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Dimensions of discourse level oral language skills and their relation to reading comprehension and written composition: an exploratory study

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Abstract We examined the relations of discourse-level oral language skills [i.e., listening comprehension, and oral retell and production of narrative texts (oral retell and production hereafter)] to reading comprehension and written composition. Korean-speaking first grade students ($N = 97$) were assessed on listening comprehension, oral retell and production, word reading, spelling, handwriting fluency as well as reading comprehension and written composition. Listening comprehension, and oral retell and production tasks were best described as having a bi-factor structure, capturing a general discourse-level oral language construct as well as unique listening comprehension and oral retell constructs which are not explained by the general discourse-level oral language skill. The general discourse-level oral language skill was related to reading comprehension whereas listening comprehension and oral retell were not. Although positive in direction, the general discourse-level oral language skill did not reach the conventional statistical significance in relation to writing quality. These findings suggest that the general discourse-level oral language skill underlying listening comprehension, and oral retell and production tasks is important for reading comprehension, and unique listening comprehension and oral retell skills that are not subsumed to the general discourse-level oral language skill do not independently contribute to reading comprehension.

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Introduction

Successful reading comprehension and written composition are two ultimate goals of literacy acquisition and instruction. For a child to achieve these two skills, a complex set of skills is needed including oral language skills (Berninger, Abbott, Abbott, Graham, & Richards, 2002; Cain, 2007; Cain, Oakhill, & Bryant, 2004; Kim, in press; Kim, Park, & Wagner, 2014b; Vellutino, Tunmer, Jaccard, & Chen, 2007). In the present study, we extend our understanding of the relation of oral language to reading comprehension and written composition in two ways. First, we examined dimensionality of oral language skills at the extended discourse level (i.e., multiple utterances including narrative comprehension and production, McGee & Richgels, 1996). Then, we examined how identified dimensions of discourse-level oral language skills are related to reading comprehension and written composition. While there are multiple aspects of oral language skills such as vocabulary, syntactic knowledge, and discourse-level skills (Apel & Apel, 2011; Berninger et al., 2002; Moats, 2000), in the present study, we focused on the discourse level skills because emerging evidence suggests that a discourse-level oral language skill such as listening comprehension captures lower-level language skills such as vocabulary and syntactic knowledge as well as cognitive skills such as working memory, inference-making, and comprehension monitoring (Florit, Roch, Altoè, & Levorato, 2009; Kim, in press; Kim & Phillips, 2014; Lepola, Lynch, Laakkonen, Silven, & Niemi, 2012; Tompkins, Guo, & Justice, 2013). Listening comprehension has been shown to be related to reading comprehension (Hagtvet, 2003; Hoover & Gough, 1990; Joshi, Tao, Aaron, & Quiroz, 2012; Kendeou, van den Broek, White, & Lynch, 2009; Kim, in press; Kim, Wagner, & Lopez, 2012; Tunmer & Chapman, 2012). In addition, oral retell and production (e.g., narrative skill) have been examined widely as important oral language skills, and for their contributions to literacy skills (e.g., Curenton, Craig, & Flanigan, 2008; Dickinson & Tabors, 1991; Justice, Bowles, Pence, & Gosse, 2010; Justice, Kaderavek, Ukrainetz, Eisenberg, & Gillam, 2006; Kang, Kim, & Pan, 2009; McCabe & Peterson, 1991; McCabe & Rollins, 1994; Pankratz, Plante, Vance, & Insalaco, 2007; Scott & Windsor, 2000; Shapiro & Hudson, 1991; Ukrainetz et al., 2005). In the present study, we included listening comprehension, and oral retell and production of narrative tasks as measures of discourse-level oral language skills. Note that we use the term, oral language, to refer to a broad range of oral language skills including lexical, sentence, and discourse-level skills. The term, listening comprehension, is used to refer to comprehension of oral texts at the discourse level (e.g., a narrative story). Oral retell is used to refer to discourse-level oral retell of narrative texts—children's ability to hear a story and to tell the story back to the assessor. Oral production refers to oral production of narrative texts, which is typically assessed by asking the child to tell a story that goes with stimuli (e.g., illustrations).

Oral language skills are foundational for children's literacy acquisition. For reading comprehension, the simple view of reading states that linguistic comprehension and word reading are essential and necessary (Gough, Hoover, & Peterson, 1996; Gough & Tunmer, 1986; Hoover & Gough, 1990). For written composition, the simple view of writing hypothesizes that ideation and transcription are two necessary component skills whereas the not-so-simple view of writing (Berninger & Amtmann, 2003; Berninger & Winn, 2006) proposes text generation, executive function, and transcription. Oral language is a key skill for the ideation component of the simple view of writing (Juel, Griffith, & Gough, 1986) and the text generation component of the not-so-simple view of writing (Berninger & Amtmann, 2003; Berninger & Winn, 2006) because generated ideas have to be translated into oral language before they are transcribed into written output. Studies have supported the relation of discourse-level oral language skill to reading comprehension and writing–listening comprehension to reading comprehension (Hagtvet, 2003; Hoover & Gough, 1990; Joshi et al., 2012; Kendeou et al., 2009; Kim, in press; Kim et al., 2012, 2014b)—and oral retell to reading comprehension (Berninger & Abbott, 2010; Pankratz et al., 2007; Snow, Porche, Tabors, & Harris, 2007) and writing (Berninger & Abbott, 2010). However, a more precise and nuanced understanding is needed about the nature of their relations. In particular, Berninger and Abbott (2010) conceptualized oral language and written language in terms of receptive and expressive modes—receptive oral language, expressive oral language, receptive written language (reading comprehension), and expressive written language (written composition)—and hypothesized that receptive oral language and expressive oral language would be independently related to reading comprehension and written composition. Using data from English-speaking children in elementary and middle schools, Berninger and Abbott (2010) found that both receptive oral language (operationalized as a sentence comprehension task) and expressive oral language (operationalized as an oral retell task) were uniquely related to reading comprehension and written composition, although some inconsistency was found across grades and cohorts. Berninger and Abbott's (2010) study suggests that 'comprehension' (or receptive) and 'retell/production' (or expressive) aspects of oral language independently contribute to reading comprehension and writing. However, Berninger and Abbott (2010) assumed dissociability of receptive and expressive oral language, and did not empirically examine whether comprehension and retell/production are distinct dimensions. Interestingly, the simple view of reading specifically identified the 'comprehension' aspect of oral language as a necessary component of reading comprehension. In contrast, theoretical models of writing (i.e., the simple view of writing and not-so-simple view of writing) did not identify specific mode of language (comprehension or production). One natural question, then, is dimensionality or factor structure of discourse-level oral language skills—whether comprehension and retell/production are separate constructs. If they are, it is important to examine their relations to reading comprehension and written composition.

Dimensionality of discourse-level oral language has rarely been examined (see Tomblin & Zhang, 2006 for dimensionality of vocabulary and syntactic knowledge). An exception is Gillam and Pearson (2004), who examined dimensionality of

listening comprehension, oral retell, and oral production tasks. They found that these tasks captured two related but dissociable constructs of listening comprehension, and oral retell and production for English-speaking children aged 5–11. In the present study, we investigated dimensionality (or factor structure) of listening comprehension, and oral retell and production, and extend Gillam and Pearson's (2004) study by systematically comparing four alternative models (see Fig. 1): (Model 1) a unidimensional, single factor model in which children's performances on listening comprehension tasks, and oral retell and production tasks were hypothesized to describe a single dimension—one discourse-level oral language factor explains children's performance on these tasks; (Model 2) a multi-dimensional, two factor model in which listening comprehension, and oral retell and production were hypothesized to be two related but dissociable dimensions; (Model 3) a multi-dimensional second-order model in which a second-order oral language dimension is indicated by the two first-order factors, listening comprehension and oral retell; and (Model 4) a bi-factor model (Chen, West, & Sousa, 2006) with a general discourse-level oral language skill dimension as well as two distinct listening comprehension and oral retell dimensions that are not subsumed by the general discourse-level oral language skill. Note that Gillam and Pearson (2004) reported that the two factor model (Model 2) fit their data well, but did not report any information about other alternative models.

Once dimensionality was identified, identified dimensions were examined as predictors of reading comprehension and writing quality outcomes, respectively, in subsequent structural equation models. For the reading comprehension outcome, identified oral language dimensions and word reading were included as predictors, following the simple view of reading (Hoover & Gough, 1990). For the written composition outcome, identified oral language dimensions and transcription skills such as spelling and handwriting fluency were included as predictors according to the simple view of writing (Berninger & Swanson, 1994; Juel et al., 1986). Based on Gillam and Pearson's findings (2004), we expected that multiple factor models might fit data better than a single factor model. However, we did not have a priori hypothesis about which multi-dimensional models (i.e., Models 2, 3, and 4) would fit data best. We further hypothesized that if listening comprehension and oral retell and production are two separate constructs, listening comprehension might be more strongly related to reading comprehension than to writing, given much evidence about the relation of listening comprehension to reading comprehension (e.g., Adlof, Catts, & Little, 2006; Hoover & Gough, 1990; Joshi & Aaron, 2000; Joshi et al., 2012; Kim, in press) and evidence that oral retell may not be an adequate measure of reading comprehension (Reed & Vaughn, 2012; Reed, Vaughn, & Petscher, 2012). To address these research questions, data from Korean-speaking first-grade children were used. Below is a brief description of the Korean language and writing system.

Characteristics of the Korean language and writing system

Unlike English, Korean is a predicate-final language with Subject–Object–Verb basic word order. Grammatical subjects are commonly omitted when they are clear

in the context. It has agglutinative morphology such that particles and/or suffixes are attached to nominal or predicate stems (Sohn, 1999). The syllable has a simple (C)V (C) structure.

The writing system in the Korean language is alphabetic, called Hangul. Hangul is relatively transparent and consists of 24 basic alphabet letters (10 vowel letters and 14 consonant letters) and 16 complex letters (11 complex/diphthong vowel letters and 5 double consonant letters; Kim, 2010). Hangul is also syllabary, called alpha-syllabary (Taylor, 1980) such that phonemic as well as syllable information is represented in writing. Furthermore, letters are composed in a nonlinear manner to form a character (syllable). Like English, Korean has a morphophonemic system, and when morphemic information is in conflict with phonological information, letter-sound principle is typically overridden by morphological information (see Kim, 2010 for further details).

Methods

Participants

A convenience sample of 97[1] first-grade children participated in the study (51 % girls; *M* age = 6.92 years old, *SD* = .28, ranging from 6.41 to 7.42). These children were from four classrooms in a single public school in a metropolitan city in South Korea. Socioeconomic information from individual children was not available, but the majority of children were from middle class families according to school personnel. All children were Korean native speakers without any reported language delay or hearing difficulties.

As shown in Table 1, the participating children were all readers and writers despite the fact that they were assessed 3 months into academic year. This is not surprising, given previous reports that even prekindergarten and kindergarten-aged children from various socio-economic families in Korea were able to read and spell words, and comprehend passages (Kim, 2009, 2010, 2011a, 2011b; Kim et al., 2014b). This is attributed to the fairly transparent orthography of the Korean language as well as the fact that majority of children in Korea receive early literacy instruction in preschool and kindergarten (Kim, 2010, 2011a, 2011b).

Measures

Due to lack of standardized and normed language and literacy measures in the target skills in Korean, experimental measures from previous studies were used (Kim, 2011a; Kim et al., 2014b). Multiple measures were used to assess a construct to employ a latent variable approach as an analytical strategy. This is advantageous to using a single task per construct because the latent variable approach captures

[1] A post hoc statistical power analysis suggests that the sample size of 97 allows detecting effect size of .21 at the power of .80 and *p* value of .05 level for the given number of observed variables and latent variables used in the present study.

Table 1 Descriptive statistics

	M (*SD*)	Min.–max.	Skewness	Reliability	Loading
Writing quality					
Pet prompt ideas	3.24 (1.30)	1–6	.45	.90[a]	.96
TV prompt ideas	3.07 (1.31)	0–6	.09		.67
Pet prompt organization	3.54 (1.31)	1–6	.26	.92[a]	.91
TV prompt organization	3.18 (1.29)	0–6	−.19		.67
Reading comprehension					
Passage 1	3.90 (1.20)	0–5	−1.30	.46	.67
Passage 2	4.95 (1.58)	0–6	−1.76	.70	.82
Cloze task	16.85 (3.27)	6–21	−1.08	.74	.62
Oral retell and production quality					
Retell task 1	4.62 (3.57)	0–14	.48	.96[a]	[c]
Retell task 2	6.70 (3.62)	0–14	−.22		[c]
Production task 1	7.14 (2.09)	0–12	−.75		[c]
Production task 2	4.36 (1.96)	0–12	.60		[c]
Listening comprehension					
Task 1	26.03 (3.82)	10–33	−.93	.62	[c]
Task 2	15.90 (2.69)	4–19	−1.41	.66	[c]
Word reading					
Word identification	30.54 (3.20)	21–34	−1.18	.76	.84
Nonword reading	31.10 (6.52)	5–40	−1.25	.86	.91
Word reading fluency 1	41.23 (11.45)	10–60	−.33	.86–.92[b]	.94
Word reading fluency 2	39.92 (11.97)	8–60	−.32		.97
Word reading fluency 3	40.00 (12.40)	11–60	−.31		.92
Handwriting fluency					
Sentence copying 1	59.05 (22.70)	23–144	1.20	.93[a]	.92
Sentence copying 2	66.90 (22.91)	28–135	1.01		.67
Spelling (total)	18.94 (5.03)	0–28		.91	
Spelling: odd items	10.85 (2.62)	0–15	−1.89	.80	.93
Spelling: even items	8.09 (2.67)	0–13	−.57	.76	.86

Unless otherwise noted, reliability estimates are Cronbach's alphas

[a] Inter-rater agreement; inter-rater agreement for quality of ideas was established across both prompts; so was quality of organization. Inter-rater agreement for the oral retell and production quality was established across the four tasks

[b] Alternate form reliability (i.e., correlations among tasks; see Table 2)

[c] See Fig. 2

common variance among measures, reducing measurement error (Kline, 2005), which is important for a task effect in reading comprehension (Cutting & Scarborough, 2006; Keenan, Betjemann, & Olson, 2008) and a prompt effect in writing (Graham, Harris, & Hebert, 2011). Note that reliability estimates of a few measures were somewhat low (e.g., $\alpha = .62$ in listening comprehension task 1). However, impact of low reliability is minimized in a latent variable approach.

Written composition

The child was asked to write on two experimental prompts. The first prompt was adapted from previous studies. In this prompt, the children were asked to write about a class pet—what animal will be best suited as a class pet and why (Kim, Al Otaiba, Wanzek, & Gatlin, in press; Wagner et al., 2011). In the other prompt, the children were asked to write about their favorite TV program with the following direction:

> We will do another writing task today. Today's topic is my favorite TV program. I want you to write about what your favorite TV program is, and why you like the program. You can write in detail about who characters are and what they do. You have 15 min to write. Begin.

Children's written compositions were evaluated in terms of quality, which was examined using two indicators, ideas and organization (Kim, Al Otaiba, Sidler, & Greulich, 2013a; Kim et al., 2014b; Olinghouse & Graham, 2009). Idea development and organization were scored on a scale of 0 (unscorable) to 6 (exceptional), which was adapted from the 6 point scale of the 6 + 1 Trait System (Kozlow & Bellamy, 2004; see Northwest Regional Educational Laboratory, 2011, for details). Recent evidence indicated that the extent to which ideas and organization were developed in children's written composition captures writing quality (Kim, Al Otaiba, Sidler, Greulich, & Puranik, 2014a; Kim et al., in press). Forty-eight writing samples were randomly selected for inter-rater agreements (exact percent agreements).

Reading comprehension

Three previously used tasks were employed to assess children's reading comprehension (Kim, 2011a; Kim et al., 2014a). In the first two tasks, the child was asked to read short passages ("Left and right shoes" with 298 syllables; "Minsoo's birthday" with 252 syllables) and asked 5 open-ended and 6 multiple choice comprehension questions, respectively. These passages had been developed considering age-appropriateness in terms of topic familiarity and sentence structures, which were verified by the research team including two early childhood educators. The last task was an oral cloze task, originally adapted from the Woodcock–Johnson III Passage Comprehension subtest (Woodcock, McGrew, & Mather, 2001). In this task, the child was asked to read sentences or short passages and to provide a missing word. There were 21 test items and 3 practice items. Children were asked to read passages and questions, and to provide answers orally.

Listening comprehension

Two tasks from a previous study (Kim et al., 2014a) were used. These two tasks were originally adapted from the Listening Comprehension Scale of Oral and Written Language Scale (OWLS; Carrow-Woolfolk, 1995) and Paragraph Comprehension subtest of Comprehensive Assessment of Spoken Language (CASL;

Carrow-Woolfolk, 1999). Adaptation included translation of items into Korean with necessary modifications for cultural appropriateness. In the adapted OWLS task, children heard sentences or short stories and were asked to point to the picture that best described the heard sentences. In the adapted CASL task, after hearing short stories, children were asked questions and were asked to point to the picture that best responds to the questions. There were 34 test items with two practice items in the first task, and 19 test items with 1 practice item in the second task.

Oral retell and production

Two retell and two productions tasks were used. In the retell tasks, children heard a story and were asked to tell the story back to the assessor as best as they can. The first story, entitled "japchae noodles," contained 598 syllables and did not have accompanying illustrations. The second story, entitled "a frog's day," had 570 syllables and had five accompanying illustrations which showed a sequence of the story. In the first oral production task, the child was shown four illustrations of a sequence of events (a story involving a duck and a boy) and was asked to tell a story that would go with the pictures. They were told that a story typically has a beginning, middle, and ending. The second oral production task had a single illustration (two children encountering a dragon), and the child was asked to create and tell a story that would go with the picture. Children's produced stories were digitally recorded, and were transcribed verbatim in utterances (i.e., those that contain a subject and a predicate; however, when a predicate is present without a subject, it was considered as an utterance. This is particularly important in Korean in which a subject is commonly omitted when it is understood in context).

Story quality was coded using children's retell and production data. Quality was the extent to which the following story elements were included in the retell and production tasks: Characters, time, location, problem, resolution, and important events (e.g., Barnes, Kim, & Phillips, 2014). Each element was rated on a scale of 0–2. A score of 0 was assigned if the element was not included; a score of one was given if the element was included but was not precise; and a score of two was given if the element was included and precise. For instance, for the character element in the japchae noodles story, a score of 2 was assigned if all the three characters were mentioned and the main boy character was named; a score of 1 was assigned if only two characters are mentioned and/or if the main character's name was not mentioned; and a score of 0 was assigned if characters were not mentioned or a wrong character was mentioned. The number of important events was a priori identified and varied in each story and was given a one point for each important detail included. A total possible score from all the four retell and production tasks was 56. A total of 48 oral retell and production samples were used to estimate inter-rater agreement rates.

Word reading

Children's word reading skills were assessed by two accuracy measures and three fluency measures (i.e., timed tasks). Word identification and nonword reading were

modified from an earlier study (Kim, 2011b—modification involved including more challenging words such as orthographically opaque words) to assess children's accuracy in word reading and decoding. In the former, the child was asked to read aloud increasingly difficult words. There were 3 practice items and 34 test items. All the test items were multi-syllabic words (2–4 syllables) and many items included orthographically opaque words. In the nonword reading task, children were asked to read each nonword aloud accurately. They were told that the words were not real, but made-up words. There were 3 practice items and 40 test items with multi-syllabic words.

In the timed word reading tasks (word reading fluency), children were presented with words in a list and asked to read aloud words as fast and accurately as possible within 40 s. Words in each task were taken from a story, and they were randomly arranged (see Kim et al., 2014a). Therefore, difficulty of words did not increase progressively. There were a total of 60 items in each task, ranging from 175 to 195 in syllables. The number of accurately read items in 40 s was the child's score. There were four practice items.

Handwriting fluency

Two sentence copying tasks were used, modeling after previous studies with English-speaking children (e.g., Berninger & Swanson, 1994; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Kim et al., 2011; Wagner et al., 2011). In this task, the sentence, "A goblin[2] jumped high into the sky" (도깨비가 하늘위로 껑충 뛰어 올라갔습니다) was shown on the blackboard, and the children were asked to write the sentence as accurately and rapidly as possible within 1 min. The number of correctly written syllables was counted. Thirty student samples were randomly selected for inter-rater agreements (exact percent agreements).

Spelling

Children's spelling ability was assessed using a dictation task, which was slightly modified from an earlier study (Kim, 2010; modification involved inclusion of more challenging words such as orthographically opaque words). The items in the spelling task in Kim (2010) were selected from Korean language textbooks as well as a corpus of the most frequent 5,000 words in Korean adults' texts. Items included orthographically transparent and opaque words (which included various phonological shifts, see Kim & Petscher, 2013, for details) that ranged from two to four syllables. For each item, the assessors read aloud a target word, the target word used in a sentence, followed by the target word read aloud again. There were a total of 30 items. In the structural equation model analysis below, we divided items into odd and even numbered ones (15 items each) to create a latent variable. Cronbach's alpha estimates for the odd and even numbered items were adequate (see Table 1).

[2] We expected children to be familiar with the word, goblin, because of its high frequency in Korean folk tales.

Procedure

The majority of assessments were administered individually in two sessions, each session lasting approximately 30–40 min. The order of individual assessments varied across children. Spelling, handwriting fluency, and writing tasks were group administered in two sessions. In the first session, the spelling task, the sentence copying task, and one writing prompt were administered. Approximately a week later, children were administered the sentence copying and the second writing prompt. Unless otherwise noted, children's answers were scored dichotomously (1 = correct; 0 = incorrect) for each item.

Data analytic strategy

Primary data analytic strategy was confirmatory factor analysis (CFA) and structural equation modeling. Assumptions (univariate and multivariate normality) were checked and met. Note that in the bi-factor model (Model 4), the general oral language and specific dimensions (i.e., listening comprehension and oral retell) are specified to be unrelated with each other so that the two specific dimensions are unique constructs from what is shared by the general oral language construct. The following indices are reported as indicators of model fits: Chi square, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residuals (SRMR). Typically, RMSEA values below .08, CFI and TLI values ≥.95, and SRMR ≤.05 indicate an excellent model fit (Hu & Bentler, 1999). In addition, TLI and CFI values $>$.90 are considered to be acceptable (Kline, 2005). Differences in model fits for two nested models were evaluated by comparing Chi square differences between the two models as well as comparing AIC and BIC values. All the analyses were conducted using MPLUS 7 (Muthén & Muthén, 2012).

Results

Descriptive statistics

Descriptive statistics are presented in Table 1. Mean scores in ideas and organization of written composition were approximately 3 with sufficient variation around the means (*SD*s ranging from 1.29 to 1.31 for the pet and TV prompts). Children wrote approximately six sentences, on average, with large variation (*SD*s = 4.50 and 5.07 for the pet and TV prompts, respectively).

Mean scores in reading comprehension tasks ranged from 3.90 to 16.85 and standard deviations from 1.20 to 3.27. Children's average oral retell quality ranged from 4.36 to 7.14. There was large variation around the average number of utterances in the four retell and production tasks ($M = 11.55$ utterances with *SD* of 9.30). Children's performances on the listening comprehension, spelling, and handwriting automaticity, and word reading tasks had sufficient variations with

symmetric distributions. A few tasks (e.g., word reading, spelling, reading comprehension) had skewness values >1. In analysis reported here, raw scores were used in the analysis because skewness was not severe and transformations did not change distribution patterns.

Table 2 shows bivariate correlations among observed variables. Listening comprehension tasks ($.29 \leq rs \leq .47$) and word reading tasks ($.22 \leq rs \leq .55$) were weakly to moderately related to reading comprehension tasks. Oral retell and production tasks were also weakly to moderately related to reading and writing tasks ($.11 \leq rs \leq .39$). Sentence copying tasks were not related to ideas and organization quality of writing ($.20 \leq rs$) whereas spelling tasks were weakly to moderately related to writing ($.32 \leq rs \leq .55$).

Discourse-level oral language factor structure

To examine factor structure of listening comprehension, and oral retell and production tasks, four alternative models[3] were compared using CFA: (Model 1) oral retell and listening comprehension as a single latent variable; (Model 2) oral retell and listening comprehension as two separate, but related latent variables; (Model 3) oral retell and listening comprehension as two separate latent variables indicated by a higher second order factor, oral language, and (Model 4) finally, a bi-factor model, in which oral retell and listening comprehension tasks were hypothesized to have a general discourse-level oral language factor as well as unique oral retell and listening comprehension factors that are not subsumed by the general discourse-level oral language factor. Based on preliminary analyses, residual variances of the listening comprehension task 1 and the frog oral retell were set at zero in CFA and SEM analyses because they were negative. As shown in Table 3, the unidimensional model did not have a good fit. Although the other three multi-dimensional models had good fits to the data, the bi-factor model (Model 4) was superior to the other alternative models when using the Chi square test [$8.52 \leq \Delta\chi^2$ (Δdfs = 0–2) ≤ 21.26, $p \leq .001$] and AIC and BIC comparisons (e.g., 2,573.62 and 2,802.55 for the two factor model vs. 2,745.11 and 2,794.03 for the bi-factor model). Standardized loadings of the bi-factor model are displayed in Fig. 2. All the indicators were significantly related to the general discourse-level oral language latent variable, listening comprehension, and oral retell with loadings ranging from .28 to .93. However, for the oral retell and production latent variable, loadings of the two production tasks were not statistically significant ($ps > .10$). Therefore, in subsequent analysis of structural relations, the two nonsignificant paths of oral production were removed from the oral retell and production latent variable and this latent variable is referred to as 'oral retell' hereafter.

[3] Prior to examining the four alternative models, confirmatory factor analysis was conducted to examine whether oral retell and production tasks are best considered as separable skills. Both single factor model and two factor model had excellent fit to the data. In addition, the Chi square different test was on the cut point ($p = .05$) and differences in AIC (2.11) and BIC (3.04) values between two alternative models were small. Therefore, for parsimony, oral retell and production were considered as a single construct in confirmatory factor models of four alternative models.

Table 2 Correlations among observed variables

	1	2	3	4	5	6	7	8	9	10
1. Pet ideas	1									
2. Pet org	.88***	1								
3. TV ideas	.57***	.62***	1							
4. TV org	.56***	.62***	.79***	1						
5. RC1	.36***	.40***	.36***	.35***	1					
6. RC2	.22*	.25*	.26*	.35***	.42***	1				
7. RC3	.34***	.38***	.30***	.35***	.51***	.55***	1			
8. Retell 1	.38***	.35***	.25*	.27**	.30**	.30**	.39***	1		
9. Retell 2	.25*	.25*	.26*	.26**	.29**	.25*	.41***	.67***	1	
10. Prod1	.30**	.28**	.27**	.24*	.25*	.21*	.34**	.42***	.39**	1
11. Prod2	.24*	.23*	.18	.14	.25*	.11	.11	.43***	.47***	.43**
12. LC1	.20*	.16	.30**	.28**	.46***	.32**	.45**	.24*	.28**	.35***
13. LC2	.17	.10	.21*	.19	.29**	.31**	.47***	.24*	.34**	.34**
14. Word	.26**	.30**	.25*	.27**	.47***	.41***	.47***	.33**	.24*	.22*
15. Pseudo	.36***	.38***	.28**	.28**	.55***	.47***	.55***	.37***	.27**	.20*
16. WRE1	.25*	.33***	.22*	.24*	.40***	.30**	.49***	.34***	.40***	.27**
17. WRE2	.29**	.38**	.24*	.25*	.43***	.25*	.46***	.31**	.38***	.28**
18. WRE3	.30**	.36***	.27**	.21*	.41***	.22*	.45***	.34***	.40***	.33**
19. S copy 1	.10	.05	.02	−.20	−.02	−.02	.08	.05	.02	.03
20. S copy2	.16	.11	.06	−.12	.09	.04	.11	−.02	.01	.03
21. Spell O	.51***	.55***	.40***	.34***	.58***	.31**	.57***	.35***	.36***	.32**
22. Spell E	.49***	.50***	.41***	.32**	.48***	.28**	.46***	.33***	.31**	.26**

Table 2 continued

	11	12	13	14	15	16	17	18	19	20	21
1. Pet ideas											
2. Pet org											
3. TV ideas											
4. TV org											
5. RC1											
6. RC2											
7. RC3											
8. Retell 1											
9. Retell 2											
10. Prod1											
11. Prod2	1										
12. LC1	.20	1									
13. LC2	.20	.45***	1								
14. Word	−.02	.36**	.36**	1							
15. Pseudo	.10	.42***	.31**	.77***	1						
16. WRE1	.18	.41***	.39***	.42***	.37***	1					
17. WRE2	.18	.31**	.37***	.40***	.35***	.92***	1				
18. WRE3	.23*	.30**	.35***	.39***	.38***	.86***	.90***	1			
19. S copy 1	−.02	.17	.08	.23*	.17	.26**	.25*	.31**	1		
20. S copy2	.06	.07	.10	.21*	.15	.25*	.27**	.32**	.61***	1	
21. Spell O	.18	.37***	.26*	.56***	.57***	.47***	.50***	.57***	.22*	.23*	1
22. Spell E	.17	.31**	.21*	.54***	.52***	.39***	.43***	.49***	.27**	.24*	.80***

Org organization, *RC* reading comprehension, *Prod* production, *LC* listening comprehension, *Word* word reading, *WRE* word reading efficiency, *S copy* sentence copy, *Spell O* spelling odd numbered items, *Spell E* spelling even numbered items

* < .05; ** < .01; *** < .001

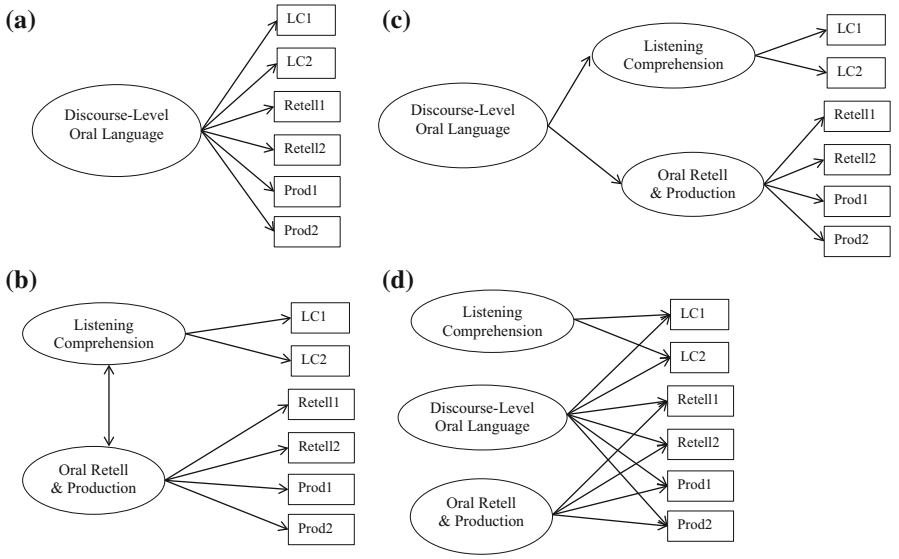

Fig. 1 Alternative models of discourse-level oral language dimensionality. **a** Uni-dimensional model, **b** multi-dimensional model, **c** multi-dimensional model with a higher order oral language construct, **d** bi-factor model

Table 3 Model fit comparisons

	χ^2	*df* (*p*)	AIC/BIC	CFI/TLI
Model 1				
Single factor	25.38	9 (.003)	2,764.37/2,810.71	.89/.81
Model 2				
Two factors	12.63	8 (.13)	2,753.63/2,802.55	.97/.94
Model 3				
Second order factor	18.38	10 (.05)	2,755.38/2,799.15	.94/.91
Model 4				
Bi-factor	4.11	8 (.84)	2,745.11/2,794.03	1.00/1.05

To summarize, for the discourse-level oral language tasks, a bi-factor model described the data best and three orthogonal latent variables were identified: (1) the general discourse-level oral language skill which captures what is common among all the six oral language tasks; (2) the listening comprehension skill which captures what is common between the two listening comprehension tasks, and not captured by the general discourse-level oral language skill; and (3) the oral retell skill which captures what is common in the retell tasks, and not captured by the general discourse-level oral language skill. These three discourses-level oral language latent variables were used in the subsequent structural equation analysis.

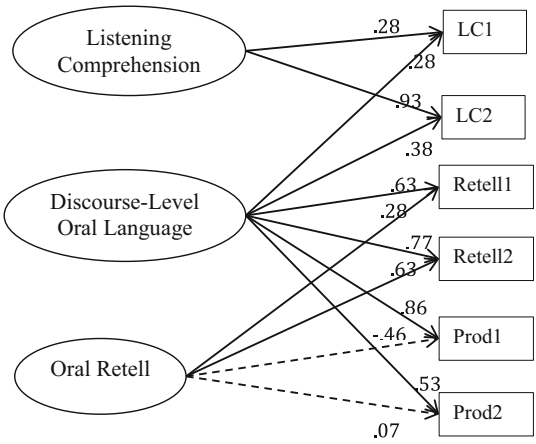

Fig. 2 Standardized factor loadings ($N = 97$). *Solid lines* represent statistically significant paths and *dashed lines* statistically nonsignificant paths

Measurement models of literacy skills

Measurement models were examined using CFA for literacy constructs (writing quality, reading comprehension, word reading, handwriting fluency, and spelling), and they were adequate (see standardized loadings ≥.62; see in Table 1). Of note is that for the word reading construct, a two factor model consisting of word reading accuracy (composed of word reading and nonword reading tasks) and word reading fluency (composed of three timed tasks) fit the data better than a single factor model [$\chi^2(4) = 2.66$, $p = .62$, CFI = 1.00 for two factor model; $\chi^2(5) = 74.13$, $p < .001$, CFI = .84 for the single factor model; $\Delta\chi^2\,(\Delta df = 1) = 71.47, p < .001$], and therefore, these two latent variables, word reading accuracy and word reading fluency, were used in the structural equation model for the reading comprehension outcome.

Relations of discourse-level oral language to reading comprehension and writing quality

Note that in subsequent structural equation modeling analyses, children's age and gender were examined in preliminary analysis but they were not statistically significantly related to the outcomes (i.e., reading comprehension and writing), and thus, excluded from the final models presented in the article. When the outcome was reading comprehension, the model fit was good: $\chi^2(66) = 85.09$, $p = .06$; CFI = .98; TLI = .97; RMSEA = .05 (90 % CI .00–.09); SRMR = .09. As shown in Fig. 3, general discourse-level oral language and word reading accuracy were positively related to reading comprehension ($ps \leq .002$). In contrast, listening comprehension, oral retell, and word reading fluency were not related to reading comprehension ($ps \geq .08$) after accounting for the other variables in the model. A total of 75 % of variance in reading comprehension was explained by the included variables.

For the writing quality outcome, predictors included general discourse-level oral language skill, listening comprehension, oral retell, handwriting fluency, and spelling. Based on preliminary analysis, residuals between idea and organization for

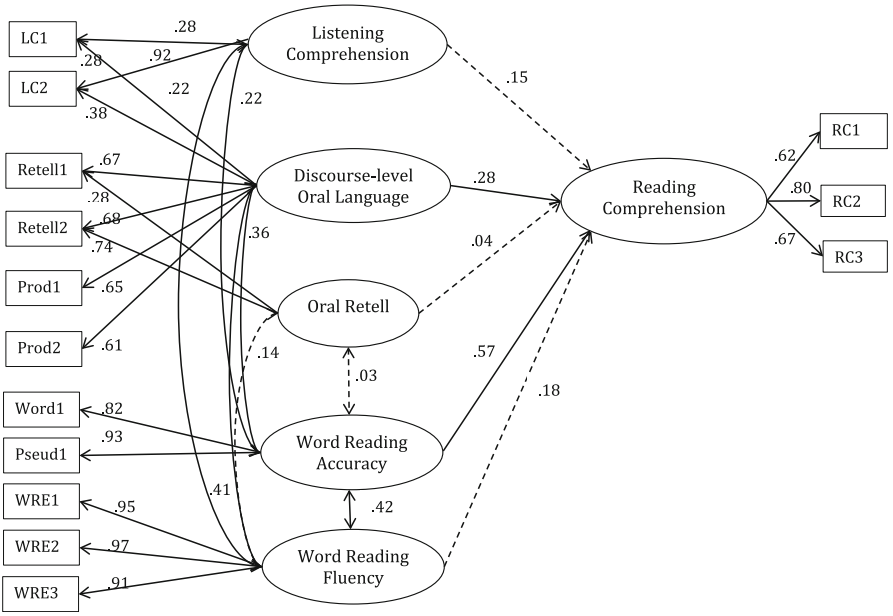

Fig. 3 Standardized structural regression weights of discourse-level oral language, listening comprehension, oral retell, word reading accuracy, and word reading fluency to reading comprehension ($N = 97$). *Solid lines* represent statistically significant paths and *dashed lines* statistically nonsignificant paths

the TV prompt were allowed to covary. Model fit was excellent for the hypothesized model: $\chi^2(65) = 65.64$, $p = .45$; CFI = 1.00; TLI = 1.00; RMSEA = .01 (90 % CI .00–.06); SRMR = .076. As shown in Fig. 4, the general discourse-level oral language skill had a relatively small but positive coefficient ($\beta = .23$, $p = .06$), but not reach the conventional significance level. Spelling was moderately related to writing quality ($\beta = .54$, $p < .001$) whereas handwriting fluency, listening comprehension, and oral retell were not ($ps \geq .22$). Forty-five percent of total variance in writing quality was explained by the predictors.

Discussion

The primary goal of the present study was to examine the relation of discourse-level oral language skills to reading comprehension and written composition. To address this question, we examined dimensionality of discourse-level oral language skills first by systematically testing and comparing four alternative models including a bi-factor structure. We found that a bi-factor model described well about children's performances on listening comprehension and oral retell and production tasks. They all loaded to the general discourse-level oral language skill factor, and listening comprehension and oral retell which were not subsumed by the general oral language construct formed separate, unique dimensions, respectively. Therefore, the

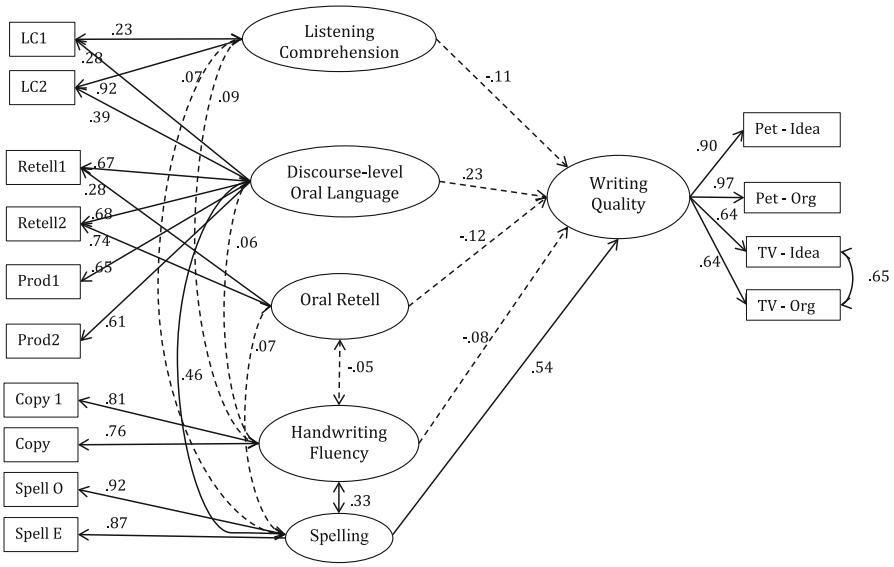

Fig. 4 Standardized structural regression weights of discourse-level oral language, listening comprehension, oral retell, handwriting fluency, and spelling to writing quality (N = 97). *Solid lines* represent statistically significant paths and *dashed lines* statistically nonsignificant paths

general oral language captures what is common in all the listening comprehension, and oral retell and production tasks. In contrast, the unique listening comprehension and oral retell dimensions capture measurement-specific aspects required in these tasks such as 'comprehension'/'receptive' or 'retell'/'expressive' nature of task demands. The present study extends a previous study by Gillam and Pearson (2004) by testing a bi-factor structure, and suggests that while comprehension and retell/production are separate dimensions, they are likely to capture measurement-specific aspects, and both capture a common discourse-level oral language skill. Further systematic investigation and replication is needed to expand our understanding about factor structure of discourse-level oral language skills.

Importantly, the present findings extend our understanding about the role of discourse-level oral language in reading comprehension. Although the simple view of reading specified the 'comprehension' aspect of oral language as a component of reading comprehension, it was the general discourse-level oral language skill that was related to reading comprehension. Unique listening comprehension and oral retell skills were not related to reading comprehension, once the general discourse-level oral language skill was accounted for. Therefore, the relation of discourse-level oral language to reading comprehension appears to be driven by an underlying 'general' discourse-level skill, not by what is unique to listening comprehension or oral retell. However, we do not believe that the present findings are contradictory to the simple view of reading as the general discourse-level oral language included listening comprehension skill. In fact, studies have consistently demonstrated the contribution of listening comprehension to reading comprehension (Hagtvet, 2003; Hoover & Gough, 1990; Joshi et al., 2012; Kendeou et al., 2009; Kim, in press).

What the present study indicates is that listening comprehension is part of a discourse-level oral language skill, but any specific task or mode (e.g., receptive and expressive) effects might not drive the relation to reading comprehension.

In contrast to the reading comprehension outcome, none of the oral language dimensions were related to writing quality. Note, however, that the general discourse-level oral language was weakly but positively related ($\beta = .23$) although it was just shy of the conventional significant level ($p = .06$). This marginal significance is likely due to a relatively small sample size in the present study. Also note that these results are divergent from Berninger and Abbott's (2010) study which found that listening comprehension (at the sentence level) and oral retell were related to reading comprehension and writing. However, Berninger and Abbott did not examine dimensionality of oral language tasks, and therefore, results cannot be directly compared. Future replications with a larger sample are needed to further examine dimensions of oral language and their relations to writing.

In addition to the general discourse-level oral language skill, children's word reading, accuracy in particular, was fairly strongly related to reading comprehension, confirming previous studies about the role of word reading in reading comprehension (Adlof et al., 2006; Catts, Adlof, & Ellis Weismer, 2006; Joshi et al., 2012; Kim et al., 2012; Tunmer & Chapman, 2012). Interestingly, word reading fluency was not related to reading comprehension over and above word reading accuracy and oral language skills. A similar finding was reported in Greek, a transparent orthography, for students in grades 3–6 (Protopapas, Mousaki, Sideridis, Kotsolakou, & Simos, 2013). This might suggest that the contribution of word reading fluency to reading comprehension is largely shared with word reading accuracy at least at this point of reading development. Alternatively, these results might be due to the fact that word reading fluency tasks in the present study did not include challenging words, which were included in the word reading accuracy tasks.

For the writing outcome, spelling was moderately related whereas handwriting fluency was not. The importance of spelling in writing has been shown in studies with English-speaking children (e.g., Berninger et al., 2002; Graham et al., 1997; Kim et al., 2013a, in press) and Korean-speaking children (Kim et al., 2013b). In contrast, the nonsignificant relation of handwriting fluency is discrepant from previous studies with English-speaking children in primary grades (Berninger et al., 1997, 2002; Graham et al., 1997; Kim et al., 2014a). However, these results are not directly comparable due to differences in the design. For instance, Graham et al.'s (1997) included only handwriting fluency and spelling, whereas discourse-level oral language was included in the present study. In addition, although Kim et al.'s study (2014a) included oral language skills, they were vocabulary and grammatical knowledge, not discourse-level skills. Future studies are warranted to investigate the role of handwriting fluency in writing acquisition for children learning to write in various languages.

Limitations and conclusions

Reliabilities were less than ideal in a few measures (e.g., listening comprehension tasks, and one reading comprehension task). Although a latent variable approach is

advantageous for this very reason because a latent variable approach minimizes the impact of low reliability of individual measures, it would have been ideal to have higher reliabilities in these measures. Additionally, the present study had a relatively small convenience sample. Therefore, future replications and extension of the present study with a larger number of children would be informative. Finally, note that results from the present study are from children at a specific phase of oral language, reading and writing development. Therefore, future studies should investigate the nature of oral language dimensionality and the relations of identified oral language dimensions to literacy outcomes for children at different developmental stages. Despite these limitations, the present findings underscore the importance of oral language in literacy acquisition, and indicate a need for more fine-grained and precise understanding about the relation of oral language skills to two ultimate goals of literacy acquisition, reading comprehension and written composition.

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