcome Variables</i>									
Quality of ideas – F	304	2.57 (1.10)	0 - 5	2.44 (1.09)	2.90 (1.05)	7.70 (.006)	2.72 (.99)	1.78 (1.35)	10.66 (.001)
Quality of ideas – W	300	3.15 (.95)	0 - 5	3.04 (.90)	3.41 (1.03)	7.83 (.006)	3.23 (.88)	2.63(1.16)	3.00 (.09)
Quality of ideas – S	300	3.26 (1.00)	0 - 5	3.15 (.93)	3.55 (1.11)	12.16 (.001)	3.34 (.96)	2.78 (1.11)	4.49 (.04)
Organization – F	304	2.17 (.99)	0 - 4	2.07 (1.01)	2.42 (.89)	5.05 (.03)	2.28 (.90)	1.52 (1.17)	5.93 (.02)
Organization – W	300	2.79 (.86)	0 - 5	2.74 (.86)	2.89 (.85)	.47 (.49)	2.87 (.81)	2.35 (.97)	2.53 (.11)
Organization – S	300	2.81 (.87)	0 - 5	2.78 (876)	2.89 (.91)	.72 (.40)	2.90 (.82)	2.33 (1.03)	9.52 (.002)
Number of words– F	304	19.86 (10.71)	0 - 59	18.31 (10.06)	23.79 (11.37)	10.67 (.001)	20.99 (10.48)	13.61 (10.22)	4.93 (.03)
Number of words– W	300	30.72 (13.24)	0 - 72	30.04 (12.41)	32.44 (15.08)	.54 (.47)	31.98 (12.81)	23.17 (13.34)	6.32 (.01)
Number of words– S	300	32.20 (14.12)	0 - 77	31.12 (13.51)	34.99 (15.31)	3.66 (.06)	33.32 (13.76)	25.48 (14.60)	3.07 (.08)
Number of ideas - F	304	3.69 (2.10)	0 - 10	3.42 (2.04)	4.37 (2.10)	8.90 (.003)	3.88 (2.03)	2.63 (2.11)	2.67 (.10)
Number of ideas - W	300	5.61 (2.45)	0 - 14	5.50 (2.40)	5.89 (2.58)	.34 (.56)	5.82 (2.35)	4.30 (2.62)	4.77 (.03)
Number of ideas - S	300	5.90 (2.68)	0 - 14	5.72 (2.57)	6.36 (2.91)	2.35 (.13)	6.06 (2.61)	4.98 (2.91)	.52 (.47)
<i>Predictor Variables*</i>									
Letter writing auto	302	28.04 (14.78)	2- 87	27.20 (14.40)	30.15 (15.60)	2.29 (.13)	28.82 (14.07)	24.76 (17.99)	.28 (.60)
Spelling	300	153.73 (40.36)	0 - 215	148.82 (41.67)	165.95 (34.16)	7.41 (.007)	159.11 (34.00)	122.55 (58.22)	11.81 (.001)
Passage Comp – raw	304	11.27 (5.07)	1 - 30	10.47 (4.52)	13.30 (5.78)	14.23 (.000)	11.67 (5.11)	9.20 (4.30)	3.34 (.07)
Passage Comp – SS	304	93.94 (15.40)	42- 133	92.43 (15.10)	97.76 (15.55)	6.92 (.009)	95.33 (15.07)	86.63 (15.41)	7.86 (.005)
Vocabulary – raw	304	18.16 (2.93)	8 - 29	17.68 (2.55)	19.37 (3.43)	16.29 (.000)	18.36 (2.69)	17.30 (3.75)	1.01 (.32)
Vocabulary – SS	304	98.03 (9.95)	58- 128	96.66 (9.25)	101.53 (10.85)	13.62 (.000)	98.83 (9.15)	94.52 (12.53)	2.83 (.09)

Note: F = Fall; W = Winter; S = Spring; IWS = Incorrect Word Sequence; IW = Incorrect Word; auto = automaticity; Passage Comp = Woodcock Johnson-III Passage Comprehension; Vocabulary = Woodcock Johnson-III Picture Vocabulary ; *All were assessed in the fall.

Table 2 Bivariate correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Q idea F	---														
2. Q idea W	.52	---													
3. Q idea S	.48	.51	---												
4. Org F	.81	.45	.45	---											
5. Org W	.48	.70	.43	.44	---										
6. Org S	.47	.42	.68	.44	.42	---									
7. TNW F	.75	.41	.48	.66	.39	.42	---								
8. TNW W	.42	.68	.43	.36	.56	.38	.44	---							
9. TNW S	.41	.47	.72	.36	.38	.59	.51	.60	---						
10. N idea F	.74	.39	.43	.68	.35	.37	.88	.36	.41	---					
11. N idea W	.40	.66	.42	.35	.54	.38	.41	.87	.55	.35	---				
12. N idea S	.42	.44	.68	.40	.38	.56	.51	.56	.89	.44	.55	---			
13. RComp F	.44	.34	.36	.43	.33	.31	.44	.26	.26	.40	.24	.26	---		
14. Vocab F	.24	.21	.21	.20	.15	.22	.21	.15	.10	.17	.12	.08	.43	---	
15. Letter F	.27	.21	.26	.24	.17	.17	.28	.24	.23	.24	.22	.23	.29	.23	---
16. Spell F	.59	.48	.45	.59	.43	.44	.49	.35	.33	.45	.32	.32	.53	.42	.27

Note: Q Idea = Quality of Ideas; Org = Organization; Q hand = Quality of handwriting; TNW = Total number of words written; N idea = number of ideas; IWS = Incorrect word sequence; IW = Incorrect words; pp = proportion; LWID = WJ-III Letter Word Identification; RComp = WJ-III Passage Comprehension; Vocab = WJ-III Picture Vocabulary; Letter = Letter writing automaticity; F = Fall; W = Winter; S = Spring; Coefficients $\leq .11$ are not statistically significant at .05 level; Coefficients $\leq .16$ are not statistically significant at .0031 level after Bonferroni correction.

Table 3 Results of multilevel growth models on the quality of ideas and organization

	Quality of Ideas			Organization		
	M1	M2	M3	M1	M2	M3
<i>Fixed effects</i>						
Intercept	3.70 (.86)***	3.13 (.84)***	1.73 (.71)*	2.40 (.76)**	1.90 (.73)*	.78 (.64)
Time	.10 (.009)***	.10 (.009)***	.10 (.009)***	.10 (.008)***	.10 (.008)***	.10 (.008)***
Male	-.21 (.09)*	-.17 (.09)	-.14 (.08)	-.11 (.08)	-.05 (.08)	-.02 (.07)
White	.12 (.11)	.06 (.11)	.10 (.09)	.002 (.10)	-.05 (.10)	.001 (.08)
Others	.05 (.16)	.07 (.15)	.18 (.13)	.05 (.14)	.05 (.14)	.15 (.11)
Treatment	.08 (.09)	.07 (.09)	.09 (.07)	.06 (.08)	.04 (.08)	.04 (.07)
Age	-.14 (.14)	-.03 (.13)	-.13 (.11)	-.02 (.12)	.08 (.12)	-.006 (.10)
FARL	-.40 (.11)***	-.44 (.11)***	-.16 (.09)	-.22 (.10)*	-.24 (.10)**	-.01 (.09)
Lang or Speech imp.		-.64 (.13)***	-.20 (.11)		-.61 (.12)***	-.20 (.10)*
Reading comp			.03 (.009)**			.03 (.008)**
Vocabulary			-.02 (.01)			-.02 (.01)
Letter writing			.008 (.003)**			.004 (.002)
Spelling			.01 (.001)***			.009 (.001)***
<i>Variance components</i>						
Children	.47 (.04)***	.47 (.04)***	.48 (.04)***	.49 (.04)***	.49 (.04)***	.49 (.04)***
Teachers				.03 (.03)	.02 (.02)	.02 (.02)
Intercept	.67 (.11)***	.59 (.11)***	.25 (.09)**	.45 (.10)***	.40 (.10)***	.11 (.08)
Rate	.004 (.002)	.004 (.002)	.004 (.003)	.001 (.002)	.001 (.002)	.00 (.002)
Intercept & rate covariance	-.03 (.01)*	-.026 (.013)	-.01 (.01)	-.02 (.01)	-.01 (.01)	.001 (.01)

Note: FARL = Free and Reduced Lunch; Lang and Speech imp. = Language and speech impairment; Reading comp = reading comprehension; Letter writing = letter writing automaticity; Inter = Intercept

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4 Results of multilevel growth models on the number of words and ideas

	Number of words			Number of ideas		
	M1	M2	M3	M1	M2	M3
<i>Fixed effects</i>						
Intercept	28.72 (8.66)***	23.52 (8.55)**	13.04 (8.42)	5.22 (2.40)*	4.02 (2.37)	2.00 (1.62)
Time	1.83 (.14)***	1.82 (.14)***	1.81 (.13)***	.33 (.06)***	.32 (.06)***	.33 (.03)***
Male	-2.00 (.95)*	-1.49 (.94)	-1.01 (.90)	-.57 (.26)*	-.48 (.26)	-.16 (.17)
White	1.47 (1.17)	.88 (1.15)	1.29 (1.10)	-.18 (.32)	-.28 (.31)	-.07 (.21)
Others	-0.73 (1.60)	-.72 (1.57)	.01 (1.49)	-.37 (.45)	-.35 (.44)	-.05 (.29)
Treatment	1.93 (.92)*	1.72 (.92)	1.78 (.87)	.63 (.26)*	.56 (.26)*	.37 (.17)*
Age	-1.14 (1.38)	-.03 (1.37)	-.98 (1.28)	-.15 (.38)	.09 (.38)	-.05 (.25)
FARL	-4.82 (1.32)***	-4.93 (1.24)***	-2.18 (1.15)	-1.00 (.32)**	-1.08 (.31)***	-.49 (.22)*
Lang or Speech imp.		-7.32 (1.41)***	-3.52 (1.37)*		-1.32 (.37)***	-.59 (.26)*
Reading comp			.38 (.10)***			.06 (.02)**
Vocabulary			-.35 (.18)*			-.07 (.03)*
Letter writing			.13 (.03)***			.02 (.006)***
Spelling			.08 (.01)***			.01 (.003)***
<i>Variance components</i>						
Children	87.51 (5.21)***	86.31 (5.16)***	76.66 (4.59)***	3.44 (.20)***	3.44 (.20)***	3.07 (.18)***
Teachers	9.35 (4.49)*	6.31 (4.04)	3.18 (2.75)	.09 (.31)	.03 (.23)	.08 (.09)
Intercept	2.20 (.30)***	2.13 (.28)***	1.84 (.24)***	.89 (.65)	.73 (.63)	.06 (.008)***
Rate				.80 (.05)***	.80 (.05)***	
Intercept & rate covariance				.26 (.02)***	.25 (.02)***	

Note: FARL = Free and Reduced Lunch; Lang and Speech imp. = Language and speech impairment; Reading comp = reading comprehension; Letter writing = letter writing automaticity; Inter = Intercept

* $p < .05$, ** $p < .01$, *** $p < .001$