



Revisiting the simple view of reading

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Background. Reading component models such as the Simple View of Reading (SVR; Gough & Tunmer, 1986; Hoover & Gough, 1990) provide a concise framework for describing the processes and skills involved when readers comprehend texts. According to the Independent Review of the Teaching of Early Reading (Rose, 2006) strong evidence for the SVR comes from Factor Analysis of datasets on different measures of reading showing dissociation between decoding skills and comprehension. To the best of our knowledge, only two such published studies exist to date. Of these, only one of is in English and this explores children between the age of 7 and 10 years.

Aims. To explore the SVR in English-speaking children aged 4 and 6 using Factor Analysis.

Samples. 116 4-year-olds and 116 6-year-olds in the US; 103 6-year-olds in Canada.

Methods. All children were administered a battery of decoding and comprehension related measures.

Results. Factor Analysis of the diverse measures undertaken independently by two research teams in different countries demonstrated that listening comprehension and decoding measures loaded as distinct factors in both samples of young English-speaking children.

Conclusions. The present findings provide important support for the generality and validity of the SVR framework as a model of reading.

Reading component models such as the Simple View of Reading (SVR; Gough & Tunmer, 1986; Hoover & Gough, 1990; Aaron, Joshi, & Williams, 1999; Joshi & Aaron, 2000) provide a concise framework for describing the processes and skills involved when readers comprehend texts. In the SVR, reading comprehension is described as the product or sum of a reader's word decoding (D) and listening comprehension skills (LC). A central tenet of the SVR model is that both decoding and comprehension are necessary for reading comprehension. Advocates of the SVR model do not discount other potential contributors to the reading process, but rather

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propose that decoding and comprehension are core competencies that drive reading comprehension experiences.

Research findings generally have supported the validity of the SVR. Indeed, researchers have shown that the SVR accounts for approximately 40% to 80% of the variance in reading comprehension for readers ranging from 8 to 16 years old (Catts, Adlof, Hogan, & Weismer, 2005; Dreyer & Katz, 1992; Johnston & Kirby, 2006; Joshi & Aaron, 2000; Savage, 2006), and describes the performance of university students with and without known reading difficulties (Savage & Wolforth, 2007). The SVR has also been used to diagnose readers with predominant difficulties in decoding from those with predominant difficulties in comprehension (Aaron *et al.*, 1999; Catts, Adlof & Weismer, 2006; Royer & Sinatra, 1994).

The SVR has direct educational implications as it provides a conceptual framework for designing appropriate teaching practices that target both decoding and comprehension skills (e.g. Aaron, 1991; Kendeou *et al.* 2005; Kendeou, van den Broek, White, & Lynch, 2007; Oakhill, Cain, & Bryant, 2003; Savage, 2001, Savage, 2006). For instance, the separation of these skills enables teachers to understand what they need to teach about decoding and comprehension within a broad curriculum. Indeed, in the United Kingdom, a wide range of recommendations in the Independent Review of the Teaching of Early Reading (Rose, 2006) are driven by the conceptual framework of the SVR. The SVR model has subsequently been adopted as the theoretical basis of the revised national curricular advice to all schools in England (DFES, 2006).

Although, the SVR provides a good fit to much empirical data, there is one aspect of the model that deserves further investigation, namely the existence of two distinct factors in young English-speaking children. According to the Independent Review of the Teaching of Early Reading (Rose, 2006) a main source of evidence for the SVR comes from Factor Analysis of datasets on different measures of reading. Identifying separate decoding and comprehension components using Factor Analysis (and specifically Principal Component Analysis) is a strong test for the SVR because it can demonstrate that the two components can be clearly deduced from a greater set of measures and that they are differentiated (de Jong & van der Leij, 2002). Furthermore, a Factor Analysis approach produces parsimonious solutions that are generally considered to have greater external validity and, as such, are more likely to replicate (Henson & Roberts, 2006; Kerlinger, 1979).

Only two such studies are described in the Rose report, one of which is in English. The first study to provide such evidence is a longitudinal study in Italian (Pazzaglia, Cornoldi, & Tressoldi, 1993) which demonstrated that measures of reading accuracy and reading speed loaded on one factor, whereas measures of reading comprehension loaded on a second factor. The second study to provide such evidence and the only one in English (Nation & Snowling, 1997), showed that three word recognition measures (word reading accuracy with and without context, non-word reading) loaded on one factor, whereas two text comprehension measures (narrative listening, text reading) loaded on to a second factor in children aged between 7 and 10 years.

It is important to note that indirect evidence for the SVR in English has been obtained in a number of other studies. For example, several studies provide evidence for the SVR by demonstrating that different underlying skills and abilities contribute to the development of decoding and comprehension skills (e.g. Cutting & Scarborough, 2006; Kendeou *et al.*, 2005; Kendeou *et al.*, 2007; Muter, Hulme, Snowling, & Stevenson, 2004; Oakhill *et al.*, 2003) suggesting their dissociation. Other studies provide evidence for the SVR by demonstrating that children can perform differentially on these two sets

of skills. For instance, research on poor readers has identified children with good decoding but poor comprehension skills (Cain, Oakhill, & Lemmon, 2005; Grigorenko, Klin, & Volmar, 2003; Nation, 2005; Stothard & Hulme, 1992) as well as children with poor decoding but good comprehension skills (Adlof, Catts, & Little, 2006; Spooner, Baddeley, & Gathercole, 2004).

If decoding and comprehension are indeed separate dimensions of reading in English as suggested by the SVR, then one would expect to obtain evidence for their dissociation using Factor Analytic techniques even in very young children (i.e. children aged below 7 years). This issue becomes one of practical importance as the current guidance on teaching in England uses the SVR account to frame the teaching and learning experiences of even the very youngest children in school (DFES, 2006; Rose, 2006). The aim of the present study, thus, is to examine the possibility of such dissociations in children between the ages of 4 and 6. To do so, we present findings from a Factor Analysis of two different datasets, originally collected in the US and Canada, respectively. These datasets come from two different studies in English, each aimed at examining the development of young children's reading skills. The first study reported here took place in the US and employed measures of high psychological validity in assessing children's decoding and comprehension skills at ages 4 and 6. The second study took place in Canada and employed measures of high psychometric validity in assessing children's decoding and comprehension skills at age 6. Our approach is unique because we bring together two datasets from different contexts, guided by different philosophies and approaches that span experimental, psychometric and curriculum-based measures, yet which are all aimed at assessing reading skills in young children in English.

The current studies

In the reanalyses we seek to examine the possible dissociation of decoding and comprehension skills in young children by employing Factor Analysis. If decoding and listening comprehension measures load as distinct components, then this will provide additional evidence for the SVR and the first evidence of this type in young English-speaking children. Furthermore, the SVR account would predict that whereas listening comprehension should load separately from measures of decoding, reading comprehension should be the only measure to load significantly on both D and LC components. Evidence suggests that this is the case in older poor readers (Savage, 2006; Savage & Wolforth, 2007), but there is no evidence whether a similar patterns exists in typically-developing younger children.

STUDY I

Method

Participants

Two hundred thirty-two children participated in this study. The children were part of a larger longitudinal study investigating their narrative comprehension skills (Kendeou *et al.*, 2005; Kendeou *et al.*, 2007, Lynch *et al.*, 2008; Kendeou, Bohn-Gettler, White, & van den Broek, in press; Van den Broek *et al.*, 2005). Two cohorts of children participated. There were 116 children in the 4-year-old cohort and 116 children in the 6-year-old cohort. Data from three children in the 4-year-old cohort and eight children in

the 6-year-old cohort were eliminated from the final sample because they had previously seen the audio-visual narrative used in the first year of the study, did not finish two or more tasks in the session at either time point, or were too old at the time of testing.

The final sample included 113 children from the 4-year-old cohort (mean age at the first time point=4 years, 6 months; range=4 years, 0 months - 4 years, 11 months) and 108 children from the 6-year-old cohort (mean age at the first time point=6 years, 4 months; range=6 years, 0 months - 6 years, 11 months).

Materials

Two narratives were used as part of the narrative comprehension assessment, one presented aurally (i.e. Listening comprehension) and the other audio-visually (i.e. Television comprehension). The onset recognition fluency subtest of the *DIBELS* assessment (Good & Kaminski, 2002a) was used to assess phonological awareness. The letter and word identification subtests of the *Woodcock Reading Mastery Test* (Woodcock, 1987) were administered as tests of letter knowledge and word decoding skills. The *Peabody Picture Vocabulary Test - III* (PPVT; Dunn & Dunn, 1997) was used to assess vocabulary. More information about each measure follows.

Listening comprehension

For the listening comprehension task, one narrative was presented aurally (on an audiotape) to the children. The story, *The Cat's Purr*, was a narrative based on an American folk tale. The entire story, when audiotaped, was seven minutes long. Eight simple, line-drawn pictures were made to accompany the story. The pictures alone did not convey any major points from the story's plot. The story had a standard, but complex structure in which the protagonist made several attempts to achieve his desired goal. Children were asked to listen to the story while the experimenter flipped through the accompanying pictures. When they had finished listening, children were asked to retell everything they remembered from the story.

Television comprehension

The audio-visual story, *Autumn Leaves*, was a 12-minute episode from an American children's television series, *The Rugrats*. This story also had a standard, but complex, structure in which the protagonists made several attempts to achieve their desired goals. Children were asked to watch the story on a 26" colour television. When they had finished watching, children were asked to retell everything they remembered from the story.

Vocabulary

The PPVT-III (Dunn & Dunn, 1997) was administered as a standardized measure of receptive vocabulary for Standard English. It was selected because it allows for participation of students who are non-verbal by pointing to a response. Words are orally given to the respondent by the examiner. The respondent points to a picture that best corresponds to the word. The total raw score is obtained by subtracting the number of errors from the numerical value of the ceiling item (highest word correctly identified). For the ages included in this study, internal consistency, as measured with coefficient alpha, ranged from .93 to .95. Split-half coefficients ranged from .86 to .95.

Phonological awareness

The Onset Recognition Fluency (OnRF) measure from the Dynamic Indicators of Basic Early Literacy Skills (DIBELS, Good & Kaminski, 2002a, 2002b) was used to assess children's phonological awareness. The examiner presents four pictures to the child, names each picture and then asks the child to identify (i.e. point to or say) the picture that begins with the sound produced orally by the examiner. For example, the examiner says, 'This is sink, cat, gloves, and hat. Which picture begins with/s/?' and the student points to the correct picture. The child is also asked to orally produce the beginning sound for an orally presented word that matches one of the given pictures. The examiner calculates the total number of initial sounds correct in a minute. For the ages included in this study, alternate-form reliability of the OnRF measure is .91.

Letter identification

The Letter Identification subtest from the Woodcock Reading Mastery Test - Revised (Woodcock, 1987) was administered. This test was selected because it provides information about a child's ability to identify different letters. In the test, the letters are presented to subjects and the subject is asked to verbally identify the letter within five seconds. The test begins at an age-appropriate item (basal level) and ends when the child answers six or more consecutive items incorrectly or when the last page of the test has been administered. The total raw score is obtained by subtracting the number of errors from the numerical value of the ceiling item (the last letter or word correctly identified). For the ages included in this study, internal consistency, as measured with split-half coefficients, ranged from .84 to .94.

Word identification

The Word Identification subtest from the Woodcock Reading Mastery Test - Revised (Woodcock, 1987) was administered. This test was selected because it provides information about a child's ability to read different words. In the test, the words are presented to subjects and the subject is asked to verbally identify the word within five seconds. It is not assumed that the subject knows the meaning of any word that is correctly identified. The test begins at an age-appropriate item (basal level) and ends when the child answers six or more consecutive items incorrectly or when the last page of the test has been administered. The total raw score is obtained by subtracting the number of errors from the numerical value of the ceiling item (the last letter or word correctly identified). For the ages included in this study, internal consistency, as measured with split-half coefficients, ranged from .97 to .98.

Procedure

The children were seen individually in a single session. The entire session was videotaped and the comprehension measures were also audiotaped. Although children engaged in a wide variety of tasks and assessments, only those that are related to the current research questions will be described. First, children completed the PPVT vocabulary assessment. Next, children listened to the aural story, *The Cat's Purr*. The children were instructed to listen closely so they could answer questions after the story was over. While listening to the story, children looked through the pictures that accompanied the story. Immediately after the story was completed, the experimenters asked the children to, 'Tell everything you remember from the story from the beginning.' When children finished recalling, they completed the phonological awareness, letter

identification and word identification measures. Then children viewed the audio-visual narrative, *Autumn Leaves*. The procedures for assessing children's comprehension of the audio-visual narrative were identical to those of the aural narrative.

Coding

Prior to data collection, three researchers analysed the narratives and parsed them into events (generally defined as subject-verb phrases). The aurally presented story had 167 events and the audio-visual narrative had 231 events. The causal structure of each narrative was then determined. Causal relations between all events in the story were identified according to principles of causality (Van den Broek, 1990; Mackie, 1980). The children's responses to the free recall were transcribed verbatim from the videotapes and audiotapes of the experimental sessions and were then parsed into events. As in the parsing of the narratives, these events were generally subject-verb phrases. Each recalled event was coded according to the event that it most closely matched in the corresponding narrative. Recalled events that did not match an event in the story, but were inferred based on the story and children's world knowledge, were coded as *inferences* (for a detailed analysis of these data see Kendeou *et al.*, 2008).

Two raters coded the transcripts. 20% of the transcripts were coded by both raters to establish and practice the coding scheme. An additional 20% of the transcripts were coded by both raters to determine inter-rater reliability. Interrater agreement was very good, $K = .86$, $p < .01$.

One measure of narrative comprehension was calculated based on these data. This measure was *high-connection recall*: The total number of unique story events that children included in their free recall that were central to the story structure (i.e. had a high number of causal connections; see van den Broek, Lorch, & Thurlow, 1996 for a review). This measure was calculated separately for each narrative (i.e. listening and TV).

Results

Preliminary analyses

Preliminary inspection of the data using conventional approaches (Tabachnick & Fidell, 2001) suggested a floor effect for the word identification measure at age 4. For this reason, this variable was not entered in subsequent analyses for the 4-year-old children. The means and standard deviations of all measures used are presented in Table 1.

Correlation analyses were then explored (for complete analyses see Lynch *et al.*, 2008). These are reported in Table 2 for the 4-year-old children and Table 3 for the 6-year-old children. Inspection of these scores showed that for the 4-year-old children there were significant associations between phonological awareness, letter identification and vocabulary. Listening and television comprehension were also significantly interrelated and associated with vocabulary. Letter identification weakly correlated with listening comprehension. For the 6-year-old children, there were significant associations between letter identification, word identification and vocabulary. Listening and television comprehension were also significantly interrelated but not associated with any of the other measures. Phonological awareness weakly correlated with listening and television comprehension. These patterns are broadly consistent with the SVR perspective that word level skills and listening comprehension skills are at least to some extent separable in young children.

Table 1. Descriptive statistics for all measures in study 1

Variable	4-year-olds			6-year-olds		
	M	SD	Max	M	SD	Max
Phonological awareness	8.78	4.08	16	14.74	1.88	16
Word identification	.82	5.07	38	19.22	20.59	43
Letter identification	17.46	10.83	40	34.74	5.41	76
Vocabulary	73.92	16.24	114	104.76	13.10	143
Listening high-connection recall	4.13	2.83	16	9.37	5.78	28
Television high-connection recall	6.58	4.10	18	10.75	6.49	36

Note. All measures are raw scores

Table 2. Inter-correlations between the literacy component measures for the 4-year-olds in study 1

Measures	1	2	3	4	5
1. Phonological awareness	—	.45**	.34**	.15	.07
2. Letter identification		—	.33**	.23*	.05
3. Vocabulary			—	.28**	.34**
4. Listening high-connection recall				—	.43**
5. Television high-connection recall					—

* $p < .05$; ** $p < .01$

Table 3. Inter-correlations between the literacy component measures for the 6-year-olds in study 1

Measures	1	2	3	4	5	6
1. Phonological awareness	—	.50**	.33**	.28**	.24*	.19*
2. Letter identification		—	.57**	.26**	.16	.11
3. Word identification			—	.32**	.09	.04
4. Vocabulary				—	.16	.12
5. Listening high-connection recall					—	.64**
6. Television high-connection recall						—

* $p < .05$; ** $p < .01$

Factor analysis

Two Exploratory Factor Analyses were performed to explore the Simple View of Reading at ages 4 and 6, respectively. For the 4-year-old children, the total matrix sampling adequacy for factor analysis was sufficient ($KMO = .64$) and Bartlett's Test of Sphericity indicated the presence of factor structure, $X^2(10) = 86.98$, $p < .001$. Kaiser's criterion that only factors with eigenvalues greater than one are retained (Child, 1990) was applied. Principal component analysis with a varimax rotation yielded a two-factor solution involving 5 items with factor loadings above .45 that explained 66% of variance. The factor solution is presented in Table 4. The two factors extracted were labeled as Decoding Skills and Comprehension Skills. The factor *Decoding Skills* comprised phonological awareness DIBELS measure, letter identification and

Table 4. Factor loadings and communalities (h^2) for principal components analysis and varimax rotation for the 4-year-olds in study I

Measure	Component 1 decoding skills	Component 2 comprehension skills	h^2
Phonological awareness	.82		.68
Letter identification	.82		.68
Vocabulary	.54		.55
Television high-connection recall		.77	.62
Listening high-connection recall		.87	.75
Percent of variance	41.81%	23.92%	

Note. Only loadings above .45 are displayed

vocabulary. The factor *Comprehension Skills* comprised listening comprehension and television comprehension measures.

For the 6-year-old children, the total matrix sampling adequacy for factor analysis was sufficient ($KMO = .65$) and Bartlett's Test of Sphericity indicated the presence of factor structure, $X^2(15) = 148.14$, $p < .001$. Kaiser's criterion was applied. Principal Component Analysis with a varimax rotation yielded a two-factor solution involving 5 items with factor loadings above .45 that explained 64% of variance. The factor solution is presented in Table 5. The two factors extracted were labeled as Decoding Skills and Comprehension Skills. The factor *Decoding Skills* comprised phonological awareness letter identification, word identification, and vocabulary. The factor *Comprehension Skills* comprised listening comprehension and television comprehension measures.

Table 5. Factor loadings and communalities (h^2) for principal components analysis and varimax rotation for the 6-year-olds in study I

Measure	Component 1 decoding skills	Component 2 comprehension skills	h^2
Phonological awareness	.69		.53
Letter identification	.83		.70
Word identification	.80		.65
Vocabulary	.55		.35
Television high-connection recall		.88	.80
Listening high-connection recall		.89	.81
Percent of variance	39.37%	24.24%	

Note. Only loadings above .45 are displayed

STUDY 2

Method

Participants

One hundred and three children participated in this study (53 boys and 50 girls). All children were drawn from Grade 1 (year 1) classrooms in 9 classrooms of 5 suburban schools in Canada. The children were part of a larger longitudinal study investigating the

impacts of teaching styles on attainment in regular classrooms. This sample represented all of the children for whom parental consents to participate in the study were received. No children in the cohort were eliminated from the final sample.

Materials

Standardized Reading Tests.

Reading skills were assessed using the *Group Reading Assessment and Diagnostic Evaluation* (GRADE; Williams, 2001). The GRADE was selected for the present study because it was designed to provide a precise measure of change by isolating word reading and listening comprehension skills and also has a Canadian standardization. Testing typically takes between 60 and 90 minutes and is completed in a whole-class format. The examiner reads instructions and examples to the group and students mark their answers individually in a student response booklet. Recent reviews of the GRADE (Fugate, 2003; Waterman, 2003) indicate that it is a reliable and valid measure of early reading ability in young children. Split-half reliability coefficients, corrected by the Spearman-Brown formula, are very high for this measure ($r = .95$), indicating that there is a high degree of homogeneity among items in the first-grade form. Test-retest reliability is also high ($r = .96$) for the first grade version of the test.

Word reading

The word reading subtest assesses children's recognition of sight words and their ability to decode regularly spelled words. For each item, the examiner reads a target word, reads the word in a sentence and then repeats the word. Students must identify the target word from a list of four or five choices and select the target word by filling in the multiple-choice item. Distracter words are generally real words that often are visually or phonologically similar to the target word, although some unrelated words are also included.

Word meaning

This subtest assesses students' word reading skills, as well as their understanding of early reading vocabulary. Students complete this task independently after the examiner has modeled two examples. Students are asked to silently read a target word and then choose its matching picture from four choices. This task has twenty-seven items, with one point awarded for each correct response. Raw scores on Word Reading and Word Meaning are taken together to obtain a *vocabulary* Composite score.

Listening comprehension

This subtest assesses students' understanding of spoken language. Students listen to a sentence read by the examiner and then must choose a picture from four choices that best illustrates the meaning of the sentence. Items increase in linguistic complexity, requiring students to attend to subtleties in the verbal cues. For example, students must respond to vocabulary, grammar and inferential questions. Scoring of this test is based on correct identification of the picture for each item, for a total of seventeen items.

Curriculum-based reading tests

The *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS; Good & Kaminski, 2002a, 2002b) was used to assess students' early literacy skills. DIBELS is designed to

identify children who may have difficulty acquiring basic early literacy skills, as well as to assess students' progress on an ongoing basis to evaluate the effectiveness of reading interventions for individual students. The DIBELS tool is readily accessible through the Internet; educators and researchers are encouraged to download test materials and to share results via the on-line database. System-wide percentile ranks are available based on participating students in the DIBELS web-based data system (Good, Wallin, Simmons, Kame'enui, & Kaminski, 2002). In the present study, Nonsense Word Fluency, Oral Reading and Retell fluency were administered at the end of grade one (equivalent to year 1).

Nonsense word fluency

This subtest assesses both students' letter-sound knowledge and their ability to apply the alphabetic principle to unfamiliar words. The task involves a stimulus page with randomly ordered VC and CVC nonsense words (e.g. sig, vaj, ov) and students are asked to verbally produce either the word or the sounds that make up the word. For example, if the word is 'sig', the student could either read the word or pronounce the individual phonemes '/s/i/g/' for a total of three points. Students have one minute to complete this task. As the task is timed, it is assumed that children who can complete speeded naming of nonsense words will be advantaged over children who sound out the individual letters as they will complete more items in one minute, reflecting superior speeded phonological recoding abilities (Good & Kaminski, 2002b). The benchmark goal for Nonsense Word Fluency is 50 correct letter-sounds per minute by first grade; students scoring below 30 in mid first grade may need additional remediation in order to achieve first grade reading goals (Good & Kaminski, 2002b). The one-month, alternate-form reliability for NWF in winter of first grade is .83. It is also a moderate predictor of the DIBELS first grade Oral Reading Fluency rate (Good & Kaminski, 2002b).

Oral reading fluency

This curriculum-based measure is a test of students' accuracy and fluency while reading connected text (Good & Kaminski, 2002a). DIBELS oral reading fluency passages were developed and refined to reflect appropriate content, grammar and readability for each grade level (Good & Kaminski, 2002a). Students read three passages at each assessment, which increase slightly in difficulty but are otherwise relatively homogeneous. Student performance is measured by having the student read each passage aloud for one minute while the examiner takes a running record of the accuracy of their reading. Any hesitations of more than three seconds, omissions or substitutions are counted as errors. However, students are not penalized for errors if they are able to self-correct within three seconds. The oral reading fluency rate is determined by counting the number of words read correctly in one minute and calculating the average fluency rate across the three passages. This task is appropriate for most students from the middle of first grade through third grade. The benchmark goal for spring in first grade is an oral reading fluency rate of 40 words per minute, with students scoring below 10 considered at risk of reading difficulty (Good & Kaminski, 2002b). Technical properties of the DIBELS Oral Reading Fluency task are not cited in the manual, however support for the reliability of Curriculum-Based Measurement has been documented through a series of studies. Test-retest reliabilities for elementary students typically range from .92 to .97 (Tindal, Marston, & Deno, 1983 as cited in Good & Kaminski, 2002b).

Reading comprehension

Retell Fluency. Following students' oral reading of each passage, a secondary measure was included to assess students' comprehension of what they have read. The purpose of the retell-fluency measure was to check if students' comprehension skills were consistent with their oral reading fluency rate and in particular, to identify children who may read fluently but lack comprehension strategies. After reading each passage, students are prompted to tell the examiner everything that they remember about the passage that they just read. Students have one minute to retell the story. The examiner records the total number of words in the child's retelling of the story that demonstrate their understanding of the passage; repetitions or irrelevant details do not count in the scoring. As a guideline, the authors of the test suggest that children's retell scores should be about 50% of their oral reading fluency score, whereas retell scores that reflect 25% or less of the content indicate that children's oral reading fluency rate may not provide the best indication of their reading proficiency (Good & Kaminski, 2002b). For example, a child reading 40 words per minute in the spring of first grade (i.e. the benchmark) would be expected to use at least 20 words in their retell of the passage. If their retell is 10 words or less, then the child's oral reading fluency rate may not reflect their comprehension skills. The authors do not provide psychometric data on the technical merits of the Retell-Fluency task.

Procedure

The children were seen in two sessions undertaken in April and May of the school year. In the first session children completed the GRADE test as a whole class. In the second session children completed the other tasks working individually with an experienced research assistant.

Results

Preliminary analyses

Preliminary inspection of the data using conventional approaches (Tabachnick & Fidell, 2001) suggested, as expected, that there were no extreme skew and kurtosis. Checks, using $p < .001$ as recommended by Tabachnick and Fidell did not identify any univariate or multivariate outliers. The means and standard deviations of all measures used are presented in Table 6. As expected in a typical reader sample, the word reading (vocabulary) and Listening Comprehension stanine scores were close to the average stanine score of 5.

Correlation analyses were then explored. These are reported in Table 7. Inspection of these scores shows that there are strong and significant associations between nonword

Table 6. Descriptive statistics for all measures in study 2

Variable	Mean	SD	Max
DIBELS oral reading fluency ¹	47.77	26.94	223
DIBELS retell fluency ¹	21.97	12.17	94
DIBELS NW fluency ¹	65.59	28.25	139
Vocabulary ²	5.59	1.97	9
Listening comprehension ²	5.15	1.77	9

Note. 1 = raw score, 2 = Stanine score

Table 7. Inter-correlations between the literacy component measures in study 2

Measures	1	2	3	4	5
1. DIBELS oral reading fluency	–	.54**	.77**	.77**	.12
2. DIBELS retell fluency		–	.48**	.42**	.29**
3. DIBELS NWF			–	.69**	.13
4. Vocabulary				–	.20*
5. Listening comprehension					–

* $p < .05$; ** $p < .01$

reading fluency, oral reading, vocabulary and to a lesser degree with retell fluency. Listening comprehension was not significantly correlated with nonword reading fluency or story retell and was very modestly associated with vocabulary. The strongest correlate of listening comprehension was retell fluency. These patterns are broadly consistent with the SVR perspective that word level skills and listening comprehension skills are at least to some extent separable in young children.

Factor analysis

An Exploratory Factor Analysis was then performed. The total matrix sampling adequacy for factor analysis was sufficient ($KMO = .75$) and Bartlett's Test of Sphericity indicated the presence of factor structure, $X^2(10) = 233$, $p < .001$. Kaiser's criterion that only factors with eigenvalues greater than one are retained (Child, 1990) was applied. Principal component analysis with a varimax rotation yielded a two-factor solution involving 6 items with factor loadings above .45 that explained 78.16% of variance. The factor solution is presented in Table 8. The two factors extracted were labeled as Decoding Skills and Comprehension Skills. The factor *Decoding Skills* comprised the DIBELS Nonword Fluency Oral Reading and Retell fluency measures, Letter identification and vocabulary¹. The factor *Comprehension Skills* comprised the GRADE Listening Comprehension and DIBELS story retell measures.

Discussion

The results of the present paper provide evidence for the dissociation of decoding and comprehension skills in young children by employing Factor Analysis. Our primary aim was to explore whether decoding and listening comprehension measures load as distinct factors in English-speaking children ages 4 and 6. To address this aim we obtained evidence from a reanalysis of two different datasets. Study 1 took place in the US and employed measures of high psychological validity in assessing

¹ It is possible that there were differential effects of the two subscales of the GRADE vocabulary composite measure as the Word Reading subscale requires only word recognition whereas the Word Meaning subscale potentially requires both word recognition and knowledge of individual word meanings. A further factor analysis was run that was identical to the one described in all ways except that Word Reading and Word Meaning subscale stanine scores were entered instead of the vocabulary composite score. This analysis produced essentially an unchanged pattern of overall factor loadings to that already reported. High loadings for both Word Reading and Word Meaning were evident on the rotated 'Decoding Skills' factor (.83 and .85 respectively) and very low loading on the 'Comprehension Skills' factor (–.05 and –.14 respectively), suggesting that both subscales load in a similar way and that their combination in a single composite 'vocabulary' scale is justified.

Table 8. Factor loadings and communalities (h^2) for principal components analysis and varimax rotation on decoding, listening and reading comprehension measures in study 2

Measure	Component 1 decoding skills	Component 2 comprehension skills	h^2
Vocabulary composite	.86		.76
Nonword fluency	.88		.79
GRADE listening comprehension		.96	.92
DIBELS oral reading fluency	.94		.88
DIBELS retell fluency	.57	.46	.56
Percent of variance	57.96%	20.20%	

Note. Only loadings above .45 are displayed

children's decoding and comprehension skills at ages 4 and 6. Study 2 took place in Canada and employed measures of high psychometric validity in assessing children's decoding and comprehension skills at age 6. Even though the two studies differ in many ways, the findings are remarkably consistent, showing that decoding and listening comprehension measures represent distinct components of successful reading comprehension.

According to the SVR, although listening comprehension should load separately from measures of decoding, literacy measures requiring reading comprehension should load with both D and LC constructs. Evidence from Study 2 is consistent with this view: Only Story Retell of the DIBELS loaded with D and LC. This finding provides important construct validation for this measure. This is important for at least two reasons. First, as to date, although the Nonword Reading fluency subtest of the DIBELS has been formally investigated (Hintze, Ryan, & Stoner, 2003), the widely-used Retell Fluency measure is lacking in formal psychometric validation (Good & Kaminski, 2002a). Second, the results of recent systematic investigations on reading comprehension measures have raised serious concerns regarding the content validity of widely used measures of reading comprehension and the fact that they tap on different cognitive processes (Cutting & Scarborough, 2006; Keenan & Betjemann, 2006). Hence, the current findings with respect to DIBELS Story Retell subtest are promising in that they demonstrate its validity and the fact that the subtest involves both decoding and comprehension processes.

In evaluating the findings of the present studies, it should be noted that our argument is not that *any* measures of D and LC will provide good indices of these underlying constructs. Of course, only well-designed experimental measures or well-validated curricular or psychometric measures with high internal reliability will do this job accurately. Rather, our argument is that the D and LC constructs are general features of reading comprehension. For this reason the D and LC constructs are evident in factorial analysis of the diverse measures of these constructs undertaken independently by two research teams in different countries. In this sense, the present findings provide important support for the generality and validity of the SVR framework as a model of reading and as a guiding principle for policy makers seeking to employ maximally effective interventions in the field (Aaron, Joshi, Gooden, & Bentun, 2008; Kirby & Savage, 2008; Rose, 2006).

Even though different vocabulary measures were used in the two studies, in both cases vocabulary loaded with the decoding component. This finding may seem

surprising considering the fact that the vocabulary measure in Study 1 included an oral comprehension component (i.e. children listen to the word and then make a choice for the picture that best represents the meaning of the word) whereas the vocabulary composite in Study 2 included a decoding component (i.e. children read the word before making any decision). In Study 2, we were however able to confirm that the Word Meaning subscale of the GRADE vocabulary test which potentially requires word reading and word meaning knowledge loaded strongly on one factor with all of the other measures that assessed decoding skills and did not appreciably with measures of comprehension skills. This finding provides some measure of further support for the notion that knowledge of individual word meanings is most closely tied to word reading skills in young children. The consistency in findings across the two studies may thus also reflect the fact that both measures assess the same vocabulary dimension. Indeed, the construct 'vocabulary' comprises at least two dimensions, breadth and depth. vocabulary breadth refers to the number of lexical entries an individual has available, whereas vocabulary depth refers to the extent of semantic representation of the entries (Tannenbaum, K. R., Torgesen & Wagner, 2006; Pearson, Hiebert, & Kamil, 2007). One investigation of 4th grade students revealed that only vocabulary depth was related to comprehension whereas vocabulary breadth was the primary factor in determining decoding (Ouellette, 2006).

We view the present study as a validation of one of the basic tenets of the SVR model that has not been investigated in young English-speaking children. There are, however, many other aspects of the existing SVR model that require formal empirical investigation and there are also many conceptual issues still to be resolved. For instance, because this was a reanalysis of existing datasets, it was not possible to include a 4-year-old sample group in Study 2. For this reason, the findings with respect to the 4-year-old group in Study 1 need to be replicated. Furthermore, Kirby and Savage (2008) noted that questions remain about how well the SVR explains reading comprehension outcomes for readers of different ages and reading proficiency levels (e.g. ESL), what the role of fluency is in the model, what the role of illustrations is, how LC and reading comprehension differ, and how to best measure reading comprehension.

In an era where there is a need for evidence-based approaches to education, we believe that the theoretical basis of the SVR provides a valid conceptual framework for practitioners for several reasons. First, the model is relatively transparent and fosters understanding of the basic components of a very complex phenomenon, that of reading comprehension. Second, the model makes clear to teachers that word recognition is necessary but not sufficient for reading comprehension. In educational practice, there has been considerable focus on early literacy programs that foster decoding skills such as phonological awareness, word reading and vocabulary (see Ehri, Nunes, Stahl, & Willows, 2001, for a review). However, findings from the current study and other research indicate that language comprehension is also necessary for reading comprehension and there has been growing recognition that the development of decoding skills should be complemented by fostering language comprehension skills (e.g. Lonigan, Burgess, & Anthony, 2000; Pressley *et al.*, 2001). Finally, this framework makes it explicit to the teachers that the children they teach may differ with respect to these two dimensions and therefore, require different teaching strategies to support their reading development. Indeed, much research demonstrated the existence of children who have good decoding skills and poor comprehension and, children with poor decoding and good comprehension (e.g. Catts, Hogan, & Fey, 2003; Healy, 1982; Nation & Snowling, 1997, 1998). This dissociation suggests that the more educational

practice can help each child move forward along each dimension (D and LC), the more it insures the child against failure (Oakhill & Cain, 2007).

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