ABSTRACT: Middle school children in a southern district of Karnataka, with Kannada as their dominant language, were investigated for individual differences in reading comprehension attainments in Kannada. This language of South India requires mastery of words inflected with markers for various grammatical functions. Children learning to read in Kannada also have to master a set of akshara of the writing system; this takes time, and has a reciprocal impact on decoding skills and phonological processing skills. We found children’s decoding skills, phonological skills, and knowledge of vocabulary and inflection, taken together, to predict individual variations in reading comprehension attainments. We suggest that programmes to improve children’s reading comprehension must actively promote the two domains of decoding and oral language skills. Contrary to the assumption that children do not need this level of support for their dominant language, our survey suggests that many need structured opportunities for developing their knowledge of vocabulary and inflection.

KEYWORDS: Kannada, reading comprehension, inflection, vocabulary, decoding, phonological processing, predictors of reading attainments

0. INTRODUCTION

Children’s oral language provides a critical foundation for reading development. Research studies have shown that children’s level of vocabulary and grammar knowledge can explain attainments in reading comprehension. On the other hand, if a child’s basic word decoding is
poor then reading comprehension can be expected to be compromised, since the child struggles with recognizing some (or many) words in the text. Cross-linguistic studies in the field are however rare and most of the published work about predictors of reading comprehension attainments are mainly in the European languages. It is against this backdrop that we investigated individual differences in reading comprehension and predictors of reading comprehension in Kannada, a language of South India.

1. KANNADA ORTHOGRAPHY, PHONOLOGY AND MORPHOSYNTAX

Kannada is a Dravidian language spoken in the southern state of Karnataka in India. The Kannada writing system comprises a set of more than 400 akshara symbols to represent distinct sounds. This number is in contrast to the much smaller set of symbols in the alphabetic writing systems of other languages. The cognitive demands for remembering the symbol set are different from those made by the more contained writing systems. Accordingly, the pace of symbol learning is drawn out in the extensive Indian akshara system. In a survey of 18 Kannada medium schools we found that children had mastered about 80% of the akshara set by Class 4 (Nag 2007). Knowledge of low frequency akshara and akshara taught later however remained poor at the end of primary school even among good readers. Similar findings have been reported in Malayalam (Tiwari, Nair & Krishnan, submitted) and in Hindi (Nag 2011).

In the Kannada writing system, sounds reliably map on to specific symbols, barring a few exceptions. The anuswara which represents either nasals or the /m/ sound is one such exception; words that carry the anuswara require additional learning, similar to learning that the letters ‘s’ and ‘c’ can both represent the sound /s/ as seen in the words ‘sell’ and ‘cell’. Moreover Kannada has some instances of irregularity because of variations between certain spoken forms and the written form. In the dialects of Chamarajanagara and the surrounding areas of South Karnataka for example, the word initial glottal fricative /h/ elides in speech to the following vowel; thus children say alva for the sweetmeat halva and uli for tiger, huli (Manjulaxmi 1996). Effects of diglossia are seen in
children’s spelling development in Kannada (Nag, Treiman & Snowling 2010b) but we are not aware of any research that has systematically examined diglossia effects on reading skills. Straightforward decoding may not suffice for reading of exception words, and word recognition may also draw upon semantic and syntactic knowledge, as indeed it does in English (Nation & Snowling 2004).

Words in Kannada typically end with open syllables and even today most loan words with closed syllable endings are turned open ended by adding a vowel. Thus the Arabic words bazaar (market) and djeb (pocket) are badjaru and djebu in Kannada; and English loan words ‘truck’ and ‘jeep’ are trakku and jiipu. Geminates and mixed consonant clusters are common in the Kannada phonology and seen in all word positions. Modern Kannada has several compound words and it has been argued that the morpho-phonological rules of both native Kannada and borrowed Sanskrit, underpin the derivation process (Sridhar 2008).

The mapping of sounds to the akshara is at the level of the syllable. The akshara are however alphasyllabic rather than syllabic because they embody phoneme markers. This type of mapping of syllable to akshara and phoneme to sub-akshara features has an influence on phonological development with the orthography pre-dominantly supporting syllabic awareness, with phonemic awareness emerging more slowly (Nag & Snowling in press; Nag 2007; Prakash, Rekha, Nigam & Karanth 1993), a finding also seen in other akshara languages (e.g., Bengali: Nag & Sircar 2008; Hindi: Gupta 2004).

We next turn to the morphosyntactic structure of the language. Kannada is an agglutinative language, with verb (person, number, gender) and noun (case) inflections. Kannada words have high morpheme length because of affixations (mainly suffixations) (see Box 1 for examples). Knowledge of inflection thus becomes critical for comprehension of Kannada sentences. Kannada, like many other inflected languages also has a comparatively free word order (Dayal & Mahajan 2004). One way to assess inflection knowledge and syntactical processing is with a grammaticality judgment task where children report if a sentence they hear is grammatically correct or not. Patterns of accuracy on sentences concerning increasingly complex inflections can be taken as an index of
children’s knowledge of the grammar of the language. Improved performance on a Kannada grammaticality judgment task has been reported among school going children as against non-school going children (Karanth, Kudva & Vijayan 1995). The authors suggest that with literacy there is an increase in knowledge of grammar, a proposal also made on the basis of cross-linguistic studies with alphabetic languages (Nunes & Bryant 2009). Learning to read and spell improves morphemic knowledge and, in turn, improved morphological knowledge leads to more advanced reading and spelling skills.

Extending this proposal to the current study, we predicted that higher Kannada reading attainments would be associated with greater awareness about the root and inflection components of words and beyond the word level, a greater appreciation of grammar. Conversely, lower levels of knowledge of inflection should slow down Kannada reading development, impacting accuracy in the mapping of inflection knowledge to meaning and therefore sentence comprehension. Studies investigating these relationships in Kannada are not presently available.

Kannada is considered a nominal language with only few cases of genuine adjectives or adverbs. One clear example of a non-derived adjective in Kannada is olleya (good). Amritavalli and Jayaseelan (2003) propose that most adjectives and adverbs in Kannada are derived from nouns by a morphological change such as dative suffixation: e.g., the noun udda (‘height’) changes to udda-kke (‘to a height, tall’) and kappu (‘blackness’) to kapp-ige (‘black, dark’). Other ways to derive adjectives are with the inflection -aagi (‘having become’, also a complementiser ‘as’): sukhav-aagi (‘happily’) from the noun sukha (‘happiness’), or the inflection -aada: ettarav -aada (‘height having happened’), from the noun ettara (‘height’), (all examples from Amritavalli 2003). This suggests that children would need an understanding of derivational morphology (however implicit this understanding may be) for a more complete representation of the Kannada lexicon. Based on other cross-linguistic reports (see for example, Crepaldi, Rastle, Coltheart & Nickels 2010) we can expect that there will be associations between reading comprehension and children’s understanding of the morphological context of individual words.
2. INDIVIDUAL DIFFERENCES IN LEARNING TO READ

We begin this section with a review of English, an alphabetic language where substantial research is available. The extent of early orthographic knowledge about the 26 letters of the alphabet has been consistently shown to explain later reading attainments (Bowey 2005 for a review). Letters and digraphs represent sounds at the level of the phoneme and children learning to read must learn to establish a system of mappings between the phonemic sounds of spoken words and the symbols in written words. Children who show higher levels of phonemic awareness are at an advantage in achieving these mappings and are generally ahead in learning to read (Byrne 1998; Goswami & Bryant 1990). Earlier phonological processing skills are robust predictors of later single word reading attainments (Muter, Hulme, Snowling & Stevenson 2004; Torgesen, Wagner & Rashotte 1994), and difficulties with phonological skills are a defining characteristic of many poor readers (see Hulme & Snowling 2009 for a review). One proposal as to how phonological skills support reading is that when the segmental units in sounds are well-specified at the level of the phoneme it allows for a fine-grained mapping of phonology to the letters of the alphabetic writing system (Hulme, Nation, Brown, Adams & Stuart 2002; Muter, Hulme, Snowling & Taylor 1998). Such detailed representations support reading of familiar words as well as allow the decoding of new, unfamiliar words (Harm & Seidenberg 1999).

The broader oral language abilities of vocabulary knowledge, grammar knowledge and narrative skills also explain individual differences in learning to read. Children with better oral language skills are able to draw from their vocabulary knowledge and the wider linguistic context in which a word appears to support recognition of unexpected or new words (Nation & Snowling 1998a, b). One proposal is that skillful extraction of contextual information and earlier knowledge of word meanings supports a more comprehensive representation of a word and eases the way for more fluent reading (Nation & Snowling 2004). Converging evidence for this proposal comes from intervention research. Children who have been poor responders to tiers of phonological interventions, for example, show gains in word reading when given an intervention that couples phonological awareness training with vocabulary instruction (Duff, Fieldsend, Bowyer-
Crane, et al 2008). In addition, studies have shown that grammar skills explain individual differences in reading comprehension. For example, when word order is accurately interpreted for mapping meaning in sentences, reading comprehension is supported (Bishop, Adams & Rosen 2006). One advantage of advanced knowledge of grammar is that children can more accurately predict, and thus more quickly recognise, up-coming words in a sentence. The mechanism of prediction has been proposed as fundamental to sentence processing (Altmann & Mirkovic 2008).

To understand the potential advantage of predicting in Kannada sentence processing, take the first example in Box 1. The person, number and gender inflection –itu on the last word (the verb taaku) must be in agreement with the subject noun (kallu) and so can be predicted as soon as the subject noun phrase is processed. Similarly in the other examples, early components in the sentence can help in the setting up of end of sentence predictions. In summary, grammar knowledge can be expected to play a critical role for recognition of words appearing later in a text, especially inflected words.

**Box 1:** The morphosyntactic characteristics of two simple sentences

| 1. ondu kallu raja-na tale-ge taak-it-u. |
| det. stone nom. king gen. head dat. touch pst.3nsg. |
| ‘A stone hit the king’s head.’ |
| 2. ondu puTTa raakSHasa biija-gaLu -ø nung- id- anu. |
| det. small ogre nom. seed pl. (acc.) swallow pst. 3msg. |
| ‘A small ogre swallowed the seeds.’ |

The links between reading development, phonological skills and other language skills beyond phonology, are an area of vigorous research. Longitudinal studies of English samples show that phonological skills and skills beyond phonology make unique contributions over the course of reading development. In a study of the first two years of formal schooling, Catts, Fey, Zhang and Tomblin (1999) found that phonological and oral language skills in the kindergarten years explained unique variance in reading attainments in Class 2. While individual sub-tests could explain
only 3 to 8% of the individual differences seen in Reading Comprehension, a composite of the Oral Language Skills accounted for up to 14% of the variance. Muter et al (2004) reported a path analysis with a similar age band, showing the unique contribution of phonemic manipulation tasks on later individual differences in word recognition and of vocabulary and grammar skills on attainments in reading comprehension. This study had assessed both syntactic knowledge about word order and morphological knowledge about word inflections. Both these aspects of oral language emerged as associated with concurrent and later word reading and reading comprehension.

Turning to an older age group, Nation and Snowling (2004) reported that phonological and broader oral language skills of vocabulary and listening comprehension were unique concurrent predictors of both reading comprehension and single word reading in a cohort of eight year old children. Four years later, at age 13 individual differences in attainments in reading comprehension and word reading were explained by the unique contribution of earlier levels of phonological skills, vocabulary and listening comprehension. A similar finding comes from a study of predictors of reading comprehension attainments in Classes 2 and 8 (Adolf, Catts & Lee 2010). Children’s early phonological and broader oral language skills, assessed during the kindergarten years, were significantly lower among poor readers when compared to competent readers. Phonological skills and broader oral language skills made independent contribution to both word recognition and reading comprehension. Importantly, children’s performance on a sentence imitation task turned out to be a ‘top predictor’ of the individual differences that emerged as they progressed through school. The sentence imitation task, as the name suggests, requires children to repeat a sentence just heard. The task is considered a measure of a range of broader oral language skills including morphological and syntactic knowledge.

Taken together, these English language studies demonstrate the critical role of oral language in reading development in both the early and later school years. Children with poor phonological skills, vocabulary knowledge or awareness of syntactic and morphological information are hampered in their reading development, though each of these components of oral
language shows a slightly different impact on reading comprehension in different phases of development. Similar findings have been reported in other languages as well (e.g., Korean: Kim 2011; Dutch: Verhoeven & Leewve 2008).

In this paper we examine individual differences in reading comprehension, given the typological characteristics of Kannada. Among children in the primary and middle school years, individual differences in Kannada reading accuracy and reading rate (fluency) can be explained by the variations in akshara knowledge, phonological skills and rapid naming (Nag & Snowling in press) with the cognitive profiles of the poor readers showing difficulties in several domains, but most particularly in akshara knowledge, phonological domain and knowledge of vocabulary and inflection (Nag & Snowling 2010a). The focus of this paper is on the predictors of variations in reading comprehension in Kannada-speaking children in Classes 4, 5 and 6. Two aspects of Kannada reading comprehension were considered. First, in line with previous research, we predicted that reading comprehension should relate closely to children’s decoding and phonological skills. Second, we predicted that knowledge of vocabulary and inflection would be associated with reading comprehension. Since reading comprehension is essentially dependent on adequate decoding, and some aspects of the Kannada writing system are still being mastered in the middle school years (Nag 2007; Nag & Snowling in press), a substantial proportion of the variance in reading comprehension would be explained by decoding skills and the strongly associated skills of phonological processing. Nonetheless, because reading comprehension is essentially a meaning making activity, and the mapping of meaning to a sentence is dependent on vocabulary and grammar skills, variance in reading comprehension should be additionally explained by broader oral language. We examined the two hypotheses through a survey.

3. A SURVEY OF KANNADA READING COMPREHENSION SKILLS

Ninety five children in 12 schools participated in the study. The children were part of a cohort which had been followed in an earlier longitudinal study from Class 1 to 3 (TPF-NIAS, 2004-07). At the time of this study,
the children were in Class 4, 5 and 6. The age of the children ranged from 8;11 years to 12 years. On a test of non-verbal general ability, their scores ranged from 25 to 95. For all of the children, formal Kannada literacy instruction had begun in Class 1, at the age of 5+, based on a government-prescribed text book for each academic year.1

3.1 The battery of tests
Each participating child was assessed for their level of general cognitive ability, reading and oral language skills. General cognitive ability was assessed using the Raven’s Coloured Progressive Matrices, in which children pick one of six alternatives to complete progressively complex patterns. There were two tests of reading: First, to measure reading comprehension, each child answered two questions based on six passages ranging in length from 14 to 37 words, with narrative styles covering fantasy, non-fiction, biography and riddles (see Box 1 for a selection of sentences from the passages). Second, for the assessment of reading accuracy, each child read a word list and a nonword list. The six texts used in the first test for assessment of reading comprehension were also examined for reading accuracy of words embedded in sentences. There were also tests of syllable deletion and substitution and phoneme deletion and substitution. An item pool of 37 bi-syllabic nonwords was used for these tests of phonological processing.

Each child was also given tests of vocabulary and inflection knowledge (see Boxes 2 and 3 for illustrative samples with children’s responses). To measure vocabulary, a list of thirty words was drawn from Classes 3 to 5 texts (Chili Pili Cheela 2007), including object names and non-object names, and words representing qualities, actions, states, time, place and result. Children were asked to explain what the words mean. To measure knowledge of inflection, children were asked to repeat a set of ten sentences differing in length, with longer sentences comprising more substantive words and inflections but simple in syntax, to reduce demands on syntactic knowledge. Knowledge of inflection was estimated based on the number of omissions or substitutions of inflections they made.

1 In accordance with government policy, English was introduced as a second language in these classes, but at the time of the study, participating children’s proficiency in spoken English was exceptionally low and only 12% could spell and read words like ‘boy’ and ‘school’.
Box 2: Sample of responses on the Vocabulary task among children with high, medium and low attainments on the reading comprehension task.

**Word 11: chaLi (cold)**

maLe band- aaga, chaLi aag- uv -udu
rain come pst then cold happen habit. 3 n sg.

‘When it rains, it feels cold.’
girl, 11,3 yrs, Class 6, 75% on reading comprehension task

gaaLi biis- id-are chaLi yaag- utt- e
wind blow pst. cond. cold happen non pst. 3 n sg.

‘If the wind blows it feels cold.’
boy, 10,4 yrs, Class 4, 42% on reading comprehension task

saLi\(^1\) aay- t- ade
cold happen non pst. 3 n sg.

‘It feels cold.’
boy, 9,5 yrs, Class 4, 17% on reading comprehension task

**Word 22: guDugitu ((it) thundered)**

raatri maLe band- aaga guDug- it- u.
night rain come pst then thunder pst. 3 n sg.

‘When it rained at night, it thundered.’
boy, 9,5 yrs, Class 5, 83% on reading comprehension task

siDilu hoDe-d-aaga guDug- utt- ade
thunderbolt hit pst. then thunder non pst. 3 n sg.

‘When the thunderbolt hits, it thunders.’
girl, 10,5 yrs, Class 5, 67% on reading comprehension task

minch- uv -udu
lightning habit. 3 n sg.

‘There is lightening.’
girl, 8,3 yrs, Class 4, 8% on reading comprehension task

\(^1\) Dialect words in children’s responses were accepted. Here, saLi is an example of dialect word for chaLi. (This entire utterance is in dialect.)
Box 3: Sample of repeated sentences among children with high, medium and low attainments on the reading comprehension task.\(^1\)

<table>
<thead>
<tr>
<th>Target Sentence</th>
<th>Inflections on words are underlined.</th>
</tr>
</thead>
<tbody>
<tr>
<td>hajaara- dalli thunTa naayi doDDa kurchi-ya sutta ooD-i- tu.</td>
<td>'The naughty dog ran around the big chair in the verandah.'</td>
</tr>
<tr>
<td>• One adjective dropped, genitive inflection on 'chair' dropped.</td>
<td>boy, 9,5 yrs, Class 5, 83% on reading comprehension task</td>
</tr>
<tr>
<td>hajaaradalli thunTa naayi kurchi sutta ooDitu.</td>
<td>'The naughty dog ran around the chair in the verandah.'</td>
</tr>
<tr>
<td>• Inflection on 'chair' changed to locative, post position also retained.</td>
<td>girl, 8,11 yrs, Class 4, 50% on reading comprehension task</td>
</tr>
<tr>
<td>naayiyalli hajaaradalli ooDaaDitu.</td>
<td>'In the dog in the verandah wandered.'</td>
</tr>
<tr>
<td>• Locative inflection on the subject as well as the locative noun (the sentence is nonsensical).</td>
<td>boy, 8,8 yrs, Class 4, 30% on reading comprehension task</td>
</tr>
<tr>
<td>• verb changed.</td>
<td></td>
</tr>
</tbody>
</table>

Each child was seen individually over four days. The first author of the present paper and research assistants, who were native speakers of Kannada, administered the tests. The assessment battery contained tests other than the ones reported here. The tests were grouped into four sets, each set administered in thirty minute sessions. The sequence of administration of the four sets changed randomly across children, with all tests within a set being administered in a fixed sequence.

### 3.2 The analyses

A summary of the children’s performance on the measures of reading comprehension, reading accuracy, phonological processing, vocabulary and inflection knowledge is given in Table 1. Analysis of these data
revealed significant positive correlations between reading comprehension and reading accuracy (.644), phonological processing (.594), vocabulary (.340) and inflection knowledge (.354). Overall, the children who were better at reading comprehension were also better in reading accuracy, phonological processing and knowledge of vocabulary and inflection.

Table 1: Means, Standard Deviations (SD) and Range of attainments on reading comprehension, reading accuracy, phonological processing, vocabulary and inflection knowledge.

<table>
<thead>
<tr>
<th></th>
<th>Mean¹</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading comprehension</td>
<td>52.28</td>
<td>23.01</td>
<td>0 - 100</td>
</tr>
<tr>
<td>Reading accuracy</td>
<td>76.60</td>
<td>15.83</td>
<td>11.43 – 98.10</td>
</tr>
<tr>
<td>Phonological skills</td>
<td>40.24</td>
<td>13.12</td>
<td>15.67 – 78.00</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>46.67</td>
<td>11.05</td>
<td>12.22 – 77.78</td>
</tr>
<tr>
<td>Inflection knowledge</td>
<td>80.70</td>
<td>8.43</td>
<td>66.67 – 93.33</td>
</tr>
</tbody>
</table>

*Note: ¹All scores are reported as percentage scores.*

We next examined the concurrent predictors of reading comprehension. Table 2 gives the results of our analysis. General cognitive ability did not correlate with reading comprehension and was excluded from the analysis. The children’s age was entered in the first step of the analysis to control for individual differences that occurred simply because some were younger than others in the study. In Step 2, we entered the children’s reading accuracy and phonological processing scores which we considered as capturing their decoding and word recognition skills. Together, these measures accounted for 44% of variance in reading comprehension after age was controlled. In a final step of the analysis (Step 3), we entered either children’s vocabulary scores, or their scores on the inflection knowledge task. Vocabulary predicted 4.8% and inflection knowledge 2.2% of unique variance in reading comprehension. We discuss the results of our analysis next.
4. FINDINGS OF THE READING SURVEY

4.1 Reading comprehension and decoding

Our first hypothesis had predicted that decoding skill would be associated with reading comprehension. Associations between word reading accuracy and reading comprehension have been reported in several languages and our study confirmed the same trends in Kannada. We found that the better a child’s decoding skills the higher their attainments in reading comprehension, suggesting that word-level reading accuracy during text reading supported ease of meaning extraction and comprehension of the passage.

Phonological processing skills are known to be closely associated with efficient decoding skills which in turn help with reading accuracy. Our study found that reading accuracy and phonological processing skills explained a large part of the variation among children in their reading comprehension: those children who were poor at manipulating syllables and phonemes and in decoding of words presented in lists and embedded in sentences, as well as decoding nonwords, were also poor in reading comprehension. It seemed that the children who were struggling to decode and hence had laboured word recognition were misreading words during passage reading, and this was a barrier to making meaning of the text.

Table 2: Hierarchical regression predicting concurrent reading comprehension (N = 95)

<table>
<thead>
<tr>
<th>Step 1</th>
<th>% R² Change</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>6.2</td>
<td>6.14</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy, Phonological skills</td>
<td>44.3</td>
<td>40.71</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>4.8</td>
<td>9.68</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflection knowledge</td>
<td>2.2</td>
<td>4.10</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>
These findings from Kannada confirm findings reported in other languages (Kim 2011; Adolf, Catts & Lee 2010; Verhoeven & Leewve 2008; Muter et al 2004). The statistically significant contribution of reading accuracy and phonological skills to reading comprehension attainments can be seen to confirm the critical role played by decoding skills in reading for meaning.

4.2 Reading comprehension and oral language

However not all difficulties with reading comprehension have their origins in poor decoding skills. We tested the second hypothesis that knowledge of vocabulary and inflection would be associated with reading comprehension. Our findings showed this to be the case. Children’s level of vocabulary reliably explained how well a child would do in reading comprehension once reading accuracy and phonological skills had been controlled for. Limited vocabulary knowledge diminished comprehension. All types of text would challenge children with weak vocabulary because of the greater probability of encountering words that were not fully understood.

A unique contribution of our study was the finding that children’s level of inflection knowledge was also an independent predictor explaining the variance in reading comprehension. Kannada is a densely inflected language, and those children who knew more about the morphological segments of words, could abstract the meaning in the text better.

Knowledge of inflection was assessed in this study through an analysis of children’s imitation of progressively complex sentences. Inflections sampled in the test were located on nouns, verbs and adjectives and were for case markers, gender, number, person and tense (for an example, see Box 3). There were also derivational markers on adjectives. Children who were poor in inflection knowledge typically made errors with agreement features – the inflections they used on the verbs, for example, did not agree with details available in the subject noun phrase of the sentence. Some children struggled with affixes on adjectives and on the non-nominative nouns (the second noun). A preliminary analysis of the errors suggested that inflections in all grammatical categories (nouns, verbs and adjectives) were vulnerable to errors. More research in Kannada and other Indian languages is however needed to understand
the nature and development of knowledge about inflections and the patterns of difficulties experienced by children with poor oral language skills. Of particular interest is the need to clarify whether the mechanism of prediction, which has been proposed as central to sentence processing (Altmann & Mirkovic 2008), is better supported by knowledge of certain inflections more than others.

Research from other languages suggests that inflections that are less productive (i.e., the number of word contexts in which they are generated is less) are slower to be learnt. In English, for example, Duncan and Gray (2011) show that the affix -er seen in words like farmer, weaver and teacher is earlier learnt than -ment seen in argument and shipment, and Rastle, Davis and New (2004) show that the cognitive processing of low frequency inflections is different from that of high frequency inflections. We also now know that the distance between the agreement features in a sentence matters (e.g., in Finnish, Bertram 2011) and that some grammatical categories attract more errors than others (for examples, see Crepaldi, Arduino & Luzzatti 2011). The nature of the cognitive processes that aid in the recognition and comprehension of inflected words is however far from clear. Candidate processes for the recognition of words with inflections are a morpho-orthographic route, a purely morphemic route and a purely orthographic route. Preliminary findings suggest that for low-frequency inflections, an orthographic process (akshara or letter decoding) would be followed whereas, for high frequency inflections, a morphemic approach (whole word or decomposition of roots and affixes) would be followed (Duncan & Gray 2011; Ahn, Nation & Winnicot 2011; Rastle, Davis & Merkx 2011). Whatever the word recognition process may be, this survey makes it clear that if we want to more fully understand children’s difficulties with reading comprehension, we need to understand their sensitivity to the inflections of their language.

4.3 Relative role of oral language and decoding in reading comprehension
The extent of the predictive role of broader oral language skills of vocabulary and grammar in explaining individual differences in reading comprehension attainments has been reported to change with age and class level. In younger children in early primary school, vocabulary appears to explain reading comprehension differences less, with the main share
of predictive power lying in decoding skills. By middle school a larger proportion of variance in reading comprehension is explained by broader oral language (e.g., Adolf, Catts & Lee 2010).

In Kannada, knowledge of vocabulary and inflection independently explained individual differences in reading comprehension in middle school. But it is important to note that decoding skills continued to explain the greater share of the variance. This is understandable if we recall that Kannada has an extensive symbol system (more than 400 akshara), and many children are still far from achieving mastery of the full akshara set. Similar trends may be expected in other Indian languages if knowledge of the akshara continues to remain shaky.

5. CONCLUDING COMMENTS

A limitation of the present study is that it was cross-sectional. While the study is able to demonstrate the associations between reading comprehension, decoding, phonological processing, vocabulary and knowledge of inflection, a longitudinal study would be needed to clarify causal relationships. There is however sufficient information here to draw some pointers for teaching practice. Any programme that would like to promote reading comprehension would need to address both decoding skills and broader oral language. Addressing one at the expense of the other would leave the child without the resources that each of these cognitive domains uniquely brings to the reading comprehension task. We would like to particularly highlight the need to focus on knowledge of vocabulary and inflection because there is often an assumption that children do not need this level of support for their home language.

This study did not address some of the other component skills that contribute to reading comprehension such as inference making, comprehension monitoring and comprehension of text structures (Cain 2010). There is robust evidence from cross-linguistic research that all of these cognitive and discourse level skills are important for reading comprehension as well. Our study however underlines that decoding skills and broader oral language skills are important building blocks for reading comprehension in the middle school years.
Finally, many questions remain about the nature of the associations between reading development, phonological development and children’s growing knowledge of vocabulary and grammar in an inflection-rich language. This survey of Kannada gives us some preliminary clues of the nature of the relationship between oral language, decoding and reading comprehension. We do not as yet understand what slows down some children from learning about the vocabulary and grammar of their language, even when it is the dominant language of their home, neighbourhood and school books. But it is clear that we must develop multi-dimensional programmes focused on oral language and decoding if we want to support children’s reading.

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