Not all sentences are created equal: Evaluating the relation between children's understanding of basic and difficult sentences and their reading comprehension

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Abstract

The sentences in texts are far more complex and diverse than those that children commonly encounter in oral language. This raises interesting questions as to whether the understanding of some sentence types might be more important than others in children's reading comprehension. Accordingly, we examined the relation between children's reading comprehension and their understanding of two types of sentences: one we label as basic sentences, which are common in both oral and written language, and the other we label as difficult sentences, which are more restricted to written language. One hundred and four English-speaking students (mean age = 10.8 years) completed an experimental measure of oral sentence comprehension capturing these two sentence types, a standardized measure of reading comprehension, as well as control measures for word reading, phonological awareness, vocabulary and working memory. After accounting for the variance explained by the control measures, hierarchical linear regression analyses revealed that comprehension of basic sentences, but not of difficult sentences, was significantly related to children's reading comprehension. These results demonstrate that, at least in the fifth grade, English-speaking children use their understanding of those sentences for which they have gained a strong foundation through oral language (i.e., basic sentences) to springboard into reading for understanding.

K*eywords*: sentence comprehension, reading comprehension, syntax

Educational Impact and Implication Statement: Interventions for reading comprehension tend to focus on building vocabulary skills in particular or oral language as a whole. Our findings also highlight a crucial role for oral sentence comprehension as an underlying skill supporting reading for understanding.

To understand what they read, children must understand the information that is conveyed when words combine into sentences. In fact, sentence complexity has been long pointed to as the strongest determinant of text readability (e.g., Chall, 1983; Graesser, McNamara, & Kulikowich, 2011; Stenner & Swartz, 2012). In support of this claim, there is a growing body of work pointing to the relations between children's understanding of sentences in the oral modality and their reading comprehension (e.g., Muter, Hulme, Snowling, & Stevenson, 2004; Perfetti & Stafura, 2014). Indeed, some of this research has shown that oral sentence-level abilities are just as instrumental in supporting reading comprehension as the classic heavy-hitters of word reading and vocabulary (e.g., Deacon & Kieffer, 2018; Shiotsu & Weir, 2007). In the present study, we build on this prior research by exploring whether understanding of some types of sentences are more important than others in children's reading comprehension. We focus on a specific distinction: the fact that the sentences in texts are more complex and diverse than the sentences children commonly encounter through oral language (e.g., Perfetti, Landi, & Oakhill, 2005). Thus, it is plausible that children's understanding of some sentence types has a greater impact on their reading comprehension than their understanding of others. Accordingly, this study investigates whether reading comprehension is differentially influenced by children's understanding of two types of sentences: one we label as basic sentences, which are common in both oral and written language, and the other we label as difficult sentences, which are more restricted to written language.

Both educators and researchers recognize the importance of sentence level understanding for reading comprehension (e.g., Perfetti & Stafura, 2014; Scott, 2009). Indeed, Scott (2009, p. 185) describes "syntax as the vehicle, even 'workhorse', of meaning". This point can be illustrated through two contrasting sentences: *the dog chased the cat* versus *the dog was chased*

by the cat. The event described in the first sentence is different from that conveyed by the second— most notably, the 'chaser' is different. Thus, in order to understand the event described by each of these sentences, one must understand the way in which the ordering of words across different sentence types conveys meaning. Reading comprehension crucially involves constructing meaning from written texts (RAND Reading Study Group, 2002). Such meaning construction depends on understanding both the individual lexical items and the events described when these lexical items are arranged into sentences (e.g., Perfetti & Stafura, 2014; Poulsen & Gravgaard, 2016).

Despite the known importance of sentence-level abilities for reading comprehension, educators and researchers have noted that there is far less certainty as to how to support children's understanding of oral sentences to enhance their reading comprehension (e.g., Council of Chief State School Officers, 2010; RAND Reading Study Group, 2002). This point is clearly stated by the RAND Reading study group who predict that "syntactic complexity will be a robust predictor of reading performance … in virtually all subject populations (RAND, 2002, p. 105)." Their statement, however, is not specific as to how and under what circumstances sentence-level factors will influence reading comprehension. In fact, they conclude their discussion with a call for further investigations to clarify the relation between sentence-level abilities and reading comprehension. One reason that such research is needed is that written language contains more complex and a greater diversity of sentences than does oral language (e.g., Fang, 2006; Perfetti et al., 2005; Uccelli, Galloway, Barr, Meneses, & Dobbs, 2015). As such, it remains unclear whether it would be most beneficial for reading comprehension if educators were to support children's learning of the sentence types more commonly found in written language. Alternatively, strengthening children's oral language foundation might have the greatest impacts

on their reading comprehension. One way to answer these educationally relevant possibilities is to evaluate the relation between children's understanding of varied sentence types and their reading comprehension.

Theoretical accounts of reading comprehension all ascribe a role for sentence comprehension in children's reading comprehension (Perfetti & Stafura, 2014; RAND, 2002; Scarborough, 2002). In our view, clarity about the relations between children's understanding of different sentence types in the oral domain and their reading comprehension would help to further specify theoretical accounts of reading comprehension. As an illustrative example, we consider the Simple View of Reading (Gough & Tunmer, 1986). This theory emphasizes the crucial role of listening comprehension in children's reading comprehension but provides insufficient detail as to the skills that underlie listening comprehension (Kirby & Savage, 2008). Recent investigations have highlighted that listening comprehension is a complex skill that relies on a composite of underlying abilities, including vocabulary and sentence-level abilities (Lervåg, Hulme & Melby-Lervåg, 2018). Accordingly, we seek to offer clarity as to the specific role of children's oral sentence comprehension of varied sentence types in their reading comprehension.

Our focus on the specific role of children's oral sentence comprehension of varied sentence types also has relevance for recent proposals of reading comprehension. As a case in point, we examine the Reading Systems Framework (Perfetti & Stafura, 2014). Perfetti and Stafura (2014) propose that one important aspect of reading comprehension is the readers' ability to create an accurate mental representation of the situation described. In our view, sentence comprehension is an integral component, in addition to vocabulary, for understanding event descriptions and subsequently building accurate mental representations of text. This point is illustrated by contrasting two illustrative sentences: *the dog chased the cat* versus *the cat chased the dog.*

These sentences contain identical words, but the event described, and consequently, the mental representation that is required for understanding, is different in each sentence. In this example, the word order (syntax) provides an additional and crucial piece of evidence to the exact event (e.g., who did the chasing). Notably, different sentence types combine words in different ways to create specific event descriptions (as is illustrated by the example sentences already discussed above: *the dog chased the cat* versus *the dog was chased by the cat*) (we also refer the interested reader to Golberg, 2006 for a full discussion of the way meaning is conveyed within sentences). Thus, we believe that detailing the relation between children's understanding of different sentences and their reading comprehension is important for further refining theoretical accounts. In our view, this investigation is well-aligned with the Reading Systems Framework. This account already includes argument structure as an important component of the lexicon, and it lists propositional meaning and parsing processes as important for generating accurate mental representations. In sum, this framework already incorporates sentence-level abilities, as relevant, above and beyond vocabulary, for understanding reading comprehension. The Reading Systems Framework and other theories of reading comprehension, however, do not delineate whether or how children's understanding of varied sentence types might differentially influence their reading comprehension. In our view, these differences should be incorporated into theories of reading comprehension. A first step towards this end lies in testing empirically whether children's comprehension of varied sentences differentially influences their reading comprehension. In this work, we focus specifically on their oral sentence comprehension abilities.

We consider two broad categories of sentence types that we feel are relevant for children's reading comprehension: basic and difficult (Poulsen & Gravgaard, 2016). The main distinction

between these sentences types is the way the nouns are arranged around the verb (word order). In English, basic sentences (also referred to as canonical sentences) have a predictable word order (cf. *the dog chased the cat*), where the person carrying out an action (i.e., the agent) precedes the verb. This is the case, for example, in active sentences and sentences that contain a subject relative clause. Basic sentences are widely prevalent in both oral and written language. Such sentences are learned through oral language during the preschool years and understanding of these sentence types is well established by the time children enter school (e.g., Ambridge & Lieven, 2011; Diessel & Tomasello, 2005; Frizelle, O'Neill, & Bishop, 2017; Gertner & Fisher, 2012). Given the known importance of oral language development in reading comprehension (e.g., Biemiller, 2014), it seems plausible that children draw on the sentence-level abilities that are already well-established through their oral language experiences, such as their understanding of basic sentences, to springboard into reading for understanding.

Difficult sentences (sometimes referred to as non-canonical sentences) also have a predictable word order, but notably, this word order is different from that of basic sentences. This is the case, for example, in passive sentences, where the agent follows the verb (cf. *the dog was chased by the cat*) and sentences that have an object relative clause. Difficult sentences are less common in both oral and written language when compared to basic sentences. When comparing difficult sentences across the two domains, these sentence types are more frequent in written than oral English (e.g., Dąbrowska & Street, 2006). Children are able to interpret these sentence types, especially in straightforward and semantically plausible sentences (e.g., Dick, Wulfeck, Krupa-Kwiatkowski & Bates, 2004; Frizelle et al., 2017; Kidd, Brandt, Lieven & Tomasello, 2007). Nevertheless, fully understanding this type of sentence continues to be more challenging than understanding basic sentences for children in the late elementary school years

and even adults (e.g., Dąbrowska, 1997; Dąbrowska & Street, 2006; Ferreira, 2003; Montag & MacDonald, 2015; Montgomery, Evans, Gillam, Sergeev, & Finney, 2016; Nippold, 2000; Street & Dąbrowska, 2010). As an illustrative example from adulthood, Traxler, Morris and Seely (2002) conducted an eye-tracking study with undergraduate students and found that sentences with subject relative clauses (basic sentences) were easier to process than those with object relative clauses (difficult sentences). This raises the possibility that the occurrence of such sentences in texts may be one point where comprehension is most impacted during reading; consequently, children's comprehension of difficult sentences, even in the oral domain, might be most relevant to their success in reading comprehension.

It is difficult from existing literature to evaluate the extent to which children's understanding of basic and difficult sentences influences their reading comprehension. First, the vast majority of research that points to a relation between children's sentence comprehension and their overall reading comprehension does so with tasks that include a wide range of sentence types (e.g., Cain, 2007; Cutting & Scarborough, 2006; Ecalle, Bouchafa, Potocki, & Magnan, 2013; Goff, Pratt, & Ong, 2005; Shiotsu & Weir, 2007). For example, Goff et al. (2005) found that sentence comprehension was a significant predictor of reading comprehension scores in English-speaking children aged eight to eleven years, after controlling for verbal working memory and short-term memory, as well as vocabulary size. Goff et al.'s (2005) sentence comprehension task aggregated scores across varied sentence types, including passive sentences and sentences with embedded clauses. A similar pattern of findings emerged in Cain's (2007) study with English-speaking children, aged seven to ten years. In that study, the sentence comprehension measure also combined performance across a range of sentences. This approach has been valuable in demonstrating and quantifying the contribution of children's understanding

of sentences to their reading comprehension; however, this work cannot identify the contribution of children's understanding of different sentence types to their reading comprehension.

This same concern arises from the body of research on syntactic awareness, a meta-linguistic skill that reflects children's ability to reflect upon and manipulate sentence structure, rather than sentence comprehension. Once again, these studies provide strong evidence for a relation between sentence-level abilities and reading comprehension generally (e.g., Brimo, Apel, & Fountain, 2017; Deacon & Kieffer, 2018; Geva & Farnia, 2012). However, the majority of studies do not report the type of sentences included in their tasks (Brimo, Lund, & Sapp, 2018). For those studies that report on the sentence types included, basic sentences appear to be favored to ensure that children are sufficiently familiar with the sentences to reasonably be able to manipulate them (Cain, 2007; Deacon & Kieffer, 2018). As such, from this body of work, we cannot extrapolate about the likely relation between children's understanding of basic compared to difficult sentences and their reading comprehension.

To our knowledge, three studies have explored the relation between different sentence types and children's reading comprehension. Poulsen and Gravgaard (2016), in the only study that included a distinct measure of sentence comprehension of varied sentence types, found that fifth-grade, Danish-speaking children's speed of comprehension for difficult, but not basic, sentences, was significantly related to reading comprehension; these effects emerged after controlling for children's vocabulary size, decoding skills and verbal memory. In Poulsen and Gravgaard's (2016) study, difficult sentences were longer than basic ones and all sentences were presented in written form. Children had accuracy levels that approached ceiling, especially for basic sentences. Poulsen and Gravgaard's (2016) findings of an influence of speed of processing of difficult sentences on reading comprehension align with the two available studies that have

assessed the impact of sentence types on children's comprehension of texts. Ecalle et al. (2013) and Richek (1976) reported that reading comprehension scores decreased as the sentence complexity within the task increased, for French- and English-speaking children, respectively. Taken together, these studies highlight that reading comprehension can be differentially influenced by specific sentence types.

A key next step in building on this research lies in specifying the extent to which children use their oral sentence comprehension abilities to make sense of what they read. These prior studies all used written measures of sentence comprehension; this means that sentence-level abilities cannot be easily disentangled from general reading ability, nor can effects be ascribed to oral sentence comprehension in particular. Understanding to what extent children's oral sentence comprehension supports their reading comprehension is a core question that would guide instruction in the classroom. Such information is necessary to design language rich supports with the most promise for supporting reading comprehension.

The Current Study

This study examines the extent to which English-speaking children's comprehension of basic versus difficult sentences is related to their reading comprehension. We test two contrasting hypotheses. On one hand, oral language abilities are known to be crucial in supporting reading comprehension. This leads us to hypothesize that children's understanding of basic sentences will be instrumental to their reading comprehension. On the other hand, there is more variability in sentence structure within written texts and this suggests that children's understanding of difficult sentences within the oral domain may also be especially relevant for understanding their reading comprehension. This leads us to hypothesize that the measures which include difficult,

and less frequent, sentences may illustrate key aspects of oral sentence comprehension that are necessary for reading comprehension. These possibilities are not mutually exclusive; it might be that children need a strong understanding of a variety of sentence types for successful reading comprehension.

To test these hypotheses, we focused on children in the fifth grade. By fifth grade, children are expected to read texts that contain increasingly complicated sentences for the purposes of learning content (Center for Public Education, 2015; Nova Scotia Education Programs Department, 2017). This is also a point at which word reading and reading comprehension diverge, allowing us to examine specific influences of sentence comprehension on reading comprehension (e.g., Chall, 1983; Foorman, Koon, Petscher, Mitchell & Truckenmiller, 2015; Tilstra, McMaster, Van Den Broek, Kendeou, & Rapp, 2009).

We administered an oral sentence comprehension measure. In using an oral language measure, we can evaluate children's sentence comprehension without a potential confound with reading level more generally. The particular task we selected was the "whatdunnit' (Montgomery et al., 2016). This task includes an equal number of basic and difficult sentences, allowing us to evaluate the relation between children's comprehension of each of these sentence types and reading comprehension. On this task, the sentences are constructed so that the same number of words are included across sentence types to minimize the extent to which working memory demands differed across the sentence types. This task has also been demonstrated to be appropriately challenging for children in later elementary years, which reduces the possibility of ceiling effects and increases the ability to capture individual differences. Beyond these features, this task is specifically of interest because it focuses on children's understanding of the meanings that arise from the way words combine, thereby aligning with our theoretical conceptualisations

of the importance of sentences to reading comprehension. In this task, sentences contain only inanimate nouns; this forces children to rely on the word order, without support from the meanings of specific words, to understand the meaning of the sentences (e.g., "*The hat had hugged the belt behind the very bright new sock*" (Montgomery et al., 2016, p. 1304). This design helps to overcome the long-known connection between semantic knowledge and sentence-level abilities, and to isolate effects due to sentence comprehension (e.g., Lesgold, 1974; Montgomery et al., 2016). Vocabulary items were randomized across the basic and difficult conditions to further minimize any potential influence from vocabulary knowledge. In our analyses of results from this task, we examine the relation between reading comprehension and performance on the basic and difficult items separately. Further, to ensure comparability of our findings to past work, we also evaluated the relation between reading comprehension and a sentence measure that aggregated across these sentence types.

In evaluating the contribution of sentence comprehension to reading comprehension, we included several relevant control variables. We included control measures for word reading fluency and phonological awareness, given that one main precursor to reading comprehension is the ability to identify the written form of words (e.g., Garcia & Cain, 2014; NICHD, 2000). Further, we control for vocabulary to ensure that effects are due to sentence-level, and not word-level, understanding and given that vocabulary size is a well-established factor in reading comprehension (e.g., Verhoeven & van Leeuwe, 2008). Additionally, we included working memory as a control. This was done to isolate our effects from the known influence of verbal working memory on children's ability to maintain a representation of the entire sentence while they seek to identify the meaning provided through sentences (Cain, 2007).

Method

Participants

A total of 104 English-speaking fifth grade children (51 girls and 53 boys) from schools in rural areas of Eastern Canada participated in this study. Children ranged in age from 10;01 to 12;00 (years;months, mean = 10;8 years, *SD* = 3.8 months). According to parent report, all children were from English-speaking homes. For eight children, a language in addition to English was also spoken in the home. These eight children had comparable scores to the other ninety-six children on all measures (*ps* > .15). For all tasks, minimum scores were in fact higher for the children exposed to an additional language than for those exposed only to English. Given this parity in performance and exposure, we analyse the data for all 104 children together.

Measures

Key measures.

Reading Comprehension. Reading comprehension was measured with the Comprehension subtest of the Level 5 Gates-MacGinitie Reading Tests (MacGinitie, MacGinitie, Maria, Dreyer, & Hughes, 2000). This standardized task presents children with 11 short passages and children have 35 minutes to read these passages. Following each passage, children's understanding of the passage is assessed through multiple-choice questions about the content of that passage. There are 48 multiple questions in total across the task. The children are able to view the passage while answering the questions. This standardized measure includes passages across the following genres: fiction, social sciences, natural sciences and the humanities (MacGinitie, MacGinitie, Maria & Dreyer, 2002). These texts also include varied sentence types, including both basic and difficult sentences.

Sentence comprehension. Sentence comprehension was evaluated via an oral language measure developed by Montgomery et al. (2016). In this experimental task, children heard a sentence about one object doing an action to another object. After hearing the sentence, three images appeared on the screen. Children selected the picture corresponding to "the doer" from the array of three pictures on a computer screen. They made this choice by pressing one of three marked buttons on the keyboard, positioned under the corresponding image. The task was comprised of 4 practice items and 132 test items equally distributed across basic and difficult sentence types. For the practice items, children heard sentences that contained animals and one of each sentence type was included (active, subject relative clause, passive and object relative clause). Within the test items for basic sentences, there was an equal number of active sentences (e.g., *the hat had hugged the belt behind the very bright new sock)* and sentences that contained a subject relative clause (e.g., *the watch that had hugged the truck behind the kite was bright)* (33 of each). Within the difficult sentences, there was an equal number of *be*-passive sentences (e.g., *the train was watched by the bed behind the very cold cake*) and sentences containing an object relative clause (*the box that the kite had splashed behind the shoe was dry*) (33 of each) (Montgomery et al., 2016, p. 25-26). Crucially, all sentences in this task were balanced for length. This is important because active sentences tend to be shorter than passive sentences and both of these tend to be shorter than sentences containing a relative clause. Balancing the length across all sentences ensures that we are investigating differences in sentence type and not simply differences due to varied length across sentence types. Following Montgomery et al. (2016), raw accuracy scores were calculated for each sentence type by tallying the correct number of responses.

Control measures.

Word reading fluency. The Sight Word Efficiency subtest of the Test of Word Reading Efficiency (TOWRE) was used to assess word reading fluency (Rashotte, Torgesen, & Wagner, 1999). In this task, participants are asked to read lists of words as quickly as possible within 45 seconds. Raw scores were verified from recordings of the task. A point was awarded for every word read with correct pronunciation during the time limit.

Phonological awareness. The Elision subtest of the Comprehensive Test of Phonological Processing was used as a measure of phonological awareness (Wagner, Torgesen, & Rashotte, 1999). This task asks participants to manipulate the phonemes within a word by reproducing the word without one of the phonemes.

Vocabulary. Children's receptive vocabulary was measured with a modified version of the Peabody Picture Vocabulary Test (PPVT-IIIR, Dunn & Dunn, 1997). To reduce testing time, we administered every fourth item of this task. Scores from the full and reduced versions remain highly correlated (Deacon, Benere, & Pasquarella, 2013). The modified version was administered and scored in the same way as the full version. Testers said a word to the child. Children then selected the corresponding picture from an array of four pictures.

Working Memory. The digit span measure from the Canadian Version of the Wechsler Intelligence Scale was used to measure working memory (Wechsler, 2004). Children were asked to recall a series of digits. Both the forward digit span and reverse digit span tasks were administered. The total raw score for digit span was the total across these two tasks.

Procedure

Data for this study come from the third time point (fifth grade) of a larger longitudinal study. General control variables for vocabulary, phonological awareness and working memory

were collected at the onset of the study when children were in third grade. Individual differences in these measures have been shown to be stable over this period of childhood (for phonological awareness: Torgesen & Burgess, 1998; for vocabulary: Biemiller & Slonim, 2001; Bornstein, Hahn, Putnick, & Suwalsky, 2014; Verhoeven, van Leeuwe, & Vermeer, 2011; for working memory: Scarborough, 1998). All tasks were administered in quiet rooms in the participants' schools. The reading comprehension task was administered in group sessions of 2 to 12 students, and all other tasks were administered individually. All testers were trained extensively in the testing procedures prior to administering tasks.

Results

Table 1 summarizes ranges, means and standard deviations for all raw and grade equivalent scores. Raw scores for the sentence comprehension task are presented as the proportion correct. Children correctly interpreted .73 (*sd* = .20, *range* = .12-.98) of the basic sentences. In contrast, they correctly interpreted, on average, .43 (*sd* = .27, *range* = .02-.98) of the difficult sentences. This difference in accuracy was significant ($t(103) = 10.68$, $p < .001$). Measures of skew, kurtosis and internal consistency reliability (Cronbach's alpha) are also provided in Table 1.

Table 2 presents a Pearson correlation matrix of bivariate correlations between all measures. The majority of the variables were significantly correlated. Children's comprehension of basic and difficult sentences was weakly correlated with each other ($r(102) = .25$, $p = .01$). Notably, an inspection of the Mahalanobis Distance between basic and difficult scores revealed no multivariate outliers. Basic sentence comprehension was moderately and significantly correlated with reading comprehension ($r(102) = .54$, $p < .001$), whereas difficult sentence

comprehension was only weakly and significantly correlated with reading comprehension ($r(102) = .36$, $p < .001$).

Reading comprehension and basic and difficult sentences

Hierarchical multiple regression was used to evaluate the contribution of children's understanding of basic and difficult sentences to their reading comprehension. These results are reported in Table 3. We included age, word reading fluency, phonological awareness, vocabulary and working memory as controls and entered these variables in the first step of the analysis, which accounted for 42% of the variance. In step two, we added children's accuracy with basic and difficult sentences. The inclusion of these variables accounted for a unique and significant 12% of the variance of children's reading comprehension scores ($p < 0.001$). It is worth considering, the extent to which each of these sentence comprehension measures influences reading comprehension scores. As can be seen from the standardized β-values in Table 3, increases in difficult sentence scores are not associated with improved reading comprehension ($\beta = .01$), whereas increases in basic sentences scores are associated with a comparable amount of improvement in reading comprehension as what can be seen for word reading ($\beta = .38$ and .40, respectively). We make one final comment about the relation between children's accuracy with difficult sentences and their reading comprehension scores. If difficult sentences are removed from the model, children's accuracy with basic sentences continues to account for a unique and significant 12% of the variance of children's reading comprehension scores ($p < 0.001$). As such, we conclude that children's accuracy with basic sentences, but not their accuracy with difficult sentences, is related to their reading comprehension scores.

Reading comprehension and aggregate sentence comprehension

To contrast the results of our work with past studies, hierarchical multiple regression was used to evaluate the contribution of scores on the aggregate measure of sentence comprehension to reading comprehension. The first step for this model included the control variables of age, word reading fluency, vocabulary, phonological awareness, and working memory. As noted above, together these variables accounted for 42% of the variance. In step two, we added the aggregate measure of sentence comprehension (i.e., a sum across children's accuracy with both basic and difficult sentences). This variable accounted for a unique and significant 8% ($p < 0.001$) of the variance in children's reading comprehension scores.

Discussion

This study evaluated whether children's understanding of two broad categories of sentence types differentially impacted their reading comprehension. We contrasted the relation between reading comprehension and children's understanding of basic sentences, which are common in both oral and written language, with the relation between reading comprehension and their understanding of difficult sentences, which are more restricted to the written language. We did so in a regression design that included word reading fluency, phonological awareness, vocabulary and working memory as controls and focused on a measurement of sentence comprehension in the oral domain. We found that, for the English-speaking, fifth-grade children in this study, understanding of basic sentences, but understanding of difficult ones, had a significant and unique relation to their reading comprehension scores.

Our findings highlight that children's understanding of basic sentences in the oral domain is substantially linked to their reading comprehension. We believe this finding aligns with the results of many other studies of reading comprehension that highlight the importance of oral language (e.g., Clarke, Snowling, Truelove, & Hulme, 2010; Gough & Tumner, 1986; Kirby &

Savage, 2008). We extend this to the specific case of oral sentence comprehension. Basic sentences are common in oral language, and so it is expected that children have a strong foundation in understanding these sentences. Certainly, such a foundation is demonstrated in children's high accuracy in comprehending basic sentences both in this study and in other studies of language development (e.g., Ambridge & Lieven, 2011; Diessel & Tomasello, 2005; Frizelle et al., 2017; Gertner & Fisher, 2012). In our view, our results suggest that children's well-established understanding of basic sentences in the oral domain is a springboard from which they launch into their reading for understanding.

The relation between children's oral comprehension of basic sentences and reading comprehension does not appear to generalize across all sentence types. In our study, children's accuracy in understanding orally presented difficult sentences was not significantly related to their reading comprehension abilities, beyond the control measures instituted. At first glance, this result is quite surprising. Indeed, we initially speculated that the relation between sentence-level comprehension and reading comprehension may be more tied to the sentence types that are more restricted to written language, a view that aligns with earlier ideas (e.g., Fang, 2006; Uccelli et al., 2015). We interpret our finding of non-significant unique relations between reading comprehension and children's comprehension of difficult sentences as further evidence that, at least at this age, children rely heavily on their foundational oral language skills, indexed here through their comprehension of basic sentences. Difficult sentences, in contrast, do not appear to be as fully developed within the oral language, as is evidenced by children's reduced accuracy at interpreting these sentences, and understanding of these sentences is thus less readily available for children of this age to use in support of their reading comprehension.

Before further detailing the relation between oral sentence comprehension and reading comprehension, it is important to further consider the children's accuracy at interpreting difficult sentences. The children in our study interpreted, on average, 43% of the difficult sentences correctly and some children performed below chance for this sentence type (n = 44). These results are in sharp contrast with children's accuracy on the basic sentences (73% correct). Accordingly, in our view, the low performance observed for the difficult (non-canonical) sentences suggests that when presented with a task that relies heavily on syntactic cues, children struggled to utilize their emerging understanding of difficult sentences to succeed at interpreting these sentences. In contrast, it seems that children readily utilize their well-established understanding of basic sentences to interpret the sentences on this measure. Of course, we are not arguing that children have no understanding of difficult sentences at this age. Clearly, past research has shown that they can interpret these sentence types, particularly in straightforward and semantically plausible sentences (e.g., Dick, Wulfeck, Krupa-Kwiatkowski & Bates, 2004; Frizelle et al., 2017; Kidd, Brandt, Lieven & Tomasello, 2007). Nevertheless, in the case of this study, the contrast between the results for the two sentence types suggests that children's understanding of difficult sentences may be less clearly established than is the case for their understanding of basic sentences. Indeed, we are not the first to suggest that children and adults continue to be challenged to fully understand difficult sentences (Dąbrowska & Street, 2006; Ferreira, 2003; Montag & MacDonald, 2015; Montgomery, Evans, Gillam, Sergeev, & Finney, 2016; Nippold, 2000; Street & Dąbrowska, 2010; Traxler et al., 2002).

One final note about performance on this particular task is warranted. The children in our study appeared to have had more challenge with the difficult sentences than was observed for the children in Montgomery et al. (2016) original study using this task. Notably, in a follow up

study, using the same task, Gillam, Montgomery, Evans and Gillam (2019) reported comparable accuracy to those found in our study for both basic and difficult sentences, although the age range in their latter study was more broad (7-11 years). In comparing these studies, we believe one important detail is that on average the children in Montgomery et al.'s (2016) typical language sample scored slightly above the standardized mean on other measures of language development (e.g., recalling sentences from the CELF). As such, one possible explanation for the slight variations in accuracy scores across these studies is that the children in Montgomery et al.'s (2016) study may have had advanced sentence comprehension abilities for their age.

Returning to the relation between oral sentence comprehension and reading comprehension, we further speculate that our pattern of results suggest that children must establish a threshold of skill in their oral language in order to be able to utilize these oral language skills to support their reading comprehension. This idea resonates with the fact that in our study, children had high accuracy in their understanding of basic sentences, far higher than that of difficult sentences. In our view, the fragility of their ability to interpret difficult sentences in the oral domain makes it challenging for children to use their abilities at understanding these sentence types to support their reading comprehension. Indeed, the notion of a linguistic threshold has been suggested in other domains. For example, a threshold of language ability has been proposed as necessary before children's bilingualism can positively influence their cognitive and academic abilities (e.g., Bae & Joshi, 2018; Brevik, Olsen, & Hellekjær, 2016; Cummins, 1979, 2000). If a certain threshold of oral language ability is necessary to support reading comprehension, then our pattern of results is expected to differ as children develop more advanced comprehension abilities with difficult sentences. We speculate that, beyond the elementary years, as the complexity of texts increases, children's understanding of difficult

sentences may become more well-established and will become more important for reading comprehension. Such ideas need testing across different developmental time points.

Clearly our findings of a role for understanding basic sentences, but not for understanding difficult ones in children's reading comprehension diverge from the limited earlier evidence. Other studies have suggested that difficult sentences are the point at which reading comprehension may break down, as evaluated by children's comprehension of written sentences during the process of reading (Ecalle et al., 2013; Richek, 1976). Building on this, Poulsen and Gravgaard (2016) found that Danish-speaking children's speed of comprehension of difficult, but not basic sentences, presented in writing was uniquely related to their overall reading comprehension. In our view, the domain in which sentence comprehension is measured is particularly important for interpreting the differences between studies. These past studies all presented difficult sentences in writing, which introduces confounds with word level reading skill. That said, the findings of these studies suggest understanding difficult sentences in written text might indeed represent a particular area of challenge for young readers. In contrast, our findings speak directly to the aspects of oral language that children specifically draw upon to support their reading comprehension. When measured specifically in the oral domain, our study shows that children draw upon the oral language skills that are already well established, such as their understanding of basic sentences, to support their reading comprehension. Taking these two sets of findings together, understanding difficult sentences in writing might indeed challenge reading comprehension while understanding basic sentences in the oral domain might support reading comprehension across texts as a whole. Such a speculation might be tested by exploring the contributions of sentence comprehension measured in different formats and by evaluating the

extent to which individual sentences—across types-- within paragraphs influences overall reading comprehension.

Another factor worth considering when interpreting differences between these studies lies in the measure of reading comprehension. We used a standardized measure of reading comprehension with paragraphs with varied sentence types, including both basic and difficult sentences. After reading the entire paragraph, children answered a series of multiple-choice questions about what they have read. In our view, this method has ecological validity in that it resembles what children are asked to do within a classroom context. Yet, format of measurement likely matters a good deal to results. Measures of reading comprehension relying on multiple-choice responses, like that used in the present study, have been shown to draw more heavily on oral language than those with cloze format (e.g., Cutting & Scarborough, 2006; Keenan & Meenan, 2014). This latter format, used by Poulsen and Gravgaard (2016), tends to have a stronger association to word reading measures (e.g., Cutting & Scarborough, 2006; Keenan & Meenan, 2014). We would encourage new studies in this domain to measure both reading comprehension and sentence comprehension across multiple modalities and response formats.

Returning to the question of the extent to which oral sentence comprehension is related to reading comprehension, we consider the size of the contribution of our aggregate measure of sentence comprehension, an analysis more closely parallel to that reported in prior research (e.g., Cain, 2007; Cutting & Scarborough, 2006; Shiotsu & Weir, 2007). Interestingly, the magnitude of the effect for the aggregate measure in this study (8%) was smaller than that for only basic sentences alone (12%). It seems that the inclusion of difficult sentence types may underestimate the role of oral sentence comprehension in reading comprehension, at least for children of this age. As such, children's sentence comprehension might be even more important to their reading

comprehension than previously speculated (e.g., Deacon & Kieffer, 2018). In sum, given that children's understanding of basic sentences had a comparable influence on their reading comprehension as their word reading abilities, we suggest that oral sentence comprehension is one of the foundational skills underlying reading comprehension for children of this age.

Our findings have implications for the classroom. Interventions for reading comprehension tend to focus on building vocabulary skills in particular or oral language as a whole (e.g., Clarke et al., 2010; RAND, 2002). We do not dispute the value of supporting oral language in these ways; however, our findings also highlight a crucial role for oral sentence comprehension. This is in line with previous research which has demonstrated that sentence-level abilities represent a noted area of difference between weak and strong readers (e.g., Gaux & Gombert, 1999; Glass & Perna, 1986; Nation et al., 2010; Nation & Snowling, 2000; Tong, Deacon, & Cain, 2013). Further, targeted supports for sentence-level abilities have been shown to improve children's reading comprehension (Weaver, 1979). We think that our results suggest that targeted support for children's understanding of basic sentences in the oral domain may be especially beneficial for children who struggle with reading comprehension in the elementary years. This suggestion, of course, needs empirical validation with intervention research. As we make this recommendation, we do not want teachers to refrain from implementing instruction in sentences in fear of doing so with the 'wrong kind' of sentences. Given the contribution of our aggregate measure of understanding of sentences as a whole to reading comprehension, we would encourage educators to teach children about sentences—without worrying too much about the specific sentence types at this point in the empirical process. Such instruction would already go beyond more general teaching about oral language as a whole.

Our findings also have important theoretical implications. All major models for reading comprehension agree that sentence comprehension is a component skill that children draw upon to support their reading comprehension (e.g., Perfetti & Stafura, 2014; RAND, 2002; Scarborough, 2002). As is illustrated by the example sentences in the introduction, word order provides the necessary cues to understand precisely what event is being described. Accordingly, we suggest that sentence-level skills are one of the important foundations that children need in order to create accurate mental representations and thus construct meaning, something which is essential for reading comprehension (Perfetti & Stafura, 2014; RAND, 2002). However, theories do not distinguish between different kinds of sentences and how they might relate to reading comprehension. In our view, our findings suggest that we need to pay particular attention to basic sentences in the oral domain in understanding children's reading comprehension. We believe that children's understanding of basic sentences reflects a contribution from an aspect of oral language for which children have a well-established foundation. Of course, as children progress and develop more advanced oral language systems, they might broaden the oral language skills on which they can draw upon to support their reading comprehension. Indeed, they may need to do so as the syntactic complexity within the texts they encounter increases (Graesser et al., 2011). In sum, we believe that theories of reading comprehension need to delineate when and how children's understanding of different kinds of sentences might differentially influence their reading comprehension.

As with all studies, the results of our study need to be interpreted within the context of specific methodological decisions. Given our use of a cross-sectional design, our results cannot speak to developmental patterns. Evaluating temporal relations may be particularly important to understanding the relations between sentence and reading comprehension because written texts

have been suggested as a primary source on which adults build their understanding of diverse sentence types, even in the oral domain (Dąbrowska & Street, 2006; Street & Dąbrowska, 2010). Future longitudinal research that investigates bidirectional relations is necessary to fully understand the way in which children's emerging understanding of diverse sentence types might develop from, as well as potentially support, their reading comprehension.

At this point, it is necessary to discuss additional aspects of the sentence comprehension task, beyond its presentation in the oral domain, which may have influenced our pattern of results. One aspect lies in our focus on a single distinction between sentence types – word order – leading to the dichotomy of basic (canonical) and difficult (non-canonical) sentences. Future research should consider the extent to which reading comprehension is influenced by other properties of the sentence, such as single clause compared to multiclause sentences. Another avenue for future research is the interplay between cognitive abilities, sentence-level skills and reading comprehension. As one example, Gillam et al. (2019) found that cognitive abilities are related to the automatic chunking of oral language input which facilitates understanding of both basic and difficult sentences. An interesting next step would be to determine the extent to which these abilities interact to support reading comprehension. A third consideration lies in our choice of a task that reduces the possible influence of semantic cues to assist in interpreting the sentences (Montgomery et al., 2016). We chose this task so that we could focus specifically on sentence comprehension, disentangling its effects from others, such as word reading. Still, all choices come with consequences. For instance, the sentences on this task do not portray plausible events, likely increasing task difficulty for the children. In our view, this is a positive aspect of the task because it avoids the ceiling effects which have occurred in other studies of sentence comprehension (e.g., Poulsen & Gravgaard, 2016) and enables the investigation of individual

differences. Despite increased difficulty, the task appeared to be understood by the children, given their high accuracy in the basic sentence condition. Yet, many children in this study performed below chance on the difficult sentences, so floor effects may have influenced the pattern of results noted here. Any of these factors might have resulted in a stronger contribution of comprehension of difficult sentences to reading comprehension in past studies (e.g., Poulsen and Gravgaard, 2016) compared to ours. Clearly these questions need to be explored with other approaches to measurement.

In demonstrating differences in the relation between reading comprehension and children's oral sentence comprehension of basic and difficult sentences, this study illustrates that not all sentences are created equal when it comes to supporting children's reading comprehension. Specifically, we found a unique role for children's understanding of basic sentences in the oral domain in their reading comprehension. This finding emphasizes how children continue to draw on their strong oral language foundation to support their reading comprehension, even as they encounter texts that contain more complex and diverse sentences than are typical in oral language. This study provides much-needed clarity as to the aspects of oral sentence comprehension that support reading comprehension through the elementary years.

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Table 1.

Means, standard deviations, ranges, skewness, kurtosis and reliability for all measures

	Mean	*SD*	*Range*	*Skewness*	*Kurtosis*	*Reliability*
Key Measures:						
Reading Comprehension						
Raw	26.70	9.41	7-47	.044	-.829	.92[a]
Grade Equivalent	5.79	2.53	2.1-12.6	1.145	.966	
Sentence Comprehension						
Basic Sentences	.73	.20	.12-.98	-.88	-.96	.94[b]
Difficult Sentences	.43	.27	.02-.98	-1.068	.496	.96[b]
All Sentences	.58	.38	.07-.098	.171	-.531	.96[b]
Control Measures						
Sight Word Efficiency						
Raw	69.02	11.25	34-92	-.588	.455	.93[c]
Grade Equivalent	5.61	1.97	2-11	.588	-1.77	---
Age (in months)	129.00	3.78	121-144	.421	1.070	---
Receptive Vocabulary Raw	32.47	4.60	23-46	.112	.588	.79[b]
Phonological Awareness	23.29	5.71	10-33	-.322	-1.073	.89[c]
Working Memory	13.08	2.30	8-20	.411	.588	.89[c]

[a]Manual-reported Kuder-Richardson reliability coefficient [b]Sample-specific Cronbach's alpha reliability coefficient [c]Manual-reported alternate form coefficients

Table 2.

Pearson Correlations between all Variables in Raw Scores

	1	2	3	4	5	6	7
1. SC: Basic Sentences	---						
2. SC: Difficult Sentences	.25**	---					
3. Age	-.005	-.02	---				
4. Vocabulary	.10	.24*	.16	---			
5. Sight Word Efficiency	.33**	.33**	.12	.39**	---		
6. Working Memory	.36**	.36**	.05	.09	.31**	---	
7. Phonological Awareness	.28**	.33**	.08	.38**	.51**	.30**	---
8. Reading Comprehension	.54**	.36**	.07	.44**	.63**	.26**	.41**

Notes. SC = Sentence Comprehension; * $p \leq 0.05$, ** $p \leq 0.01$

Table 3.

Hierarchical linear regression analyses predicting reading comprehension from basic and difficult sentence comprehension scores.

Step	Variable	ΔR^2	β
1	Age	.424***	-0.007
	Word Reading Fluency		0.404***
	Vocabulary		0.235**
	Working Memory		-0.051
	Phonological Awareness		-0.010
2	Sentence Comprehension: Basic Sentences	.121***	0.379***
3	Sentence Comprehension: Difficult Sentences	.004	0.010

Notes: Standardised β values and the corresponding *p*-values are from the final step.
** p < .0, ** p < .0, *** p < .001*