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REVIEW

The Simple View of Reading: Is It Valid for Different Types of Alphabetic Orthographies?

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Abstract We present a meta-analysis to test the validity of the Simple View of Reading Gough & Tunmer (Remedial and Special Education, 7:6–10, 1986) for beginner readers of English and other, more transparent, orthographies. Our meta-analytic approach established that the relative influence of decoding and linguistic comprehension on reading comprehension is different for readers of different types of orthography during the course of early reading development. Furthermore, we identified key differences in the relations among different measures of decoding and reading comprehension between readers of English and other more transparent orthographies. We discuss the implications for reading instruction and the diagnosis of reading difficulties, as well as our theoretical understanding of how component skills influence reading comprehension level.

Keywords Simple view of reading · Reading comprehension · Decoding · Linguistic comprehension · Early reading development

Successful reading comprehension is critical for full engagement in today's society because, in addition to education and employment, a range of cultural and social activities rely on an individual's ability to efficiently and accurately assimilate information from text. Thus, it is critical to produce accurate models of the development of reading comprehension in order to develop evidence-based curricula and interventions for young and struggling readers. However, reading comprehension is determined by a wide range of component skills and processes (Kendeou, van den Broek *et al.* 2009; Oakhill and Cain 2011; Vellutino *et al.* 2007), making the specification of such models a challenge. In this paper, we evaluate one highly influential model, the *Simple View of Reading* (SVR), which offers a relatively simple framework within which to conceptualise reading comprehension (Gough and

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Tunmer 1986; Hoover and Gough 1990). Our aim is to assess if the SVR provides an adequate description of reading comprehension development for alphabetic orthographies that differ in the depth of their orthography. To do this, we conducted an exploratory meta-analysis of relevant data for learning to read in different alphabetic orthographies and identify and discuss the implications for reading instruction, the diagnosis of reading difficulties and our theoretical understanding of reading comprehension development.

According to the SVR, the skills and processes that determine reading comprehension are captured by two broad components: decoding and linguistic comprehension. The identification of a simple model of reading has theoretical, educational and diagnostic implications (Chen and Vellutino 1997; Kendeou, Savage and van den Broek 2009; Savage 2006; Stuart *et al*. 2008). First, it provides a framework within which to understand, conceptualise and empirically test complex phenomena. Second, it can guide the design of targeted and appropriate early teaching practices. Third, it can inform the diagnosis of developmental reading difficulties. As pointed out by Kirby and Savage (2008), the critical issue for the Simple View of Reading (and other simple models) is whether this reduction is useful or whether it fails to be accurate and informative because it does not capture sufficient information about the components of reading ability.

The validity of a model of reading must be tested across languages that differ in orthographic depth to confirm whether or not it is general or language specific (Georgiou *et al*. 2009). In relation to word reading, Share (2008) points out that the most influential models of word reading, such as the Dual-Route Model (e.g. Coltheart 2005), might be misleading because they have been developed largely to deal with a single language—English, which has some significant properties different to other alphabetic orthographies. To date, most of the research on the SVR model has been carried out on English-speaking children in English-speaking countries. Its influence in these countries has been considerable. For example, in the United Kingdom, it has been adopted as a framework for the national curriculum of early literacy (e.g. Kendeou, Savage and van den Broek 2009), and the distinction between decoding and linguistic comprehension expressed in the SVR informed the RAND Reading Study Group review of literacy in the USA (RAND Reading Study Group 2002). The present review was driven by the need to determine whether or not the SVR is valid and applicable for beginner readers in alphabetic orthographies other than English, because of the importance that the SVR has assumed for reading research, education and the diagnosis of reading difficulties.

The SVR: Key Concepts and Critical Issues

The SVR was proposed by Gough and colleagues (Gough and Tunmer 1986; Hoover and Gough 1990; see also Gough *et al*. 1996), at the height of the whole language movement in literacy education in the United States and Canada. The SVR can be seen as an attempt at a “balanced literacy” because it recognizes the importance of both decoding and general language skills for reading (Kirby and Savage 2008). A basic assumption of the SVR is that reading comprehension (R) is the product of two broad components: decoding (D) and linguistic comprehension (L) (Gough and Tunmer 1986; Hoover and Gough 1990). Each component can range in value from 0 (skill not present) to 1 (perfect performance), such that their relation can be expressed with the following formula: $R=D\times L$. These two components represent the most important and proximal determining factors of reading comprehension.

The decoding component refers to the ability to convert graphic stimuli (writing) into linguistic referents and is specific to reading. The linguistic component refers to, and involves, higher mental processes that are not limited to reading but which concern the processing of language more broadly. It is defined as the ability to take lexical information (word level) and derive sentence and discourse interpretations and should be assessed as the ability to answer questions about the contents of aurally presented texts and, thus, can be thought of as listening comprehension (Gough and Tunmer 1986; Hoover and Gough 1990). For consistency, we use the term linguistic comprehension throughout.

These two components are proposed to be "of equal importance" (Hoover and Gough 1990, p. 128) in that successful reading comprehension relies on both: neither decoding nor linguistic comprehension is sufficient by itself. There is strong support that reading comprehension is determined by these two components in both transparent and deep alphabetic orthographies (e.g. Adlof *et al*. 2006; Chen and Vellutino 1997; Joshi and Aaron 2000; Megherbi *et al*. 2006). In addition, the assumption that these two components are partially independent is supported by research that shows that different underlying skills and abilities contribute to the prediction of decoding and reading comprehension skills (de Jong and van der Leij 2002; Kendeou, van den Broek, *et al*. 2009; Megherbi *et al*. 2006; Muter *et al*. 2004; Oakhill and Cain 2011; Pazzaglia *et al*. 1993) and by twin studies that support distinct genetic, as well as environmental, influences on performance on the two components (e.g. Keenan *et al*. 2006).

Gough and colleagues proposed that the balance of the influence of these two components, decoding and linguistic comprehension, will change with reading proficiency and grade level (Gough and Tunmer 1986; Hoover and Gough 1990). In the early stages of learning to read, decoding, rather than linguistic comprehension, should have the greatest influence on reading comprehension (predict more variance). The logic is that although beginner readers have linguistic comprehension skills, they have to learn how their particular writing system represents their spoken language; that is they have to learn to decode. It is has long been acknowledged that the faster that letters and words can be processed during reading, the greater the cognitive resources available for higher-level comprehension processes (e.g., Cunningham *et al*. 1990; Jackson and McClelland 1979; Perfetti 1985). Thus, when word reading becomes relatively fast and automatic, a greater proportion of these processing resources can be devoted to reading comprehension. For that reason, in readers with several years of reading instruction, linguistic comprehension is the more significant predictor of reading comprehension performance. In English-speaking populations, there is good evidence for this developmental pattern (e.g. Catts *et al*. 2006; Gough, *et al*. 1996).

We propose that this particular aspect of the SVR—the relation between decoding and reading comprehension, and also linguistic comprehension and reading comprehension in early reading development—is likely to differ between alphabetic orthographies that differ in transparency. In a language such as English, the same letter or cluster of letters (graphemes) can have multiple pronunciations, and the same sound (phoneme) can be written in more than one way. Such languages can be described as having a 'deep' orthography, in contrast to those with a 'shallow' orthography (e.g., Finnish, Italian, German) in which the mapping between graphemes and phonemes is more consistent in both directions (Ziegler and Goswami 2005). English includes a large number of words with irregular spelling patterns, which will only be read accurately through instruction and exposure. These factors contribute to the slow rate of word reading acquisition in English, relative to other alphabetic orthographies (Ellis *et al*. 2004; Seymour *et al*. 2003). As a result, readers of transparent orthographies may demonstrate a weaker relationship between decoding and reading comprehension in the early stages of reading acquisition than English readers. Further, beginner readers of transparent orthographies may demonstrate a stronger relationship between linguistic comprehension and reading comprehension than beginner readers of opaque orthographies, such as English, as shown by Müller and Brady (2001). Our primary aim was to investigate this hypothesis, namely that the transparency of the orthography affects the weight of the components predicting reading comprehension.

Decoding is the term used by Gough and Tunmer to refer to the word recognition component of reading, which we use throughout for consistency. Although Gough and Tunmer (1986) noted that the ability to use grapheme–phoneme correspondence rules is not sufficient for accurate word recognition in English, they proposed non-word (also referred to as pseudoword) reading as the measure of decoding in the SVR. The rationale for this decision is that beginner readers have to acquire the alphabetic principle (Hoover and Gough 1990, see also Vellutino *et al*. 2004). Yet, although non-word reading may be the most appropriate measure of decoding skill in languages whose scripts are highly transparent, it will not be adequate for a script like English where grapheme–phoneme correspondences are less predictable and for which readers must also rely on orthographic knowledge in order to read accurately (Kirby and Savage 2008; Stuart *et al*. 2008). Indeed, there is some evidence from studies of English-speaking elementary school children that phonic analysis skills, e.g. measured by non-word decoding, are a less powerful predictor of reading comprehension than real word decoding (Byrne and Fielding-Barnsley 1995; Conners 2009; Johnston and Kirby 2006; but see Chen and Vellutino 1997 for different results).

When we consider the decoding component of the SVR, we also need to examine the nature of the measure. The original paper defined word recognition as the ability to read isolated words *quickly*, *accurately* and *silently* (Gough and Tunmer 1986); yet, the majority of studies conducted on the SVR have measured only decoding accuracy of either words or non-words. Studies of readers of English are inconclusive about whether decoding fluency adds to the prediction of reading comprehension over and above decoding accuracy. Some find that it makes a significant unique contribution (Cutting and Scarborough 2006; Joshi and Aaron 2000), whilst others do not (Adlof, *et al*. 2006; Conners 2009; Neuhaus *et al*. 2006). It has been proposed that for readers of English, decoding fluency might play a more important role in later grades than in earlier grades, as texts become more demanding (Aaron *et al*. 1999). For transparent alphabetic orthographies, the results are clear. Speed, not accuracy, is the marker of poor word decoding in languages such as German (e.g., Wimmer *et al*. 1998). Thus, fluency may be a more appropriate measure of decoding skill than accuracy in these languages, because of the fast acquisition of the alphabetic principle (e.g., Share 2008; Wimmer 2006). Such differences need to be reflected in a model of reading development that is language- (or orthography) general. The secondary aim of our exploratory meta-analysis was to determine whether or not the recommended measure of decoding should differ according to the transparency of the orthography and/or stage of reading development.

In sum, the SVR proposes that reading comprehension is the product of two broad components, decoding and linguistic comprehension, the relative balance of each will change during the course of reading development. Because word reading is generally acquired more readily in transparent orthographies, we examined whether or not this balance occurs at different stages in reading development in orthographies that differ in orthographic transparency. The measure used to assess the decoding term in the SVR (successful word decoding vs non-word decoding; accuracy vs fluency) might result in different patterns of associations with reading comprehension and different measures might be appropriate for different alphabetic orthographies and at different stages of reading development. These issues are examined in our meta-analysis.

Research Questions and Hypotheses

Our review has identified reasons why we need to examine the validity of the SVR for readers of non-English alphabetic orthographies. We present a meta-analysis to address the following research questions:

1. Is the developmental pattern of the strength of the relations between decoding and reading comprehension, and also linguistic comprehension and reading comprehension, different for readers of different alphabetic orthographies? Specifically, is the strength of the relationship between decoding and reading comprehension stronger for a longer period of reading development for readers of English compared with readers of more transparent alphabetic orthographies? Further, is linguistic comprehension more strongly predictive of reading comprehension earlier in development for readers of more transparent alphabetic orthographies, relative to English-language readers?
2. Do the relations between decoding and reading comprehension depend on the way that decoding is measured, and does this differ for orthographies that differ in transparency? Specifically, are measures of word decoding more strongly predictive of reading comprehension for readers of English than measures of non-word decoding? And are measures that tap fluency more strongly predictive of reading comprehension for readers of more transparent alphabetic orthographies than measures of accuracy? Further, is the pattern the same or different for readers at different stages of reading development?

Different countries have different educational systems that affect when formal literacy instruction begins. As a consequence, children who are in the same year group (or grade) but come from different countries may have been exposed to formal instruction for a different number of years. Further, children in the same grade could also differ in chronological age in different countries. Therefore, in order to allow for adequate comparisons within and between orthographies, we conducted two separate groups of analyses. In one, participants were grouped according to years of schooling (beginner readers with 1–2 years of schooling and older readers with 3–5 years of schooling). In the other, we grouped participants by chronological age (6–7 vs 8–11 years). To disentangle the effect of years of schooling and chronological age on the changes in the relations between the components of the SVR, a meta-analytic approach (Borenstein *et al*. 2009) was adopted considering each factor separately.

Method

Selection of empirical studies For inclusion in this review, we used the following criteria. We examined all published research articles on typically developing beginner readers from preschool to the fourth year/grade (years of schooling: from 1 to 5 years; chronological age: from 4–5 to 10–11 years) that included measures of reading comprehension, decoding and/or linguistic comprehension. The studies of readers of more transparent orthographies included children learning to read in one of several European languages.

Papers for inclusion were identified by searching the PsycINFO, PsyArticle and PsyCRITIQUES databases (1990–2010 i.e., the last 20 years after the publication of the Hoover and Gough's 1990 paper) using the following search criteria: reading comprehension (and variants: reading skills); decoding (and variants: word reading, word recognition, word identification, word decoding, pseudo-word reading, non-word reading); and linguistic comprehension (and variants: listening comprehension, language comprehension, passage comprehension, narrative comprehension). The database was searched with the profile [reading comprehension (and variants) × decoding × (and variants) × linguistic comprehension (and variants)]. The key words were derived from key publications on the SVR model and were indexed on Thesaurus. Papers, books and dissertations that were not published or peer-reviewed were not included. Our criteria for inclusion were narrow in order to allow for only relevant, well-designed and rigorous studies to be included in the meta-analysis. As a consequence, however, it is likely that we were not able to include all the existing studies. We commented on this point as a possible limitation of our study in the discussion.

Thirty-three studies were identified (see Table 1 for details). Twenty carried out with English-speaking children, and 13 with children speaking other European languages. Two studies were published in a non-English speaking journal but we obtained all the necessary information either from the author or from translations performed by native speakers expert in the field. The selected papers (a) reported data on at least two of the three components (reading comprehension, decoding, and linguistic comprehension) and relations between them evaluated at the same time, (b) assessed reading and linguistic comprehension using standardized measures at the text/discourse-level or composite language scores which include measures at word-, sentence-, and text-level.[1] Measures of decoding reported in the papers considered accuracy and/or fluency for words and non-words, and the majority of word decoding measures assessed the reading of single words. Most of the studies provided data on the relations between all three components of the SVR for children with different years of schooling or chronological age. The number of studies for grouping (by time at school or chronological age) ranged from 5 to 12 for English and from 1 to 7 for transparent orthographies. In order to prevent violation of independence of observations (i.e. including data from the same sample more than once), studies by the same author were examined in order to detect duplicate samples.

Results and Summary

Our analysis addresses our two broad research questions: 1. Is the developmental pattern of the strength of the relations between decoding and reading comprehension, and also linguistic comprehension and reading comprehension, different for readers of different alphabetic orthographies? 2. Do the relations between decoding and reading comprehension depend on the way that decoding is measured, and does this differ for orthographies that vary in transparency? We present data relating to these questions in two sections: in the first, we conduct comparisons between beginner and more advanced readers based on years of schooling; in the second, we group according to chronological age.

The following variables from each study were coded for the meta-analysis procedure: number of participants, year of schooling/chronological age of participants, type of decoding measure reported in the study, the statistical test reported for the correlation between reading comprehension and decoding as well as reading and linguistic

[1] An exception was made for studies that directly tested the SVR but used measures at the word- or sentence-level (Carver 1998; Conners 2009; Jarmulowicz *et al*. 2008; Joshi and Aaron 2000; Kendeou, Savage and van den Broek 2009; Spear-Swerling 2004; for further information, see Table 1).

Table 1 List of studies included with details about language, grade/year, age, number of participants and reading comprehension and decoding and linguistic comprehension measures

	Language	Grade/year	Age	N	Measure of RC	Measure of D	Measure of L
Studies on readers of English							
Aaron (1991)		3, 4	9;2, 10;1	30; 30	Cloze task (text -level measure)	Accuracy-non-words	Cloze task (discourse -level measure)
Adlof *et al*. (2006)		2, 4		604; 604	Cloze-task; task with open-ended questions; multiple-choice task (text-level measures) [b]	Accuracy-words and non-words. Fluency-words [b]	Picture-matching tasks and task with open-ended questions (word-, sentence- and discourse-level measures) [b c]
Carver (1998)		1–4		22; 24; 22; 25	Sight vocabulary task (word-level measure)	Accuracy-words	Oral vocabulary task (word-level measure)
Chen and Vellutino (1997)		1, 2			No specific information about the format	Accuracy- non-words	No specific information about the format
Conners (2009)		–	8;6	67	Picture-matching task (Sentence-level measure) [c]	Accuracy-words and non-words	Picture-matching tasks (word- and sentence-level measures) [c]
Dryer and Katz (1992)		3	–	137	No specific information about the format (Achievement battery)	Accuracy-words [a]	No specific information about the format (Achievement battery)
Hoover and Gough (1990)		1–4	–	210, 206, 86, 55	Recalling task and open-ended questions (text-level measure)	Accuracy—non-words	Recalling task and open-ended questions (discourse-level measure)
Jarmulowicz *et al*. (2008)		3	8;10	76	Cloze task (sentence-level measure)	Accuracy- non-words	Receptive oral language measure (no specific information about the format)
Joshi and Aaron (2000)		3	–	40	Multiple-choice task (text-level measure)	Accuracy-non-words	Cloze task (sentence-level measure)
Kendeou *et al*. (2008)			8 (6–8 years cohort)	108	Task with open-ended questions (text-level measure) [a]	Accuracy-letters and words	Task with open-ended questions (discourse -level measure) [a]
Kendeou, Savage, and van den Broek		1 (Second study)		103	Retelling task (text-level measure)	Fluency-non words and words	Picture-matching task (sentence-level measure) [c]

Table 1 (continued)

	Language	Grade/year	Age	N	Measure of RC	Measure of D	Measure of L
(2009)							
Muter *et al.* (2004)		2 (Time 3)	–	90	Task with open-ended questions (text-level measure)	Accuracy-words	–
Neuhaus *et al.* (2006)		3	8;9	122	Text-level measure (no specific information about the format)	Accuracy- non-words Fluency-words	Discourse-level measure (no specific information about the format)
Ouellette and Beers (2010)		1	6;7	67	Cloze –task or answer a content question (text-level measure)	Accuracy- non-words and words	Answering questions about stories (discourse-level measure) [b]
Sears and Keogh (1993)		3		104	Recall of passages (Text-level measure)	Accuracy- words	Word-and discourse-level measure (no specific information about the format)
Sparks *et al.* (2009)		3, 4	–	54, 54	Multiple choice task (text-level measure)	Accuracy non-words/ words [b]	Close-task (text –level measure)
Spear-Swerling (2004)		4	9;8	95	Cloze-task, task with open-ended questions (text –level measures)	Accuracy- non-words and words Fluency-words	Picture-matching task and close task (word- and sentence-level measures) [c]
Spear-Swerling (2006)		3	8;5	61	Cloze task, (sentence and text-level measures)	Accuracy–non-words and words Fluency-words	Cloze task, (sentence and text-level measures)
Spooner *et al.* (2004)		3	7;10 8 (Study 1 and 2)	114, 211 (Study 1 and 2)	Task with forced-choice true/false questions (text-level measure) (Study 1 and 2)	Accuracy-words (Study 1)	Multiple-choice task with written answers (text-level measure) (Study 2)
Tilstra *et al.* (2009)		4	9;11	89	Multiple-choice task (text-level measures)	Accuracy-non-words Fluency-words	Multiple-choice task (discourse -level measures)
Studies on readers of more transparent orthographies							
de Jong and Van der	Dutch	1	7;2	141	Multiple choice task (text-	Fluency-words and	Multiple choice task (discourse

Table 1 (continued)

	Language	Grade/year	Age	N	Measure of RC	Measure of D	Measure of L
Leij (2002)					level measure)	non-words	-level measure)
Diakidoy *et al.* (2005)	Greek	2, 4	–	135, 151	Sentence verification task (text-level measure) [a]	–	Sentence verification task (text-level measure) [a]
Droop and Verhoeven (2003)	Dutch	3, 4	8;7	143	Multiple choice and cloze tasks (word- and text-level measures) [b]	Fluency-words	Picture-matching task, close-task, imitation task and multiple choice task (word-, sentence- and discourse- level measures) [b c]
Florit, *et al.* (2008)	Italian	3 (First study)	8;7	31	Multiple choice task (text-level measure)	Fluency-words	Task with open-ended questions (discourse-level measure)
Hagtvet (2003)	Norwegian	2	9	70	Retelling and cloze tasks (text-level measures) [a]	Fluency-non-words/ words [b]	Retelling and cloze tasks (discourse -level measures) [a]
Lerkannen *et al.* (2004)	Finnish	1 (Time 1)	7;3		Task which requires to colour pictures and to answer multiple-choice questions (text-level measures) [d]	Accuracy-words	–
Marx, and Jungmann (2000)	German	1–4	7;5–10;2	360 for each grade	Questions about stories (text-level measure)	Accuracy for non-words and words [b]	Questions about stories (discourse-level measure)
Megherbi *et al.* (2006)	French	1, 2	6;8, 7;8	106, 105	Task with open-ended questions (text-level measure)	Accuracy for non-words	Task with open-ended questions (discourse-level measure)
Müller and Brady (2001)	Finnish	1, 4	7;6, 10;4	80, 79	Task with multiple choice questions (text-level measure)	Accuracy and fluency -non-words	Task with multiple choice questions (discourse -level measure)
Proctor *et al.* (2006)	Spanish	4	10;1	135	Cloze tasks (text-level measure)	Accuracy-non-words Fluency-words	Cloze tasks (discourse -level measure)
Roch and Levorato (2009)	Italian	1	6;8	23	Task with multiple choice questions (text-level measure)	Accuracy and fluency-non-words and words	Task with multiple choice questions (discourse-level measure)

Table 1 (continued)

	Language	Grade/year	Age	N	Measure of RC	Measure of D	Measure of L
Seigneuric and Ehrlich (2005)	French	1–3	6;1 grade 1		Picture matching and sentence completion task (text- and sentence-level measures) [b]	Accuracy and fluency-non words	–
Seigneuric *et al.* (2000)	French	4	9;9		Task with fill-in blank questions (text-level measure)	Accuracy and fluency-words	–

[a] Tasks that were not standardized

[b] Composite scores

[c] Picture matching describes comprehension assessments that required the participant to choose one of an array of pictures to match the text

[d] Two measures were used to evaluate literal and inferential text comprehension, therefore, two RC-D correlations were reported which were averaged to obtain a single value

comprehension (i.e., r). Discrepancies in the coding procedure were minimal and were resolved through discussion by the two authors.

Given the number of studies for each year of schooling and chronological age group ($n < 30$), we performed a fixed-effect meta-analysis, as suggested by Borenstein *et al.* (2009, p. 84). Specifically, a meta-analysis of correlations was carried out to obtain a global measure of the effect size (i.e., a summary effect) for the correlations between reading comprehension and decoding, and reading comprehension and linguistic comprehension. Following the procedure reported by Borenstein *et al.* (2009), each correlation was converted to the Fisher's z scale, and all the analyses were performed using the transformed values. The Fisher's z score and its variance (V_z) were computed as follows $z = 0.5 \times \ln(1 + r/1 - r)$, where r is the correlation of the study, and $V_z = 1/(n - -3)$, where n is the sample size of the study. In addition, each score was weighted by the reciprocal of its variance ($W_z=1/V_z$). The summary effect (M) and its variance (V_M) were then computed using $M = (\sum W_z \times z)/\sum W_z$ and $V_M = 1/\sum W_z$, respectively. The square root of V_M was the standard error of the summary effect size and was used to calculate confidence intervals (i.e., 95% CI=$M \pm 1.96 \sqrt{V_M}$). The summary effect size (and CI) when then converted back from the Fisher's z metric to correlation units using $\bar{r} = \left(e^{(2\times M)} - 1\right)/\left(e^{(2\times M)} + 1\right)\bar{r}$. The effect size for the correlation between reading comprehension and decoding was calculated distinguishing, for English studies, between those in which decoding was measured by accuracy for non-words, accuracy for words or fluency.[2] For more transparent orthographies, we distinguished between those in which decoding was measured by accuracy or fluency.[3] When more than one measure of decoding or linguistic comprehension was reported in a single study, a fixed-effect meta-analysis of correlations within each study was carried out in order to obtain a single measure for each construct (Borenstein *et al.* 2009).[4] To compare the magnitude of the summary effect for correlations, between years of schooling/chronological age groups within/between English and transparent orthographies, each summary effect was converted to the Fisher's z scale

[2] Some studies (see Table 1) used composite scores of measures of word and non-word decoding. These studies were grouped together with those using measures of word decoding.

[3] In most of the studies on English and more transparent orthographies (see Table 1), performance on the fluency measures was coded as the number of stimuli read correctly in a fixed period of time; in these cases, the correlation between decoding fluency and reading comprehension was positive. In the study of Proctor *et al.* (2006), Roch and Levorato (2009), Seigneuric and Ehrlich (2005) and Seigneuric *et al.* (2000), which are included in the group of studies on transparent languages, the indicator of fluency was coded as a response time measure. In these two studies, therefore, the correlation between fluency and reading comprehension was negative. In order to carry out the meta-analysis, the sign of the correlation was reversed. This change was based on the rationale that even though these studies used different coding systems, the expected direction of the correlation for both types of measures is the same at a theoretical level. In other words, children who read a higher number of words correctly in a fixed period of time, are also expected to be those who will read the words faster. Based on a similar rationale, we reversed the negative sign of the correlation between decoding accuracy and reading comprehension in the study of Seigneuric *et al.* (2000).

We did not distinguish between measures of word and non-word decoding accuracy for transparent orthographies because the majority report measures of non-word, rather than single word decoding and, more importantly, for transparent orthographies the crucial distinction is between decoding accuracy and fluency (Wimmer, *et al.* 1998).

[4] The procedure has been applied to: Kendeou, Savage *et al.* (2009) (for the measure of decoding fluency), Muter *et al.* (2004) (for the measure of word decoding accuracy), Spear-Swerling (2004) (for measures of non-word and word decoding accuracy, decoding fluency and linguistic comprehension), which were included in the group of English studies, and de Jong and van der Leij (2002) (for measures of decoding fluency and linguistic comprehension), Hagtvet 2003 (for measures of decoding fluency and linguistic comprehension) and Roch and Levorato 2009 (for measures of decoding fluency and accuracy), which were included in the group of studies on transparent orthographies.

and Z test (i.e., $Z = (z_1 - z_2)/\sqrt{V_{z1} + V_{z2}}$, where z_1 and z_2 are summary effects to be compared) was used to test for significant differences.

There was a small number of studies for transparent orthographies. For that reason, data in the different years of schooling and chronological age groups were collapsed for both orthography groups in order to include more than one measure of the correlation between reading comprehension and decoding, distinguishing between measures of accuracy or fluency, and reading and linguistic comprehension in each year of schooling/chronological age group. To do this, we grouped data for children with 1–2 years of formal reading instruction and compared those data with studies of children with 3–5 years of formal instruction. We chose these groups because of evidence that children learning to read in transparent orthographies master decoding skills in the first 2 years of school (e.g., Ellis, *et al*. 2004). Data for children aged 6–7 and 8–11 years were collapsed in the meta-analysis for chronological age because an inspection of the studies on transparent orthographies showed that children started school at 6 years of age in the majority of these studies.

Meta-analysis for Years of Schooling

According to the SVR, the correlation between decoding and reading comprehension should be higher than the correlation between linguistic comprehension and reading comprehension in beginner readers; the reverse pattern should be found for older readers. Furthermore, non-word reading is a more appropriate measure of decoding for beginner readers. Thus, non-word measures of decoding should be more strongly correlated with reading comprehension than should measures of real word reading, for beginner readers. The results for each prediction, which was tested by our analysis, are reported in turn below.

Table 2 reports the summary effects for the correlations between reading and linguistic comprehension in the two orthography groups, and between reading comprehension and decoding (i.e., accuracy for non-words, accuracy for words and fluency, for English, and accuracy and fluency for transparent orthographies).

Is the developmental pattern of the strength of the relations between decoding and reading comprehension, and also linguistic comprehension and reading comprehension, different for readers of different alphabetic orthographies?

English In line with the predictions of the SVR, the decoding component exerted a larger influence on reading comprehension than did linguistic comprehension in beginner readers with 1–2 years of schooling. The summary effect for the correlation between reading comprehension and linguistic comprehension was medium and lower than that for the correlation between reading comprehension and decoding ($Z=-10.04$, $p<.001$, accuracy non-words; $Z=-7.72$, $p<.001$, accuracy words). When looking at readers with 3–5 years of schooling, a different pattern emerged. As predicted by the SVR, linguistic comprehension had a greater influence on reading comprehension than did decoding for readers with several years of reading experience. However, this conclusion was qualified by the measure used to evaluate the decoding term: the prediction was supported only when decoding was evaluated with non-word reading. The correlation between reading and linguistic comprehension ($r=.71$) was large and was higher than that between reading comprehension and non-word decoding accuracy ($r=.61$; $Z=5.34$, $p<.001$), but it was lower than the correlation between reading comprehension and word decoding accuracy ($r=.78$) and decoding fluency ($r=.79$) ($Z=-5.92$, $p<.001$ and $Z=-5.98$, $p<.001$, respectively).

Table 2 Number of studies, summary effects, number of participants and confidence intervals for studies on readers of English and more transparent alphabetic orthographies with 1–2 or 3–5 years of schooling

	Number of studies	$\bar{r}$	Number	95%CI
English [a]				
Years 1–2[b]				
RC-A NW	2	.83	277	.79–.87
RC-A W	3	.80	179	.75–.86
RC-L	4	.38	402	.29–.46
Years 3–5				
RC-A NW	11	.61	1,251	.57–.64
RC-A W	12	.78	2,489	.76–.79
RC-F	5	.79	1,575	.77–.81
RC-L	18	.71	3,199	.69–.73
Transparent orthographies [a]				
Years 1–2				
RC-A	6	.36	1,290	.31-.41
RC-F	5	.60	456	.54-.66
RC-L	7	.50	1,380	.46-.55
Years 3-5				
RC-A	5	.45	1,038	.40–.50
RC-F	6	.48	635	.42–.54
RC-L	6	.68	1,402	.66–.71

$\bar{r}$ summary effect, *Number* summation of the sample size of the studies considered to calculate the summary effect for the different relations, *RC* reading comprehension, *A NW* decoding accuracy non-words, *A W* decoding accuracy words, *F* decoding fluency, *L* linguistic comprehension, *A* decoding accuracy

[a] Range of years of schooling for English studies and studies on more transparent alphabetic orthographies was 2–5 and 1–5 years, respectively

[b] There was only one English study reporting a correlation between reading comprehension and decoding fluency for children with 1–2 years of schooling (Kendeou, Savage and van den Broek 2009); therefore, this study was excluded

This pattern of different strengths for the relations between reading comprehension and alternate measures of decoding was also found when we compared beginner readers (1–2 years of schooling) with those who had received more reading instruction (3–5 years of schooling). When non-word accuracy was used as the decoding term, its relation with reading comprehension was stronger in young beginner readers than those with several years of reading instruction ($Z=7.18$, $p<.001$). In contrast, no group differences in the strength of the relation between reading comprehension and decoding were apparent when other measures of decoding were considered ($p>.05$). In line with the predictions of the SVR, the relation between reading and linguistic comprehension was stronger for children with more years of schooling than beginner readers ($Z=9.17$, $p<.001$).

Transparent orthographies A different pattern of relations to the one described above, emerged for readers of more transparent orthographies, one which that does not support a strong version of the SVR. For children with 1 to 2 years of schooling, the summary effect for the correlation between reading comprehension and linguistic comprehension was medium to large. It was substantially greater than the correlation between reading comprehension and decoding accuracy (Z=4.45, p<.001) and lower than the correlation between reading comprehension and decoding fluency (Z=−2.65, p<.01). Thus, for readers of a transparent orthography, linguistic comprehension exerts a considerable influence on reading comprehension from the very early stages of reading development, at least when decoding accuracy is considered. The pattern of data for the children with more years of reading instruction was, however, in line with the predictions of the SVR. The correlations between reading comprehension and the decoding term were significantly smaller in magnitude than the correlation between reading comprehension and linguistic comprehension (Z=−8.40, p<.001, for accuracy; Z=−6.39, p<.001, for fluency).

Turning to the comparisons between children with 1–2 and 3–5 years of schooling, the SVR was broadly supported. The relation between reading comprehension and decoding fluency was lower for the children with more years of reading instruction (Z=−2.76, p<.01) and the relation between reading and linguistic comprehension was higher for this group (Z=7.37, p<.001). Somewhat surprisingly, when decoding was evaluated by accuracy, the relation between reading comprehension and decoding was stronger for those with more years of reading instruction than for beginner readers (Z=2.58, p<.01). The latter result is largely influenced by the inclusion of a study (Marx, and Jungmann 2000), in which the correlation between reading comprehension and decoding did not differ from 0 in children with 1–2 years of schooling.

Comparisons across orthography group The strengths of the correlations between reading comprehension and decoding (using different measures) and also reading comprehension and linguistic comprehension were compared between the two types of orthography (English vs transparent orthographies), for each schooling group. The findings indicate that linguistic comprehension is an important predictor of reading comprehension during the first years of schooling for readers of transparent orthographies, whereas decoding influences reading comprehension more strongly and for a longer period of development in English readers than in readers of more transparent orthographies. For readers with 1–2 years of schooling, the correlation between reading and linguistic comprehension was higher for readers of transparent orthographies (Z=2.63, p<.01). For children with 3–5 years of schooling, the relation between reading comprehension and linguistic comprehension in the two orthography samples did not differ (p>.05). Further, for both schooling groups, the correlations between reading comprehension and measures of decoding were significantly higher for the readers of English than for others (all Z>3.81, all p<.001).

Do the relations between decoding and reading comprehension depend on the way that decoding is measured, and does this differ for orthographies that vary in transparency and across years of schooling?

English For young beginner readers with 1–2 years of schooling, the decoding component exerted a large influence on reading comprehension. The correlation between reading comprehension and decoding measured by accuracy for either non-words or words was large (r about .80) and the two correlations had a similar magnitude and did not differ from each other (p>.05). However, for English readers with 3–5 years of reading instruction, the measures of decoding ability that exerted the largest influence on reading comprehension involved real words rather than non-words. The correlations between reading comprehension and both word decoding accuracy and fluency were similar in magnitude and did not differ (p>.05). Importantly, these were significantly larger than that between reading comprehension and non-word decoding accuracy (Z=9.70, p<.001, comparison with word decoding accuracy; Z=9.56, p<.001, comparison with decoding fluency).

Transparent orthographies For children learning to read transparent orthographies with 1–2 years of schooling, decoding defined as fluency was a more powerful predictor of reading comprehension than decoding accuracy. The correlation between reading comprehension and decoding accuracy was medium and significantly smaller than the correlation between reading comprehension and decoding fluency (Z=5.79, p<.001). In the group with more years of schooling, the correlations between reading comprehension and decoding accuracy and fluency were moderate and did not differ (p>.05).

Meta-Analysis for Chronological Age

We conducted a similar set of analyses to those described above, this time using chronological age, rather than years of schooling, as a grouping variable. Data for studies on children aged between 6 to 7 years were compared with data from children aged between 8 to 11 years. A summary of these comparisons is provided in Table 3. Here, we focus on the findings that differ from the previous analyses, which used years of schooling as a variable.

Is the developmental pattern of the strength of the relations between decoding and reading comprehension, and also linguistic comprehension and reading comprehension, different for readers of different alphabetic orthographies?

English The predictions of the SVR were partly supported. For the younger children, the strength of the relations between the decoding measures and reading comprehension were all higher than the relation between reading and linguistic comprehension (Z=7.49 to 15.57, p<.001). In contrast, for the older children, reading and linguistic comprehension were significantly more strongly related than reading comprehension and either word decoding fluency or non-word decoding accuracy (Z=1.98 and 6.37, p<.05).

The comparisons between the younger group (6- to 7-year-olds) and the older group (8- to 11-year-olds) differ from those reported in the analysis based on years of schooling. Here, the correlations between all three decoding measures and reading comprehension were lower in the older than in the younger group (Zs ranged from −7.50 to −11.97, p<.001). Thus, this analysis supports the SVR.

Transparent orthographies For the younger children, decoding accuracy was only weakly related to reading comprehension, whereas decoding fluency was strongly related to reading comprehension. Thus, like in the analysis for years of schooling, the latter correlation was higher than that between reading and linguistic comprehension (Z=4.24, p<.001). For the older children, reading comprehension and linguistic comprehension were more strongly related than reading comprehension and either of the two decoding measures (Z=7.95 for accuracy and 6.07 for fluency, p<.001).

Comparisons across orthography group Similar to the meta-analysis for years of schooling, decoding (evaluated using the different measures) was more strongly correlated with

Table 3 Number of studies, summary effects, number of participants and confidence intervals for studies on readers of English and more transparent alphabetic orthographies aged 6–7 and 8–11 years

	Number of studies	$\bar{r}$	Number	95% CI
English [a]				
6–7 years				
RC-A NW	3	.79	646	.76–.82
RC-A W	7	.84	1,192	.82–.85
RC-F	2	.89	707	.88–.91
RC-L	8	.62	1,719	.60–.65
8–11 years				
RC-A NW	10	.57	882	.52–.61
RC-A W	10	.73	1,476	.70–.75
RC-F	5	.68	971	.65–.71
RC-L	15	.72	1,882	.69–.74
Transparent Orthographies [a]				
6–7 years				
RC-A	6	.30	930	.24–.36
RC-F	4	.63	386	.57–.69
RC-L	6	.45	950	.42–.54
8–11 years				
RC-A	5	.47	1,398	.42–.51
RC-F	6	.48	702	.42–.54
RC-L	7	.66	1,832	.64–.69

$\bar{r}$ summary effect; *Number* summation of the sample size of the studies considered to calculate the summary effect for the different relations; *RC* reading comprehension; *A NW* decoding accuracy non-words; *A W* decoding accuracy words; *F* decoding fluency; *L* linguistic comprehension; *A* decoding accuracy

[a] Age range for English studies and for studies on more transparent orthographies 6–11 and 6–10, respectively

reading comprehension in both age groups of English-speaking children than in readers of more transparent orthographies (all $Z>2.46$, $p<.01$). However, contrary to the findings from the meta-analysis for years of schooling, the relation between reading and linguistic comprehension was higher for English-speaking children than for children speaking more transparent orthographies in both age groups ($Z>3.50$, $p<.001$).

Do the relations between decoding and reading comprehension depend on the way that decoding is measured, and does this differ for orthographies that vary in transparency and across age?

English For both age groups, measures of decoding ability that exerted the largest influence on reading comprehension involved real words as stimuli. The correlations between reading comprehension and word decoding accuracy were higher than those between reading comprehension and non-word decoding accuracy ($Z=3.06$ and $Z=6.60$, $p<.001$, for the younger and older groups, respectively). Similarly, the correlations between reading comprehension and decoding fluency were higher than those between reading comprehension and non-word decoding accuracy ($Z=5.85$ and 3.90, $p<.001$, for the younger and older groups, respectively). Reading comprehension and word decoding accuracy were more strongly related than reading comprehension and decoding fluency in the older age group (Z=2.4, p<.05), whereas the reverse is true in the younger group (Z=4.22, p<.001). These findings do not support the measure of decoding advocated by Gough and colleagues. Instead, these findings suggest that word decoding is the best predictor of reading comprehension, regardless of chronological age.

Transparent orthographies The results were similar to those obtained in the analysis for years of schooling and support the view that decoding fluency plays an important role early on in reading development. In the younger sample, decoding fluency was more strongly related to reading comprehension than was decoding accuracy (Z=7.11, p<.001). For the older children, the correlations between reading comprehension and these two measures of decoding did not differ (p>.05).

Discussion

Our aim was to determine whether the SVR (Gough and Tunmer 1986; Hoover and Gough 1990), which has been tested primarily on English readers, is valid and applicable for beginner readers of transparent (non-English) alphabetic orthographies. Our meta-analytic approach revealed evidence of a different pattern of relations between reading comprehension, linguistic comprehension, and decoding during the course of early reading development for readers of different types of alphabetic orthographies. Furthermore, we found key differences in the relations between different measures of decoding and reading comprehension between English and other types of alphabetic orthography. These outcomes have important implications for reading instruction and the diagnosis of reading difficulties, as well as our theoretical understanding of how component skills influence reading comprehension level at different stages in development.

Our main research question concerned the developmental pattern of the relations between reading comprehension, decoding, and linguistic comprehension. When we compared beginner readers with more advanced readers, based on the years of reading instruction, we found that the relative influence of decoding and linguistic comprehension on reading comprehension is influenced by the transparency of the orthography of the language that has to be mastered. For readers of English, decoding was more influential than linguistic comprehension in the early stages of reading and, when assessed with real words, remained a strong influence even for readers with 3 to 5 years of instruction. This result is consistent with previous evidence showing that the development of skills that support word reading progress at a slower rate in a language with a deep orthography like English than in more shallow orthographies (e.g., Ellis *et al.* 2004). Thus, for English, reading instruction should focus on the acquisition of new (irregular) words as well as fluency, in addition to grapheme–phoneme correspondences.

Our analysis revealed that linguistic comprehension was an important predictor of reading comprehension for readers of transparent orthographies: it had greater influence on reading comprehension than did decoding even for beginner readers (those with 1–2 years of instruction). That conclusion, however, is qualified by the measure used to evaluate the decoding term: linguistic comprehension was a stronger predictor of reading comprehension than was decoding accuracy, but it was not stronger than a measure of decoding fluency. This result is in line with evidence that decoding accuracy is acquired at a fast rate by readers of shallow orthographies (Ellis *et al.* 2004), and, as a consequence, greater cognitive resources are available for higher comprehension processes. In contrast, the predictions of the SVR were upheld for readers of English: in the early stages of reading development, linguisitic comprehension is only moderately predictive of reading comprehension. These findings suggest that an assessment of linguistic comprehension in young readers of a transparent orthography would provide a more reasonable estimate of reading comprehension skills than it would for readers of deep orthographies.

The study presented here was an exploratory meta-analysis, which strongly identified the need for more extensive future work. Because of the paucity of suitable studies conducted in languages other than English, we were not able to conduct a more fine-grained analysis by age or years of instruction. Such an analysis may show a marked change in the pattern of relations between readers in their first and second year of reading instruction, because of the fast rate of acquisition of word reading skills in transparent orthographies. Clearly additional data on the relations between these variables during the very initial stages of reading is needed.

One reason for the small number of studies is that we chose only to include peer-reviewed articles, mainly published in English-language journals, which has been referred to the ‘file-drawer problem’ (see Borenstein *et al*. 2009, pp. 277): studies that find lower or nonsignificant relations between these variables are less likely to be published. Thus, there is the possibility that the effect sizes might be reduced with a more extensive database. However, the alternative to our approach—to adopt broader criteria might result in the inclusion of some poorly designed studies—may influence the validity of our findings. We recommend that future research on this topic adopts methods such as the one adopted in a recent meta-analysis of Su and Reeve (2011) and reports separate analyses of studies that fit lenient criteria and, additionally, analyses of a smaller sample of studies that meet strict inclusion criteria.

Accurate models of reading development inform reading instruction. Previous research has already recognized that the two broad components of the SVR are based on different and partially independent skills, knowledge and processes (e.g., Kirby and Savage 2008; Oakhill *et al*. 2003; Stuart *et al*. 2008). Our findings suggest that for readers of more transparent orthographies, instruction to support the development of text comprehension ability can include both oral and written text, because decoding is acquired in the very earliest stages of reading development in this group. In contrast, English readers clearly require instruction that includes orally presented written texts to ensure practice with the language and text structures that are common in written text, but not conversation (Cunningham and Stanovich 1998).

Our second research question addressed the relations between different measures of decoding and reading comprehension for readers of different alphabetic orthographies. In general, decoding had a greater influence on reading comprehension for readers of English than for readers of other languages: the summary effect sizes between these variables were substantially larger for English. For beginner readers of English, decoding accuracy of real words was, in most cases, more predictive of reading comprehension than non-word decoding. The exception was the analysis by years of schooling, where the summary effects were comparable for readers with 1–2 years of instruction. Thus, contrary to the suggestion of Gough and Tunmer (1986) that non-word decoding is the most appropriate measure of the decoding component, real word decoding appears to be particularly influential for languages such as English, with a deep orthography. We discuss the implications for theory and practice later.

For readers of transparent orthographies, decoding fluency was more strongly predictive of reading comprehension than measures of decoding accuracy, particularly for younger readers and those with fewer years of reading instruction. In shallow orthographies, where the correspondences between graphemes and phonemes are regular and highly predictable, accurate reading of words is easy acquired, often by end of the first grade (e.g., Ellis *et al.* 2004). Thus, it is perhaps not surprising that the critical determinant of early reading comprehension in these orthographies appears to be word decoding fluency. At higher grades, when decoding skill has been mastered, the influence of fluency and accuracy on reading comprehension is comparable.

However, decoding fluency was a good predictor of reading comprehension level for both orthography groups. A review of research on word reading fluency and reading comprehension by Paris and colleagues (Paris *et al.* 2005) found that although low levels of word reading fluency are positively correlated with low levels of reading comprehension, the data demonstrate that fluent word reading will not ensure good reading comprehension. Nevertheless, it is recognized that skilled word reading involves both rapid and automatic orthographic recognition of words (e.g., Castles and Nation 2006; Ehri 2005). Thus, measures of decoding need to capture the extent to which the young reader has developed fluency, whatever the language of instruction. This has important implications for the assessment of word reading in English.

A surprising finding was that the relation between accuracy and reading comprehension increased with grade level or chronological age for readers of transparent orthographies. As noted earlier, this result is influenced by the inclusion of a large study by Marx and Jungmann (2000), in which the correlation between reading comprehension and decoding was not different from 0. When this study was excluded, the relation between decoding accuracy and reading comprehension in the two groups of readers (grouped either by chronological age or years of schooling) was not statistically different. This highlights the need for further studies of reading development in transparent orthographies to enable a robust test of the SVR.

The SVR is a useful model of reading for educators and researchers. Our findings challenge the validity of the SVR for all readers as far as the relative contribution of the different components and their measurement in different orthographies is concerned. Our interpretation of these findings is that models of reading development may be misleading if tested predominantly on a single language, such as English, which has less predictable grapheme–phoneme correspondences than other alphabetic orthographies. We suggest that the decoding component of the SVR should be refined in line with the transparency of the orthography that has to be mastered. This will enable the construction of more accurate models of reading development that offer a better approximation to language-general, as well as language-specific, changes in development.

The SVR has been used as a framework for the study of reading difficulties (Nation and Norbury 2005) and this line of research has provided evidence for the (partial) independence of the two components, decoding and comprehension. We see this in children with Dyslexia, and those with Hyperlexia and poor reading comprehension, where the skills that support decoding and linguistic comprehension have not developed in tandem (e.g., Cain *et al.* 2000; Catts *et al.* 2003; Nation and Snowling 1998). We did not directly evaluate the adequacy of the SVR for the diagnosis of literacy difficulties, but our analysis has implications on this issue.

In the diagnosis of dyslexia, measures of decoding tend to focus on phonological skills, because these are a fundamental determinant of word reading difficulties (Vellutino, *et al.* 2004). Work by Wimmer (1993) on German dyslexics, who are learning to read in a fairly regular orthography shows that fluency or speed, rather than accuracy, is a marker of poor decoding skills. In contrast, English dyslexic readers typically are poor on measures of accuracy, as well as fluency (Snowling 2000). When we consider children with poor reading comprehension, there is no clear consensus on whether real word reading or non-word reading should be used as the measure of decoding (compare Cain *et al*. 2000, and Nation and Snowling 1999). According to the analysis presented here, real word decoding accuracy exerts a substantial influence on reading comprehension during (at least) the first 5 years of reading instruction in readers of English. For readers of both English and transparent orthographies, measures of decoding fluency were also good predictors of reading comprehension level. Thus, the measure of decoding (real words vs non-words) as well as the nature of the assessment (accuracy vs fluency) can influence the accuracy with which a specific reading difficulty is identified in different languages and also has implications for both intra- and cross-linguistic research comparisons.

This exploratory meta-analysis has indicated points that should inform future research, on which we expand here. First, we found few studies of readers learning to read transparent alphabetic orthographies. A more fine-grained analysis of different orthographies, compared to the gross ‘English’ vs ‘others’ distinction used here, would provide a more precise account of how the orthography influences reading comprehension development. Second, future research on reading development in all languages should include more than a single measure of decoding. Our analysis suggests that for studies of English, measures of decoding accuracy and fluency are particularly important, whereas fluency is the more appropriate measure in transparent orthographies. Third, years of instruction should be considered when making cross-linguistic comparisons of a skill that is taught. We sometimes found different patterns of results when we grouped children by chronological age compared with years of schooling. It is crucial that researchers report both age and information about the schooling system, to enable appropriate cross-linguistic comparisons in which the effect of both maturational and experiential factors on the relations between reading comprehension, decoding and linguistic comprehension can be taken into account.

We did not consider the analysis of different measures used for evaluation of reading and linguistic comprehension skills in our meta-analysis. There is strong evidence that the way that comprehension is assessed will influence the evaluation of the SVR: some measures of reading comprehension are more dependent on decoding skills than others (e.g., Cutting and Scarborough 2006; Keenan *et al*. 2008) or tap different aspects of language comprehension (Cain and Oakhill 2006). Hoover and Gough (1990) stated that parallel materials tapping comprehension at the discourse-level should be used to assess linguistic and reading comprehension; however, our review of the literature indicated that often reading and linguistic comprehension were assessed at different levels (word- or/and sentence- or/and discourse-level).

Our review also revealed that not all research on reading comprehension development includes an early assessment of discourse-level language skills (e.g., Muter *et al*. 2004, see de Jong and van der Leij 2002, for a discussion on the implications for interpretation on the inclusion of the autoregressor). It is critical that our theoretically driven research into the determinants of reading comprehension includes appropriate assessments of linguistic comprehension—i.e., different aspects of oral language skills—to fully understand what determines reading comprehension. In studies that have included early measures of reading comprehension, understanding of written and spoken discourse is a critical determinant of later reading comprehension level over and above decoding and word comprehension (de Jong and van der Leij 2002; Oakhill and Cain 2011). Thus, although the SVR has been used, quite rightly, to support good teaching practice for word reading, it does not follow that higher-level comprehension skills are not also important.

Our analysis broadly supports the SVR, demonstrating the importance of both decoding and linguistic comprehension in the determination of early reading comprehension across a range of alphabetic orthographies. However, reading comprehension instruction and the diagnosis of reading comprehension difficulties can be effective only if derived from an accurate evidence base. Our review suggests that this evidence base will be compromised, if researchers adopt a ‘one size fits all’ approach to the assessment of the decoding. To understand reading comprehension development across languages, we require decoding measures that are sensitive to the properties of the specific language’s orthography so that we can accurately assess the influence of linguistic comprehension in the development of reading ability.

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