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Direct and mediated effects of language and cognitive skills on comprehension of oral narrative texts (listening comprehension) for children

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A B S T R A C T

We investigated component language and cognitive skills of oral language comprehension of narrative texts (i.e., listening comprehension). Using the construction–integration model of text comprehension as an overarching theoretical framework, we examined direct and mediated relations of foundational cognitive skills (working memory and attention), foundational language skills (vocabulary and grammatical knowledge), and higher-order cognitive skills (inference, theory of mind, and comprehension monitoring) to listening comprehension. A total of 201 first grade children in South Korea participated in the study. Structural equation modeling results showed that listening comprehension is directly predicted by working memory, grammatical knowledge, inference, and theory of mind and is indirectly predicted by attention, vocabulary, and comprehension monitoring. The total effects were .46 for working memory, .07 for attention, .30 for vocabulary, .49 for grammatical knowledge, .31 for inference, .52 for theory of mind, and .18 for comprehension monitoring. These results suggest that multiple language and cognitive skills make contributions to listening comprehension, and their contributions are both direct and indirect.

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Introduction

Successful listening comprehension (i.e., language comprehension at the extended discourse level or comprehension of multiple utterances; Kim & Pilcher, in press; McGee & Richgels, 1996) is critical for literacy acquisition as well as language interactions (Berninger & Abbott, 2010; Dickinson, Golinkoff, & Hirsh-Pasek, 2010; Hoover & Gough, 1990; Kim, Wagner, & Lopez, 2012; Tunmer, 1989). Listening comprehension plays a prominent role in reading comprehension, as hypothesized by the simple view of reading (Hoover & Gough, 1990), and has been supported by much empirical evidence (Hoover & Gough, 1990; Johnston & Kirby, 2006; Joshi & Aaron, 2000; Joshi, Tao, Aaron, & Quiroz, 2012; Kendeou, van den Broek, White, & Lynch, 2009; Kendeou et al., 2005; Tunmer & Greaney, 2010; Vellutino, Tunmer, Jaccard, & Chen, 2007). Listening comprehension becomes increasingly more important in reading comprehension as children's reading proficiency develops (Adlof, Catts, & Little, 2006; Gernsbacher, Varner, & Faust, 1990; Keenan, Betjemann, & Olson, 2008; Kim et al., 2012).

Despite its importance, systematic investigation about component skills of listening comprehension has not received much attention until recently. Emerging evidence indicates that listening comprehension is a complex skill, requiring more than an understanding about meanings of individual vocabulary and various combinations of words (Florit, Roch, & Levorato, 2011, 2014; Sénéchal, Ouellette, & Rodney, 2006) and, instead, drawing on higher-order cognitive skills such as inference making (Florit et al., 2011; Kendeou, Bohn-Gettler, White, & van den Broek, 2008; Lepola, Lynch, Laakkonen, Silvén, & Niemi, 2012; Strasser & del Rio, 2014; Tompkins, Guo, & Justice, 2013), theory of mind (Kim, 2015; Kim & Phillips, 2014), and comprehension monitoring (Kim, 2015; Kim & Phillips, 2014; Strasser & del Rio, 2014). Building on these studies, we expand emerging literature in several important unique ways in the current study. First, we included a comprehensive set of language and cognitive skills based on theory and empirical evidence. Many above-noted previous studies included a limited number of focal cognitive skills (e.g., inference making) in a piecemeal manner. Second, recent evidence suggested the roles of higher-order cognitive skills such as theory of mind and comprehension monitoring in listening comprehension (Kim, 2015; Kim & Phillips, 2014; Strasser & del Rio, 2014) in addition to the more established role of inference making (Florit et al., 2011; Kendeou et al., 2008; Lepola et al., 2012; Tompkins et al., 2013). However, to our knowledge, no previous studies have examined whether theory of mind and comprehension monitoring are related to listening comprehension after accounting for inference. Third, many previous studies do not provide information about "structural" relations among these multiple language and cognitive skills (see Kim, 2015, for an exception). Understanding structural relations is important to gain insight about paths of relations (direct and mediated or indirect) of language and cognitive skills to listening comprehension. For instance, despite a statistically significant relation in a bivariate correlation, vocabulary was no longer independently related to comprehension of a wordless picture book after accounting for several cognitive skills such as working memory, attention, and inference making in a multiple regression model (Strasser & del Rio, 2014). Although this result is informative about the unique and independent role of vocabulary, this result is limited in illuminating how vocabulary might be indirectly related to the outcome via its overlapping influence with other cognitive skills. In the current study, we examined how foundational cognitive skills (working memory and attention), foundational oral language skills (vocabulary and grammatical knowledge), and higher-order cognitive skills (inference, theory of mind, and comprehension monitoring) are related to each other and to listening comprehension of narrative texts directly and indirectly.

"Texts" encompass both oral and written texts, and theoretical models of text comprehension do not differentiate oral texts from written texts (Kintsch, 1988). Text comprehension literature has primarily studied adult proficient readers using written texts. However, for developing readers, "reading" comprehension is constrained by processes involved in word reading (Perfetti, Landi, & Oakhill, 2005; for work on reading comprehension, see, e.g., Cain, Oakhill, & Bryant, 2004; Cromley & Azevedo, 2007; van den Broek & Espin, 2012; Vellutino et al., 2007). Therefore, in the current study, we use the term *listening comprehension* to specifically refer to comprehension of "oral" or "spoken" narrative texts, and we draw on empirical evidence primarily on "listening" comprehension for developing children. It should also be noted that oral language is a broad construct encompassing lexical-, sentence-, and discourse-level skills. In the current study, we use the term *foundational language skills* to refer to vocabulary and grammatical knowledge (Lepola et al., 2012).

Text comprehension ultimately requires constructing a coherent mental representation called the situation model (Graesser, Singer, & Trabasso, 1994; Kintsch, 1988, 1994; Kintsch & Rawson, 2007; Perfetti & Stafura, 2014; van den Broek, Rapp, & Kendeou, 2005; van Dijk & Kintsch, 1983). The situation model is a comprehender's representation of the situation of text (Graesser, Millis, & Zwaan, 1997; Kintsch & Rawson, 2007) and requires deep processing of text by establishing coherence at the local level (respective propositions) and global level (across propositions). According to the construction–integration model (Kintsch, 1988; van Dijk & Kintsch, 1983), establishing coherence goes through two phases: a process of constructing initial propositions based on linguistic input of the text, followed by integration across the discourse (e.g., a story) to establish a coherent integrated whole. To encode ideas in the text, three levels of mental representations have been proposed (Kintsch, 1988; see also Graesser et al., 1994; Perfetti & Stafura, 2014; Perfetti et al., 2005). First, linguistic input, exact wording and phrases, of the text needs to be represented (i.e., surface code). This is the basis for establishing elementary and literal propositions as expressed by the text–textbase representation. Finally, the situation model is established by integrating propositions across the discourse and with the comprehender's background knowledge. The multilevel mental representation hypothesis entails that language and cognitive skills (i.e., processes and knowledge) involved at each level are likely to differ. Language and cognitive skills involved in encoding linguistic input of the text (i.e., surface code) would likely differ from those involved in a deep understanding of the text (i.e., the situation model). In the current study, we hypothesized that foundational cognitive skills (working memory and attention) are important to the acquisition of foundational language skills (vocabulary and grammatical knowledge),[1] and foundational cognitive and language skills are required for the surface code representation, which lays a foundation for the textbase representation. Then, higher-order cognitive skills such as inference, theory of mind, and comprehension monitoring are needed to integrate propositions from the textbase representation to establish the situation model, which is required in successful listening comprehension. Working memory and attention (i.e., sustained attention) were hypothesized to be foundational cognitive skills because they were deemed to be fundamental skills necessary for any learning tasks (see below for further details). Vocabulary and grammatical knowledge were considered foundational oral language skills because discourse-level comprehension (listening comprehension) is not possible without understanding of meaning of words and combinations of words (Lepola et al., 2012). Finally, higher-order cognitive skills go beyond the foundational cognitive skills and oral language skills. Research from reading comprehension has demonstrated the importance of these higher-order cognitive skills (e.g., Cain, Oakhill, Barnes, & Bryant, 2001; Cain et al., 2004; Conners, 2009; Perfetti et al., 2005; van den Broek & Espin, 2012).

Fig. 1 shows the three levels of text comprehension and the hypothesized associated oral language and cognitive skills included in the current study. To test this model, we used data from children in Grade 1 (M_{age} = 6.84 years) and tested and compared four plausible alternative models (see below for further details; Fig. 2). It should be noted that the construction–integration model of text comprehension includes many details about processes (e.g., spreading actions). The focus of the current study was not about these on-line processes but instead to examine how individual differences in the above-noted language and cognitive skills are interrelated to one another in a hierarchical structure that maps onto the three levels of mental representations (i.e., surface code, textbase, and situation model) in listening comprehension. Below are rationales and a review of studies for the language and cognitive skills hypothesized to be involved in listening comprehension.

[1] Note that grammatical knowledge is used in the current study, although some distinguish grammatical knowledge from grammatical awareness (e.g., see Brimo, Apel, & Fountain, in press; Cain, 2007).

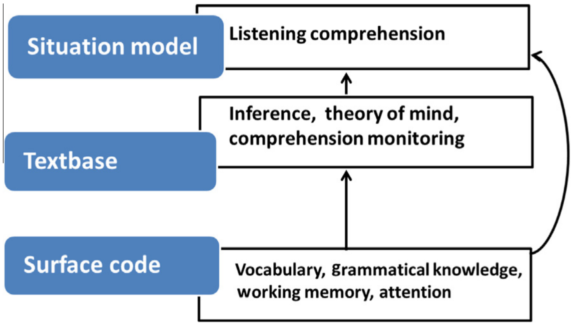
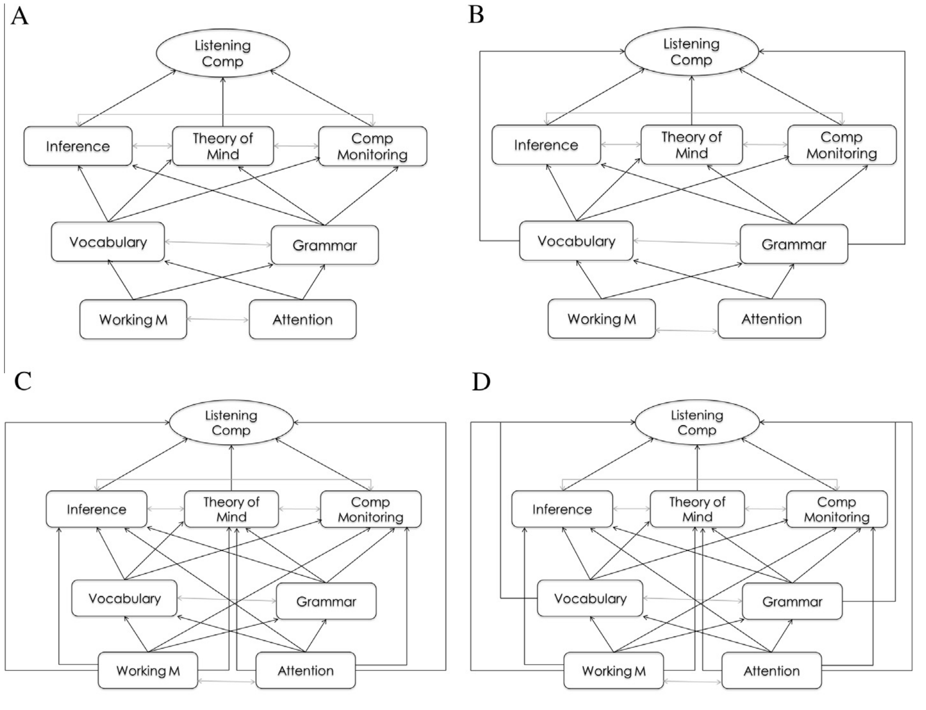


Fig. 1. Three levels of text representations proposed by Kintsch (1988) and associated language and cognitive skills hypothesized in the current study.



Method

Fig. 2. Four alternative models of hypothesized relations of foundational cognitive skills (Working memory [Working M] and attentional control) and language skills (vocabulary and grammatical knowledge [Grammar]) and higher-order cognitive skills such as inference, theory of mind, and comprehension monitoring (Comp Monitoring) to listening comprehension. Panels A, B, C, and D represent Models 1, 2, 3, and 4, respectively. Gray lines represent covariance.

Foundational cognitive skills (i.e., working memory and attention) for listening comprehension

Listening comprehension requires remembering words and phrases, parsing the sentence, holding and retrieving information from preceding sentences, and relating text information to the comprehender's background (or general world) knowledge. Therefore, working memory, the capacity to store and manipulate information (Baddeley & Logie, 1999; Gathercole, Pickering, Ambridge, & Wearing, 2004; Swanson & Howell, 2001; Unsworth & Engle, 2007; see Baddeley, Eysenck, & Anderson, 2009, for a review) would be implicated in text comprehension (Daneman & Merikle, 1996; Perfetti et al., 2005). Working memory would be needed for the surface code representation to store words and phrases temporarily and process incoming words. Working memory would also be important for the textbase representation to allow holding the linguistic input temporarily while processing and integrating it with new linguistic information (e.g., phrases) to construct elementary local propositions and some initial inferences (e.g., referential inferences such as "he" referring to a character mentioned in the preceding sentence). Finally, working memory has been suggested to play an important role in constructing the situation model to allow integration of propositions and to establish global coherence across sentences and text and with background knowledge (Daneman & Merikle, 1996; Graesser et al., 1994; Kintsch & van Dijk, 1978). In other words, listeners should be able to access the previously processed linguistic and semantic information while at the same time processing incoming semantic input to link, integrate, and infer meanings (Daneman & Merikle, 1996).

Evidence has shown that working memory is important to vocabulary (Morra & Camba, 2009; Stokes & Klee, 2009), grammatical knowledge (Robinson, Mervis, & Robinson, 2003), inference (Estevez & Calvo, 2000; Moran & Gillon, 2005), and listening comprehension (Florit, Roch, Altoè, & Levorato, 2009; Florit, Roch, & Levorato, 2013; Was & Woltz, 2007). However, unclear from these studies is the precise role of working memory in listening comprehension, whether it is directly involved at all the levels of text representations or its relation to listening comprehension is partially or completely mediated by its influence on other skills. In fact, a recent study with kindergartners showed that the role of working memory in listening comprehension is partially mediated by theory of mind and comprehension monitoring (Kim, 2015).

Attention is another foundational cognitive skill that was hypothesized to be important to listening comprehension. Learning, even implicit learning, occurs in real-life contexts where multiple irrelevant stimuli compete for attention (Toro, Sinnett, & Soto-Faraco, 2011). Therefore, sustained control of attention (sustained attention), one's ability to inhibit and not get distracted by irrelevant stimuli and sustain attention on the selected focal stimuli, is important in learning, including oral language (e.g., Stevens, Sanders, & Neville, 2006). In fact, sustained attention has been hypothesized to be a prerequisite to any learning tasks according to information processing theories (e.g., Adams & Snowling, 2001; Verhoeven, Reitsma, & Siegel, 2011). Therefore, it seems reasonable to speculate that individual differences in sustained attention might be related to the ability to represent linguistic input of the text (i.e., surface code representation), subsequently encode meanings from it (i.e., textbase representation), and integrate meanings across propositions (situation model). Attention can be operationalized in various ways, but in the current study a rating scale was used. Previous studies have suggested a relation between attention measured by a rating scale and oral language skills. In Stephenson, Parilla, Georgiou, and Kirby's (2008) study, individual differences in attention were moderately related to individual differences in vocabulary size for primary grade children. In addition, a recent study examined the relation of attention to story comprehension[2] (measured by the extent of comprehension of a wordless picture book) for 6-year-old children (Strasser & del Rio, 2014). In this study, children's sustained attention was measured by assessors on a scale of 1 to 4 while children were completing a story comprehension task, and children's attentiveness was independently related to story comprehension. Based on these studies, we speculated that individual differences in attentiveness might be related to foundational oral language skills (i.e., vocabulary and grammatical knowledge). Thus, in the current study, we investigated whether attentiveness is directly related to listening comprehension or its relation is mediated by foundational language skills and higher-order cognitive skills.

[2] As noted, story comprehension was not measured by oral texts or written texts but instead was measured by comprehension of a wordless picture book. Because it did not involve written texts, we believe that this study is relevant to the current study.

Foundational language skills (vocabulary and grammatical knowledge) and listening comprehension

Children's foundational language skills such as vocabulary and grammatical knowledge would be needed to represent words and phrases in the text (i.e., surface code representation), their subsequent derivation of propositions (textbase representation), and ultimately the situation model (Kim, 2015; McNamara & Kintsch, 1996). Vocabulary was related to listening comprehension (Florit et al., 2009, 2014; Kendeou et al., 2008; Tompkins et al., 2013), and children's grammatical knowledge was related to sentence processing (Pizzioli & Schelstraete, 2013) and listening comprehension (Carrow-Woolfolk, 1999; Tunmer, 1989). However, these studies have not examined whether the relations of vocabulary and grammatical knowledge to listening comprehension are direct or mediated by higher-order cognitive skills (i.e., inference, theory of mind, and comprehension monitoring). A recent study suggested that vocabulary and grammatical knowledge may be directly and indirectly mediated via higher-order skills related to listening comprehension (Kim, 2015). In the current study, we expand our understanding about the role of foundational language skills in listening comprehension by investigating alternative models—completely mediated (Figs. 1C and 2A) and partially mediated (direct and indirect; Figs. 2B and D) by higher-order cognitive skills.

Higher-order cognitive skills (inference, theory of mind, and comprehension monitoring) and listening comprehension

The textbase representation includes literal and potentially incoherent local propositions, and natural discourse text is often incomplete in terms of information necessary to construct the situation model (Kintsch, 1988). Therefore, the comprehender should reconcile incoherent propositions and link missing parts across the text and/or based on background knowledge (Kintsch & van Dijk, 1978). Therefore, constructing the situation model entails resolving incoherence by evaluating initial propositions constructed in the textbase representation and making inferences across propositions and background knowledge (Graesser et al., 1994; Kintsch, 1988; Whitney, Ritchie, & Clark, 1991). We hypothesized that higher-order cognitive skills such as comprehension monitoring, inference, and theory of mind would be involved in these processes.

Comprehension monitoring is one's ability to think about and evaluate one's own comprehension of text (Baker, 1984; Cain et al., 2004; Kim & Phillips, 2014; Kinnunen, Vauras, & Niemi, 1998; Oakhill, Hartt, & Samols, 2005; Ruffman, 1999) and is likely to make a contribution to listening comprehension because it allows children to evaluate potential incoherence in the initial propositions. Studies have shown that many children in primary grades do not spontaneously detect or identify inconsistent information presented in oral texts (Kim & Phillips, 2014; Markman, 1977) and written texts (Baker, 1984; Beal, 1990). Furthermore, comprehension monitoring, as measured by the ability to identify any inconsistencies or contradictions in the oral text, has been shown to be related to listening comprehension (Kim, 2015; Kim & Phillips, 2014) and story comprehension (Strasser & del Rio, 2014).

An inferencing skill refers to the ability to derive meaning that is not explicitly stated in the text (Lepola et al., 2012). There are different types or taxonomies of inference such as referential coherence, causal relations, and character's thoughts and emotions (Graesser et al., 1994; Zwaan & Radvansky, 1998). These inferences are needed to establish local coherence for the textbase representation as well as for the situation model (Graesser et al., 1997; Kintsch, 1988; Perfetti & Stafura, 2014; Perfetti et al., 2005). In the current study, we focused on and use the term *inference* to refer to children's ability to integrate text information with background knowledge (i.e., elaborate inference, not referential) needed for the situation model. Inference has been shown to be related to listening comprehension after accounting for vocabulary (Kendeou et al., 2008), vocabulary and verbal memory (Lepola et al., 2012), vocabulary and age (Tompkins et al., 2013), vocabulary and working memory (Florit et al., 2014), and working memory, vocabulary, attention, comprehension monitoring, and theory of mind (Strasser & del Rio, 2014).

Constructing the situation model might also rely on a higher-order complex social reasoning skill, namely theory of mind—an understanding of others' mental states and predicting behaviors (Howlin, Baron-Cohen, & Hadwin, 1999). Theory of mind has been widely studied in terms of its relation to grammatical skill (e.g., complement structure) and pragmatic and idiomatic aspect of oral language

(Astington & Jenkins, 1999; Caillies & Sourn-Bissaoui, 2008; de Villiers, 2000; de Villiers & Pyers, 2002; Norbury, 2005; Pyers & Senghas, 2009; Shields, Varley, Broks, & Simpson, 1996). In a false belief task, a widely used measure of theory of mind, children are required to make connections about a series of events that would involve making inferences and taking perspectives. We hypothesized that theory of mind might capture children's ability to infer characters' thoughts and emotions, a type of inference that is important to establish the situation model (Graesser et al., 1994). Theory of mind would be related to an inference skill because they both require some level of reasoning. However, it might independently relate to listening comprehension after accounting for inference, particularly in narratives, because thoughts, beliefs, and intentions of storytellers and story characters are critical aspects of narrative texts that require one's metacognition—the ability to think about one's own and others' thinking and mental status. For instance, inferences about character emotions were independently related to listening comprehension for 8-year-old children after accounting for vocabulary and inferences about causal consequences and actions (Kendeou et al., 2008). Recent studies have shown that theory of mind is related to listening comprehension for children in kindergarten and first grade (Kim, 2015; Kim & Phillips, 2014). However, these studies did not include inference; thus, it is unknown whether theory of mind is independently related to listening comprehension after accounting for inference.

The current study

The primary research question in the current study was about direct and indirect pathways of foundational cognitive skills (working memory and attention), foundational language skills (vocabulary and grammatical knowledge), and higher-order cognitive skills (comprehension monitoring, inference, and theory of mind) to listening comprehension. To this end, we examined partial and complete mediations of multiple language and cognitive skills to listening comprehension. A complete mediation is when the relation of the predictor and the criterion becomes statistically nonsignificant once the mediator is in the model, whereas partial mediation occurs when both the predictor and mediator remain related to the criterion (Baron & Kenny, 1986). Four alternative structural equation models were tested and compared. The following four alternative models were examined to empirically test plausible alternative "direct" paths in a systematic manner because there are no specific theoretical models about how the included oral language and cognitive skills are directly and indirectly related to listening comprehension. Model 1 (Fig. 2A) was a complete mediation model; foundational cognitive skills were hypothesized to be directly related to foundational language skills, which in turn were directly related to higher-order cognitive skills, which then were hypothesized to be directly related to listening comprehension. Foundational cognitive and language skills were not hypothesized to be directly related to listening comprehension. Models 2 and 3 differed in terms of how foundational cognitive and language skills were specified to have direct relations to listening comprehension. Model 2 (Fig. 2B) was the same as Model 1 except that foundational language skills were hypothesized to have direct relations to listening comprehension over and above higher-order cognitive skills. Studies have shown that listening comprehension is predicted by vocabulary after accounting for working memory (Florit et al., 2011, 2013) and even after accounting for an inference skill (Florit et al., 2014; Tompkins et al., 2013). In Model 3 (Fig. 2C), foundational cognitive skills were hypothesized to be directly related to higher-order cognitive skills and listening comprehension. Evidence has suggested that working memory is independently related to listening comprehension over and above vocabulary, verbal IQ, and sentence comprehension (Florit et al., 2013). Furthermore, attention was independently related to story comprehension (Strasser & del Rio, 2014). In Model 4 (Fig. 2D), all direct and indirect relations were allowed from foundational language and cognitive skills to listening comprehension.

Method

Participants

A total of 201 children in Grade 1 (44% girls, M_{age} = 6.84 years, SD = 0.30) from seven classrooms in a single public school in South Korea participated in the study. The slight gender imbalance represents enrollment status at the school. Government statistics also indicate a slightly greater number of boys between 0 and 9 years of age in Korea (http://rcps.egov.go.kr:8081/ageStat.do?command=month). Data on socioeconomic status (SES) were not available from individual children; SES information is highly sensitive in the Korean context (Kim, 2011). According to the school personnel and the neighborhood, the school primarily served children from middle-class families. All of the children were without diagnosed hearing or language impairments at the time of data collection. The vast majority of participants were Korean monolingual children, and approximately 6% of the sample had a parent whose native language was not Korean. This is similar to the population-level statistics; approximately 5% of the population is ethnic minority in South Korea. Unfortunately, the extent of bilingualism of these language-minority children (Korean and the parental home language) was not available.

Instructional context

Elementary schools in South Korea uniformly run from Grade 1 to Grade 6. Furthermore, in South Korea a centralized national curriculum is used in all elementary subjects, including Korean language arts and reading. In reading, children are expected to have foundational skills when they enter first grade, the onset of formal education. Therefore, texts in Grade 1 reading textbooks are mostly composed of connected texts, including sentences, stories, and poems that become progressively longer and more complex.

Measures

The majority of measures in the current study were experimental tasks used in previous studies with English- and Korean-speaking children. However, the vocabulary task and the listening comprehension task 2 were standardized and normed; thus, standard scores were available for these two tasks. Unless otherwise noted, all of the items in a task were administered, and children's responses for each item were scored dichotomously (1 = correct, 0 = incorrect). Only accuracy was measured, and response time was not measured. All of the tasks were "oral" language measures such that children were not asked to read any written texts or to respond in reading. Reliability estimates are shown in Table 1. The majority of tasks had high reliabilities (i.e., Cronbach's alphas), but the inference task was just shy of .70 and the listening comprehension task 1 was .65. The influence of the relatively low Cronbach's alpha for the listening comprehension task 1 was minimized due to the use of a latent variable for listening comprehension.

Working memory

The listening span task was used (Kim, 2015) and had been adapted from tasks in prior studies (e.g., Cain et al., 2004; Florit et al., 2009) and pilot-tested. In this task, children heard a sentence and were asked to identify whether the sentence was correct or not (yes/no response) and to identify the first words in the sentences they heard. Sentences in the task involved common knowledge (e.g., "Apples are red"). Although listening span tasks in English and European languages require children to identify the last words in each sentence (e.g., Cain et al., 2004; Florit et al., 2009), in the current study children were asked to identify the first word in each sentence because of the SOV sentence structure in Korean. Verbs in Korean are always inflected and similar in a given context. There were 4 practice items and 18 experimental items. Children's yes/no responses regarding the veracity of the statement were not scored (see Daneman & Carpenter, 1980; Swanson, 2008), but their responses on the first words in correct order were given a score of 2 and responses including the first words in incorrect order were given 1 point.

Attention

The first 9 items of the Strengths and Weaknesses of ADHD Symptoms and Normal Behavior Scale (i.e., SWAN; Swanson et al., 2006) were translated to Korean to measure children's attentiveness. SWAN is a widely used behavioral checklist, typically rated by classroom teachers, and has 30 items, with each item rated on a 7-point scale from 1 (far below average) to 7 (far above average) to allow for ratings of relative strength (above average) as well as weaknesses (below average). The first 9 items

Table 1
Descriptive statistics.

Variable (and maximum possible score)	α	Min	Max	Mean	*SD*	Skewness	Kurtosis
Age in months	NA	76	88	82.11	3.56	0.13	−1.33
Working memory (36)	.80	0	28	12.97	6.65	−0.46	−0.33
Attention (63)	.99	9	63	44.63	14.21	−0.32	−1.03
Vocabulary (52)	.89	2	47	30.56	7.41	−0.72	0.95
Grammatical knowledge (32)	.84	0	25	10.20	5.07	0.42	−0.14
Inference (12)	.69	0	12	7.20	2.66	−0.57	−0.20
Theory of mind (15)	.74	0	14	5.24	2.91	0.64	0.20
Comprehension monitoring (22)	.78	0	22	15.81	3.83	−0.95	1.52
Listening comprehension 1 (7)	.65	0	7	2.05	1.62	0.69	0.29
Listening comprehension 2 (78)	.96	0	62	12.68	8.73	2.84	10.79

used in the current study are related to sustaining attention on tasks (e.g., "Engage in tasks that require sustained mental effort") and were shown to capture the ability to regulate attention (Saez, Folsom, Al Otaiba, & Schatschneider, 2012). The other items assess hyperactivity (9 items) and aggression (12 items), and were not included in the study. The 9 items of SWAN were completed by the students' classroom teachers. Higher scores represent greater attentiveness.

Vocabulary
A standardized and normed expressive vocabulary task was used (Kim, Cho, & Park, in press). In this task, children were shown a picture and were asked to name the picture. There were 4 practice items and 52 items with increasing difficulty. Task administration stopped after five consecutive incorrect responses.

Grammatical knowledge
Children's grammatical knowledge task was composed of detection and correction of errors in grammatical markers, tense, and postpositions, adapted from Kim (2015). The item format was similar to the Grammaticality Judgment subtest of the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999), in which children heard a sentence and were asked to identify whether the sentence they heard was correct or incorrect. If incorrect, children were asked to correct the sentence. There were 2 practice items and 18 experimental items (14 incorrect sentences). Children were given 1 point per correct response for the 18 grammatical error identification items and 1 point for correcting 14 incorrect sentences.

Inference
An inference task was developed modeled after the Inference subtest of the CASL (Carrow-Woolfolk, 1999). In this task, children heard a short story and were asked an inference question related to the story. As an example, children heard the following story: "Mom told Sooji, 'Make sure to bring a swimsuit. Don't forget a floater.' Where do you think Sooji and her mom are going?" (correct answer: beach or swimming pool). All of the items were similar to this example item, requiring children to use their background knowledge for correct responses. There were 2 practice items and 12 experimental items.

Theory of mind
One first-order and two second-order false belief scenarios were employed. The first-order scenario was an appearance–reality task (or unexpected identity) using a snack box that is highly familiar to children in Korea (Gwon & Lee, 2012). In this task, children were shown the snack box and were asked to guess its content. Then, the assessor showed the actual content of the box (i.e., a pencil) and asked children to identify what the object was. Children were then shown a puppet looking at the snack box and were asked what the puppet thought would be in the snack box. The second-order false belief scenarios involved different types of bread sold in a bakery and a visit to a farm (Kim, 2015; Kim & Phillips, 2014). The second-order task examined children's ability to infer a story character's mistaken belief about

another character's knowledge. In the second-order task, the assessor presented illustrations to children along with the accompanying stories, followed by the assessor's questions. There were 3 questions in the first-order task and 6 questions in each second-order task for a total of 15 items.

Comprehension monitoring

An inconsistency detection task was slightly modified from a previous study with Korean-speaking (Kim, 2015) and English-speaking (Kim & Phillips, 2014) children. Children were asked to identify whether the story they heard (two to four sentences long) heard made sense or not, and if the story did not make sense children were asked to provide a brief explanation. An example of an inconsistent item is as follows: "Jimin's favorite color is green. His bag is green. His pants are green. Jimin's favorite color is red." There were 4 practice items and 14 experimental items. The meaning of "not making sense" was explained as sentences not going together and therefore silly, and feedback was provided in the practice items. Consistent stories (6 items) and inconsistent stories (8 items) were randomly spread across items. For the 8 inconsistent stories, the accuracy of children's explanation was also dichotomously scored; thus, the total possible score was 22.

Listening comprehension

One experimental task and one standardized and normed task were used to assess children's listening comprehension. In the experimental task, children heard a story composed of 78 words and were asked seven open-ended comprehension questions that included both literal and inferential questions (see Appendix). In the standardized and normed tasks, children heard a series of short stories and were asked to identify a picture that best described the answers to the questions or to answer short open-ended questions based on the short stories (Kim et al., in press). For example, a short story involved a girl riding a bicycle with her brother and her brother's friend. After hearing the story, children needed to find a picture that showed what the story was about. Questions involving pictures had four options (i.e., pictures), and short open-ended questions were scored dichotomously. In both tasks, literal and inference questions were included, but the number of literal and inferential questions varied depending on the texts and associated questions. The nature of the texts was similar to that shown in the Appendix. Although formal text difficulty values are not reported for these texts,[3] the number of words in sentences ranged from 3 to 13. Note, however, that this is a slightly conservative estimate compared with word count in English because it is based on the spacing rule in the Korean language, which is different from that in English. Identifying what a word is tricky and different in Korean than in English due to the agglutinative nature of Korean (see Lee & Ramsey, 2000). There were a total of 78 test items, and testing was discontinued when children had incorrect responses in 3 items in a single story. Each story had three to six comprehension questions.

Procedure

Children were assessed in several sessions by trained research assistants individually in a quiet room in the school. Research assistants were early childhood educators or graduate and undergraduate students in the psychology department. All research assistants were rigorously trained and needed to meet a minimum of 95% accuracy in assessment fidelity prior to working with children. Each session lasted approximately 40 min, but when children showed signs of fatigue assessment was discontinued and resumed at another time. Children were assessed approximately 2 months after the academic year had started.

Data analysis strategy

Confirmatory factory analysis (CFA) was used to create a latent variable for listening comprehension, and factor loadings were adequate (see Fig. 3). The language and cognitive skills were assessed

[3] Koo and Yang (2013) reported a text difficulty measure in Korean incorporating vocabulary, grammar, sentence length, and modifying expressions. However, the algorithm is not publicly available.

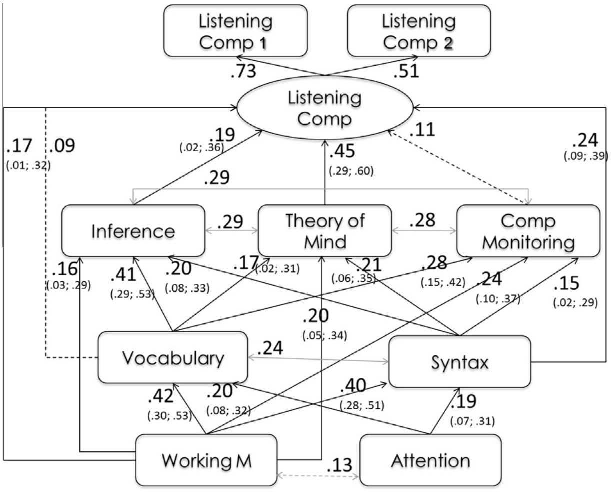


Fig. 3. Final model of the relations of foundational cognitive skills (working memory [Working M] and attention) and language skills (vocabulary and grammatical knowledge [Grammar]) and higher-order cognitive skills such as inference, theory of mind, and comprehension monitoring (Comp Monitoring) to listening comprehension. Values in parentheses represent 95% confidence intervals. Solid lines represent statistically significant relations, gray lines represent covariance, and dashed lines represent nonsignificant relations.

by single measures for each construct due to time and resource constraints; therefore, observed variables were used for the language and cognitive skills. The research question was addressed by structural equation modeling, which is an appropriate and powerful approach for examining direct and mediated relations because it allows modeling multiple predictors and multiple outcomes and outcomes can become predictors in a single model (Jose, 2013). Model fits were evaluated by chi-square statistics, comparative fit index (CFI), Tucker–Lewis index (TLI), Akaike information criterion (AIC), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Typically, RMSEA values below .08, CFI and TLI values equal to or greater than .95, and SRMR values equal to or less than .05 indicate an excellent model fit (Hu & Bentler, 1999), and TLI and CFI values greater than .90 are considered to be acceptable (Kline, 2005). Chi-square difference tests and AIC values were used to compare the relative fits of models. CFA and structural question modeling analyses were conducted with Mplus 7.1 (Muthén & Muthén, 2013).

Results

Descriptive statistics and preliminary analysis

Table 1 displays means, standard deviations, minimum and maximum values, and reliabilities (Cronbach's alphas). The sample had a somewhat low average score in the normed tasks: the vocabulary task (M = 35th percentile rank, ranging from 1st to 99th) and the listening comprehension task 2 (M = 37th percentile rank, ranging from 1st to 93rd). Distributions of the majority of the variables approached symmetric, with an exception of the listening comprehension task 2. As shown in Table 1, kurtosis and skewness in this task were high. An inspection of frequency of scores indicated that the large kurtosis value was due to the fact that the majority of children (73%) scored between 7 and 14, although children were evenly distributed for each score within this score span (15–29 students). In addition, large skewness was due to 3 students who scored above 52. Given that transformations did not change the overall shape of the distribution, and that the spread of scores was across a band and not on a single score, raw scores were used in the data analysis. It should be noted that results were

Table 2
Correlations among measures.

	1	2	3	4	5	6	7	8
1. Working memory	–							
2. Attention	.12	–						
3. Vocabulary	.43	.24	–					
4. Grammatical knowledge	.41	.22	.38	–				
5. Inference	.41	.21	.54	.40	–			
6. Theory of mind	.34	.11+	.32	.32	.46	–		
7. Comprehension monitoring	.42	.23	.44	.35	.50	.43	–	
8. Listening comprehension 1	.43	.19	.40	.45	.50	.55	.43	–
9. Listening comprehension 2	.31	.25	.30	.31	.33	.29	.33	.36

Note. All of the coefficients were statistically significant at the .001 level with the exception of +, which was >.05.

the same when excluding the three students with extremely high scores (i.e., >52); thus, the final models reported in the current study include all of the students.

Correlations among measures after partialing out age are presented in Table 2. Working memory was moderately related to language skills and higher-order cognitive skills (.31 ⩽ *r*s ⩽ .43), whereas attention was weakly related to other measures (.11 ⩽ *r*s ⩽ .24). Foundational language skills were moderately related to higher-order cognitive skills (.32 ⩽ *r*s ⩽ .54). Finally, language and cognitive skills were weakly to moderately related to listening comprehension tasks (.19 ⩽ *r*s ⩽ .55). These magnitudes are similar to results of previous studies with prekindergartners and kindergartners in Italian (Florit et al., 2009, 2014), kindergartners in Spanish (Strasser & del Rio, 2014), 4- to 6-year olds in Dutch (Lepola et al., 2012), kindergartners in Korean (Kim, 2015), and kindergartners and first graders in English (Kim & Phillips, 2014).

Relations of language and cognitive skills to listening comprehension

Model fit information of four alternative models (Models 1–4) is shown in Table 3. Age was not included in these models because it was consistently nonsignificant after accounting for the variables in the model. Model 1 (the complete mediation model) did not fit the data very well whereas Model 4 (partial mediation model) had an excellent fit to the data. As indicated by the $\Delta\chi^2$ difference tests (*ps* ⩽ .005) and AIC differences (⩾6.51), Model 4 was determined to be the best-fitting model. However, in Model 4 direct paths of attention to higher-order cognitive skills and listening comprehension were consistently nonsignificant (*ps* > .07). Therefore, Model 4 was revised to a more parsimonious model in which these nonsignificant paths of attention to higher-order cognitive skills and listening comprehension were removed. As shown in Table 3, this revised model (Model 4R) had an excellent fit to the data. Furthermore, $\Delta\chi^2$ and ΔAIC indicated that Model 4R was not different from Model 4. Therefore, Model 4R was chosen as the final model, and standardized path coefficients and associated 95% confidence intervals (in parentheses) are shown in Fig. 3. It should be noted that, following conventions (Bollen, 1989), a gamma (γ) notation is used for the path between exogenous and endogenous variables, and a beta (β) notation is used for the path between endogenous variables.

Table 3
Model fit comparisons.

Model	χ^2 (*df*), *p*	AIC	CFI, TLI	RMEA	SRMR	$\Delta\chi^2$ (Δdf)	ΔAIC
1	48.58 (16), <.001	10378.11	.94, .86.	.10	.07		
2	30.83 (14), .006	10364.36	.97, .92	.08	.05	M1 vs. M2 = 17.75 (2), *p* < .001	13.75
3	14.77 (8), .06	10360.30	.99, .94	.07	.03	M2 vs. M3 = 16.06 (6), *p* = .01	4.06
4	4.25 (6), .64	10353.79	1.00, 1.02	.00	.02	M1 vs. M4 = 44.33 (10), *p* < .001	24.32
						M2 vs. M4 = 26.58 (8), *p* < .001	10.57
						M3 vs. M4 = 10.51 (2), *p* = .005	6.51
4R	10.41 (10), .41	10351.95	1.00, 1.00	.01	.03	M4 vs. M4R = 6.16 (4), *p* = .19	1.84

Note. M1, Model 1; M2, Model 2; M3, Model 3; M4, Model 4; M4R, Model 4R.

Table 4
Direct, indirect, and total effects of language and cognitive skills on listening comprehension.

	Direct	Indirect	Total
Working memory	.17	.29	.46
Attention	–	.07	.07
Vocabulary	–	.30	.30
Grammatical knowledge	.24	.25	.49
Inference	.19	.12	.31
Theory of mind	.45	.07	.52
Comprehension monitoring	–	.18	.18

Working memory was directly and moderately related to foundational oral language skills such as vocabulary ($\gamma = .42$, $p < .001$) and syntax ($\gamma = .40$, $p < .001$). Working memory was also directly but weakly related to higher-order cognitive skills such as inference ($\gamma = .16$, $p = .01$), theory of mind ($\gamma = .20$, $p = .007$), and comprehension monitoring ($\gamma = .24$, $p < .001$) as well as listening comprehension ($\gamma = .17$, $p = .03$) after accounting for vocabulary and grammatical knowledge. Attention was weakly related to vocabulary ($\gamma = .20$, $p = .001$) and syntax ($\gamma = .19$, $p = .002$) after accounting for working memory. Foundational oral language skills, vocabulary and grammatical knowledge, were related to all three higher-order cognitive skills: inference, theory of mind, and comprehension monitoring ($.15 \leqslant \beta s \leqslant .41$, $ps < .02$). Grammatical knowledge was also directly related to listening comprehension ($\beta = .24$, $p = .001$), whereas vocabulary was not ($\beta = .09$, $p = .26$), after accounting for the other variables in the model. Finally, inference ($\beta = .19$, $p = .03$) and theory of mind ($\beta = .45$, $p < .001$) were independently related to listening comprehension, whereas comprehension monitoring was not ($\beta = .11$, $p = .18$), after accounting for all of the other predictors in the models. Approximately 85% of total variance in listening comprehension was explained by the included predictors.

Table 4 shows direct, indirect, and total effects of the language and cognitive skills on listening comprehension. Indirect effects were calculated by multiplying the path coefficient from the variable being mediated with the path coefficient from the mediator to the criterion (see Cromley & Azevedo, 2007). For instance, the indirect effect of inference mediated by theory of mind was calculated as follows: .29 * .45. Indirect effects in Table 4 are the sum of all indirect effects given that there were multiple mediators in the model. The total effects ranged from medium sizes for theory of mind (.52), grammatical knowledge (.49), working memory (.46), inference (.31), and vocabulary (.30) to small sizes for comprehension monitoring (.18) and attention (.07).

Discussion

Recent emerging evidence has suggested that listening comprehension is not a simple skill but instead draws on multiple language and cognitive skills (Florit et al., 2011, 2014; Kendeou et al., 2008; Kim, 2015; Kim & Phillips, 2014; Lepola et al., 2012; Tompkins et al., 2013). However, the nature of pathways among language and cognitive predictors has been unclear. In the current study, we used the multilevel representations framework and hypothesized that listening comprehension, a discourse-level oral language comprehension skill, is a higher-order language comprehension requiring the situation model. Listening comprehension was hypothesized to be directly and indirectly predicted by higher-order cognitive skills (comprehension monitoring, inference, and theory of mind), foundational language skills (vocabulary and grammatical knowledge), and foundational cognitive skills (working memory and attention).

Overall, a large amount of total variance in listening comprehension (85%) was explained by the included language and cognitive skills. Importantly, the results highlight direct and mediated nature of relations among skills involved in listening comprehension, revealing an intricate picture. Listening comprehension of narrative texts was directly predicted by working memory, grammatical knowledge, inference, and theory of mind and also indirectly by attention, vocabulary, and comprehension monitoring. It is also notable that working memory, grammatical knowledge, and theory of mind contributed the largest amounts of total effect, followed by vocabulary and inference. Comprehension monitoring and attention made smaller contributions to listening comprehension. Below we discuss findings in greater details in relation to theory and previous studies. It should be noted that, as is the case in any study, our results should be taken in the context of how constructs were measured and in the context of included and missing variables in the study, which would influence relative magnitudes of the skills in the study.

We hypothesized that working memory and attention (i.e., sustained attention) were foundational cognitive skills and would be necessary for foundational language skills, higher-order cognitive skills, and listening comprehension. We found that working memory and attention were both directly and moderately related to vocabulary and grammatical knowledge. Working memory was also directly, albeit weakly, related to higher-order cognitive skills, comprehension monitoring, inference, and theory of mind and even to listening comprehension. The total effect of working memory on listening comprehension was sizable (.46). The direct relation of working memory to higher-order cognitive skills is in line with the hypotheses about the role of working memory in inference making (Yuill & Oakhill, 1991), theory of mind (Davis & Pratt, 1995), and comprehension monitoring (Oakhill et al., 2005; Slade & Ruffman, 2005; Yuill & Oakhill, 1991). The relation of working memory to listening comprehension is consistent with some studies (Florit et al., 2009; Was & Woltz, 2007) but is discrepant with a recent study (Kim, 2015) that showed that working memory was not directly related to listening comprehension after accounting for foundational oral language skills and higher-order cognitive skills. Other than a difference in the included predictors (e.g., attention, inference), explanations for this discrepancy are unclear and require further investigation. Overall, however, our findings are in line with theoretical models of text comprehension and empirical evidence about the role of working memory in listening comprehension and further extend our understanding by revealing direct and indirect pathways of influence of working memory on listening comprehension. Taken together, these results support that working memory is critical for listening comprehension, making a contribution directly and indirectly via foundational language skills and higher-order cognitive skills.

A somewhat different pattern was observed for attention (i.e., sustained attention). Attention was related to vocabulary and grammatical knowledge after accounting for working memory. This is in line with a previous finding (Stephenson et al., 2008) and shows that attention makes a contribution to foundational oral language skills. However, attention was not directly related to either higher-order cognitive skills or listening comprehension after accounting for the other variables. This result is divergent with a recent finding of a direct relation of attention to story comprehension of a wordless picture book (Strasser & del Rio, 2014). One potential explanation may be that in the study by Strasser and del Rio (2014), attention was measured during the story comprehension task (i.e., how attentive children were during the story comprehension assessment), whereas in the current study attention was overall attentiveness rated by classroom teachers, not attentiveness during the listening comprehension assessment. It is also notable that the total indirect effect of attention to listening comprehension was smallest (.07) of all the included language and cognitive skills. Therefore, it appears that although individual differences in attentiveness are important to higher-order cognitive skills and listening comprehension, their influence may be indirect via foundational language skills and working memory. Because manipulating information in working memory requires attention (Fougnie, 2009), attentional control has been suggested to be important to or part of working memory capacity (Engle & Kane, 2004; Shipstead, Harrison, & Engle, in press). Although the relation between working memory and attention is weak in the current study, which is in line with a recent study (Strasser & del Rio, 2014), we believe that this might be partially due to how attention was measured—using a rating scale. Rating scales are widely used to evaluate attentiveness and have ecological validity, but attention measured by rating scales might capture a specific aspect of attention. Therefore, it will be important to replicate the current study using multiple tasks of attention such as rating scales as well as online tasks.

The current findings underscore the importance of foundational oral language skills in listening comprehension; the total effect was .49 for grammatical knowledge and .30 for vocabulary. Both vocabulary and grammatical knowledge were related to higher-order cognitive skills such as inference, theory of mind, and comprehension monitoring. Foundational language skills are essential for encoding meanings to construct initial propositions on which higher-order cognitive processes operate to construct the situation model. Although these results are in line with previous findings that children's grammatical knowledge (complement structure in particular) and vocabulary (cognitive verbs such as *think*) are important to theory of mind (Astington & Jenkins, 1999; de Villiers, 2000; Pyers & Senghas, 2009), the current findings also indicate the roles of vocabulary and grammatical knowledge in the other higher-order cognitive skills such as inference and comprehension monitoring. Furthermore, the direct relation of grammatical knowledge to listening comprehension over and above the higher-order cognitive skills is consistent with a recent study (Kim, 2015) and the hypothesis that grammatical repair skill is critical to the situation model (Perfetti, 2007).

Higher-order cognitive skills, inference and theory of mind, were both independently related to listening comprehension, supporting the hypothesis that the situation model requires making inferences (Graesser et al., 1994; Kintsch, 1988, 1994; van den Broek et al., 2005). An inference skill has been recognized for its importance in listening comprehension for young children (Florit et al., 2011, 2014; Kendeou et al., 2008; Lepola et al., 2012; Strasser & del Rio, 2014; Tompkins et al., 2013), and the current study showed that children's ability to infer missing information from their background knowledge contributed to their listening comprehension.

Interestingly, theory of mind was independently related to listening comprehension over and above an inferencing skill. In fact, its total effect on listening comprehension was largest (.52). As noted above, theory of mind, assessed by false belief tasks, requires children to understand others' thoughts and emotions, and we hypothesized that it taps into children's ability to make inferences about emotions and thoughts, an important but different type of inference than inferencing from background knowledge (Graesser et al., 1994). Because a critical aspect of comprehending narrative texts is not only understanding a sequence of events but also understanding about how the story evolves as a function of characters' goals, beliefs, and emotional reactions to events (Graesser et al., 1994), one's ability to think about others' mental status or thinking, a metacognitive ability, would be important in listening comprehension, particularly in narrative texts. The current finding is in line with recent evidence that theory of mind is related to listening comprehension (Kim, 2015; Kim & Phillips, 2014) and further indicates that theory of mind may be important to listening comprehension of oral narrative texts even over and above inference. These findings, however, are divergent from a recent study. In Strasser and del Rio's (2014) study with Chilean kindergartners, theory of mind was not independently related to children's story comprehension after accounting for days in school, age, gender, vocabulary, working memory, inhibitory control, attention, inference, and comprehension monitoring. Some differences between Strasser and del Rio's study and the current study (e.g., age of children, different predictors) might potentially explain this discrepant result. Another potential explanation is differences in the nature of texts used in the current study and Strasser and del Rio's study. In the current study, stories involved more than one character (see Appendix) and involved understanding thoughts of characters. Strasser and del Rio's study involved comprehension of a picture book about a capybara's effort to reach bananas in a tree. However, the extent to which this story involved understanding about the main character's thoughts and emotions is unknown; therefore, this speculation needs further investigation.

The relation of comprehension monitoring to listening comprehension of oral narrative texts was positive, but weak, and was not statistically significant after accounting for the other predictors in the model. We hypothesized that comprehension monitoring would relate to listening comprehension because initial elementary propositions need to be evaluated to establish coherence in their text representation (Perfetti et al., 2005). The lack of a direct relation to listening comprehension is discrepant from recent studies (Kim, 2015; Kim & Phillips, 2014). However, these previous studies did not include inference. Instead of a direct relation, comprehension monitoring was indirectly related to listening comprehension via inference and theory of mind (total indirect effect = .18). Comprehension monitoring, inference, and theory of mind were moderately related to each other in bivariate correlations and were somewhat weakly related to each other in the structural equation model. To examine whether the contribution of comprehension monitoring is indirect via inference and theory of mind, a post hoc structural equation modeling analysis was conducted by excluding inference and theory of mind from the model. Results (not displayed) revealed that the path coefficient of comprehension monitoring to listening comprehension increased to .30 and became statistically significant ($p < .001$). This indicates that the contribution of comprehension monitoring to listening comprehension is largely shared with inference and theory of mind. Comprehension monitoring involves making inferences to some extent because one needs to connect propositions in the text or with the comprehender's background knowledge to detect inconsistencies. Theory of mind also requires inference in order to understand others' mental status. Another related aspect of shared variance among these higher-order skills might be metacognition, one's awareness and regulation of his or her own cognitive states and processes (Flavell, 1979). Comprehension monitoring involves one's awareness or knowledge about his or her level of comprehension. Theory of mind is also a metacognitive skill (Flavell, Green, & Flavell, 2000) because it involves understanding one's and others' cognition. It appears that inference, theory of mind, and comprehension monitoring are different skills but also share similar processes; therefore, their influence on listening comprehension is shared to some extent.

Limitations, future directions, and conclusion

A few limitations and related future directions are worth noting. First, causal inferences cannot be drawn given the correlational nature of the data, although evidence indicates causal roles for some of the skills included in the study (e.g., inference making and comprehension monitoring: Bianco et al., 2010; vocabulary in listening comprehension: Coyne et al., 2010).

Second, some skills that have been suggested to be important to text comprehension were not included in the current study, including background knowledge and text structure knowledge (Kintsch, 1988; Perfetti et al., 2005). Background knowledge (e.g., McNamara & Kintsch, 1996; Miller & Keenan, 2009) and text structure knowledge (e.g., Cain et al., 2004; Williams, Stafford, Lauer, Hall, & Pollini, 2009) have been shown to be important to "reading" comprehension and, thus, are likely to be important to listening comprehension. In the current study, we believe that children's background knowledge is at least partially captured in the vocabulary and inference tasks. Recent studies showed that vocabulary and background knowledge are indistinguishable for school-aged children (e.g., Francis, 2014; Lonigan, 2013). If this is the case, inclusion of background knowledge and vocabulary would result in a multicollinearity effect. Furthermore, inference in the current study focused on making connections between propositions in the text and background knowledge; thus, the inference task required children to tap into background knowledge to some extent.

Third, directionality of relations needs further investigations in longitudinal and experimental studies. For instance, bidirectional relations between grammatical knowledge and theory of mind have been suggested (de Villiers, 2000) but were not tested in the current study.

Fourth, due to time and resource constraints, single tasks were used to measure language and cognitive skills. It would be ideal to measure language and cognitive skills with multiple tasks and create latent variables in future studies. For instance, in addition to a widely used rating scale of attention, a direct measure of sustained attention could be included in future studies.

Fifth, because of the discontinue rule in the listening comprehension task 2, children were exposed to different numbers of passages and associated questions. Therefore, the number of literal questions and inferential questions to which children responded varied across children. However, it is important to note that our results primarily depend on covariance among measures. Therefore, as long as children answered some literal and inferential questions, variation among children in this aspect was captured. Furthermore, the latent variable approach employed in the current study captured variance common to both the listening comprehension task 1 and task 2. Recall that the listening comprehension task 1 included both literal and inferential questions, and all of the items were administered to children. Therefore, the listening comprehension latent variable would reflect children's ability to answer literal and inferential questions, and our results are not likely to be invalid.

Finally, it will be critical to examine the direct and mediated relations of language and cognitive skills to listening comprehension for children in different languages and at different developmental phases. Although the construction–integration model of text comprehension does not specifically hypothesize differential structures as a function of language features, future studies replicating the current study with children from different language backgrounds would reveal any potential language-general and language-specific processes involved in listening comprehension. Furthermore, developmental level of children is another aspect to examine because the strengths of relations between component skills to listening comprehension might change as children mature. For older children, complexity of narrative texts increases in terms of sentence structure, storylines, and multiple perspectives such that greater attentional resources and higher-order cognitive skills might be required for comprehension.

Despite these limitations, the current findings indicate that multiple language and cognitive skills are involved in comprehension of discourse-level oral texts, and critically it is important to consider direct and indirect relations. Theoretical models and empirical studies have demonstrated the importance of listening comprehension in literacy development (Berninger & Abbott, 2010; Hoover & Gough, 1990; Joshi et al., 2012; Kendeou et al., 2009; Kim, Al Otaiba, Wanzek, & Gatlin, 2015; Kim, Al Otaiba, Sidler, Greulich, & Puranik, 2014). Therefore, success and/or difficulty with listening comprehension require systematic and careful attention in instruction and assessment. The current findings indicate that multiple language and cognitive skills are potential candidates for children's success, and difficulty with listening comprehension, assessments, and intervention on listening comprehension should attend to these multiple skills.

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Appendix

Text and questions in the Listening Comprehension Task 1

My name is Rightie. I am Ttory's sneaker for his right foot. I walk slowly. I also run fast. I have a habit of kicking something that is in sight. When Ttory tried me on for the first time, I kicked a soft drink can. Then it made loud cling noises. That sound was amusing and funny. From then on, it became my habit to kick this, that, or anything. I tried kicking an empty yogurt bottle. It made a rolling sound. I tried kicking a gate. It made a thump sound. I kicked old newspaper. It made a ripping noise. "It is too noisy. Couldn't you be quiet?" complained Leftie.

Who is Rightie? (Literal or explicit question)
How did he get his name "Rightie"? (Inferential question)
What is Rightie's habit? (Literal or explicit question)
How did Rightie come to acquire his habit? (Inferential question)
Who is Leftie? (Inferential question)
About what did Leftie complain? (Literal or explicit question)
What sound was made when Rightie kicked old newspaper? (Literal or explicit question)

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