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The simple view of reading and its broad types of reading difficulties

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Abstract

Common depictions of the simple view of reading (SVR), in both research and practice, describe reading comprehension difficulties by using the dichotomous variables of "poor" and "good" for each of its three constructs. But these fail to accurately capture the role the product of the two subcomponents of word recognition and language comprehension plays in defining such difficulties. When the skills in both subcomponents are "good," most depictions show reading comprehension as "good" – but this is not what the SVR holds. This can lead users of the SVR to both overlook the great variation in reading comprehension skills that are possible within each of the SVR's defined reading difficulty types as well as misunderstand that reading comprehension may still suffer even when both word recognition and language comprehension do not. This article first reviews the SVR and its main predictions, followed by an overview of the evidence bearing on these. The article then describes how reading comprehension difficulties are defined under the SVR, presenting graphics that employ continuous variables that accurately reflect these definitions. The article concludes with a discussion of classification studies that have investigated SVR-defined reading difficulties and their findings of cases of good skills in word recognition and language comprehension coupled with poor reading comprehension. The article argues that these can be interpreted as consistent with the SVR rather than counter to it.

Keywords Dyslexia · Hyperlexia · Reading assessment · Reading components · Reading difficulties · Reading disabilities · Simple view of reading · Specific comprehension difficulty · Specific language difficulty

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Introduction

Many have described the simple view of reading (SVR) using both text and graphic, but many of the depictions used fail to accurately portray the SVR and its characterization of the broad types of reading difficulties (e.g., Breadmore, Vardy, Cunningham, Kwok, & Carroll, 2019; Hoover & Tunmer, 2020; Kilpatrick, 2015; Miller, Cutting, & McCardle, 2013; Spencer et al., 2019). Most troublesome are the misrepresentations that appear in the most common (and likely most memorable) graphics used, those employing dichotomous variables within a two-by-two matrix crossing word recognition and language comprehension. The resulting misrepresentations of reading difficulties stem from the focus on the two subcomponent abilities without depicting the role their product plays in defining such difficulties. Along with failing to represent the wide variations of reading component skills that are possible within each type of difficulty, this also leads to the incorrect interpretation that those who are "good" in both word recognition and language comprehension should also be "good" in reading comprehension (e.g., see just this claim recently made in Duke & Cartwright, 2021, as well as the response to it by Hoover & Tunmer, 2022). This article clarifies the SVR on this point and provides graphic representations that accurately capture its five distinct reading groups, one representing no reading comprehension difficulties and four representing poor reading comprehension. These graphics also depict the entire span of theoretical variation in the reading components represented in each of these five reading groups. Further, they show why it is not inconsistent within the SVR to have cases of above average skill in both of its two subcomponents but not in reading comprehension. Several studies that have found such outcomes are discussed in this article. To set the groundwork, a somewhat detailed overview of the SVR, along with its predictions and the evidence addressing them, is first presented.

Overview of the SVR

The simplicity of the SVR is that it holds that reading rests on just two cognitive capacities, language comprehension and word recognition, both of which are required (and nothing more) for successful reading comprehension (Gough & Tunmer, 1986; Hoover & Gough, 1990). In short it states that the ability to derive meaning from printed text depends on the combined abilities to understand the language in which the text is written and to identify the written words of that language. But to better understand the SVR, a more precisely defined set of terms is needed (the ones below are taken from Hoover & Tunmer, 2022):

- Reading comprehension is the ability to extract and construct literal and inferred meaning from linguistic discourse represented in print.
- Language comprehension is the ability to extract and construct literal and inferred meaning from linguistic discourse represented in speech.

- Word recognition is the ability to recognize printed words accurately and quickly to efficiently gain access to the appropriate word meanings contained in the internal mental lexicon.

There are two key aspects to these definitions. The first is that reading comprehension and language comprehension are broad, linguistic capacities defined in parallel fashion, and the second is that word recognition entails an outcome that is achieved both accurately and quickly. The reason for the parallel definitions of comprehension is that the SVR holds that language comprehension and reading comprehension are essentially the same save that one is achieved through speech and the other through print. But beyond this conceptual clarity for understanding comprehension, parallel definitions of language comprehension and reading comprehension become important when either assessing the adequacy of the SVR or using it to understand individual reading capacities.[1] To take an example, while keeping the key contrast of mode of input (speech versus print), if language comprehension is measured by having one provide definitions of dictated vocabulary words, but reading comprehension is assessed by retelling read passages of text, then the contrast is neither broadly based nor parallel as the former only represents a subset of the cognitive capacities required for the latter. Similarly, assessing language comprehension based on listening to narrative passages but reading comprehension based on reading expository ones also reflects a faulty assessment strategy given the many differences between narrative and expository material. Neither of these circumstances would be helpful in evaluating the SVR as a model of reading or in understanding what lies behind an individual's reading ability. But it must be recognized that while researchers should strive for parallel assessments, achieving them can be difficult (e.g., presentation pace is more easily controlled in print than in speech, which can influence student success).

Regarding the second key aspect of the definitions given above, the reason word recognition must be accurate is that the incorrect identification of any word can yield widely divergent sentence meanings (e.g., *hot* misidentified as *not* in the sentences *John was hot on the boat* compared with *John was not on the boat*). The reason word recognition must be completed quickly is because if it is not, then the limitations of working memory and overall cognitive capacity come into adverse play. The time constraint on working memory impacts understanding sentences as what was initially read may well be forgotten before it can be fully integrated with the understanding that must come from what remains to be read. Thus, slowly recognizing each word encountered (e.g., by sounding each one out or by guessing based on still-developing understanding) will not likely result in successful comprehension even

[1] The importance of employing parallel assessments in evaluating the SVR has been repeatedly emphasized by the researchers who conducted its seminal work (Gough & Tunmer, 1986; Hoover & Gough 1990; Hoover & Tunmer, 2018, 2020, 2022). Its importance has also been discussed by Kim (2020), but under the name of equivalent assessments. While the notion of parallel assessments is important conceptually, there is the empirical question of whether select non-parallel assessments might nonetheless tap a broad, largely overlapping set of linguistic skills given strong correlations that might be found between them (Lonigan, Burgess, & Schatschneider, 2018).

if all the words are finally correctly identified. In addition, cognitive resources (e.g., those used in deriving meaning from the words encountered thus far) in general are limited, and the more such resources are consumed by efforts in identifying words the fewer will be available to focus on building comprehension (Perfetti, 2007).

All three of the SVR components[2] are hypothetical constructs – abstract, unobservable, theoretical entities. While language comprehension and listening comprehension can be (and have been) used as labels representing the same construct, the former, when used here, refers to the more general hypothetical construct – linguistic competence – while the later refers to a particular way in which this construct exhibits itself and as a mechanism for its measurement.

Relationships between the SVR components

Given the above definitions, the SVR proposes that both word recognition (*WR*) and language comprehension (*LC*) are necessary, and thus, of equal importance, for reading comprehension (*RC*). This fundamental idea is represented in the simple equation, $RC = WR \times LC$, where *RC*, *WR*, and *LC* range in value, under a theoretical perspective, from 0 (no skill) to 1 (perfect skill).[3] This equation captures the idea that skill in both *WR* and *LC* are needed for success in *RC*, for when considering their extreme values:

- if word recognition skill is perfect but language comprehension skill is absent, reading will not be possible (i.e., if $WR = 1$ and $LC = 0$, then $RC = 1 \times 0 = 0$);
- if the opposite pattern occurs, where word recognition skill is absent, but language comprehension skill is perfect, reading again will not be possible (i.e., if $WR = 0$ and $LC = 1$, then $RC = 0 \times 1 = 0$);
- if both word recognition and language comprehension are absent, then reading will not be possible (i.e., if $WR = 0$ and $LC = 0$, then $RC = 0 \times 0 = 0$); but
- if both word recognition and language comprehension are perfect, then reading will be perfect (i.e., if $WR = 1$ and $LC = 1$, then $RC = 1 \times 1 = 1$).

[2] In describing the SVR constructs in this paper, the term *component* is used when discussing aspects that apply to any of its three constructs, while the term *subcomponent* is used when specifically discussing aspects limited to the two underlying constructs of word recognition and language comprehension.

[3] In their article focused on identifying reading difficulties, Gough and Tunmer (1986) presented the original formulation of the SVR as $R = D \times C$, using the terms *reading* (*R*), *decoding* (*D*), and *comprehension* (*C*). The definitions of these terms were clarified in Hoover and Gough (1990) to emphasize that (1) reading comprehension and language comprehension represented the same comprehension capacity differing only in whether it was accessed through print or speech, thus requiring parallel materials and tasks in their assessments; and (2) decoding was better thought of as word recognition, an efficient capacity not limited to linking orthography to meaning via phonology but also to directly connecting orthography to meaning. This made explicit the claim that the SVR was a general account of reading ability, one that applied regardless of the process used for recognizing print, save that speed and accuracy were necessary requirements. The labels for the three SVR constructs were not changed with these clarifications, thus maintaining the elegance of the original single-letter expressions as well as the prominence alphabetic coding skills played in identifying early reading difficulties and their necessity in gaining automaticity in word recognition.

Stated succinctly, the ability to construct linguistically based meaning from text will be impaired for anyone who has difficulty recognizing the words of the text or understanding the language being read, or both. Stated another way, wherever there is high skill in word recognition and language comprehension, there will be high skill in reading; otherwise, there will be some level of reading difficulty or disability.

As shown in the equation, the subcomponents are combined *multiplicatively* and not *additively*. This precisely captures the notion that the two subcomponents are individually *necessary but not sufficient* for reading, explicitly denying the additive claim that development in either one of these subcomponents *alone* could be sufficient for some development in reading comprehension. In the multiplicative notion, no matter the skill level in one subcomponent, reading will not be possible without (at least some) skill in the other subcomponent.

Allowing the parameters of each SVR construct to run from nullity to perfection greatly aids understanding reading across the many complexities contained within each component. But it is difficult to translate these into measurements used in practice. While it may seem straightforward to imagine having no skill in any one of the components, along with measures that could confirm such, perfection is more intransigent, both theoretically and empirically. What does it mean to be perfect in understanding a language, recognizing its written words, or reading its written texts, and how could one validate any such claims? Certainly, there is no single scale that could be employed across all the variations of the many properties each of these complex components exhibit. Thus, performance measures must be calibrated relative to a sample of individuals and to material characteristics associated with stages of development, grade levels, chronological age, or indices of complexity, where typical, task-specific performance (and variation) can be established. The skills represented in the components so measured would thus be assessed relative to a standard, like grade-level average. For comprehension, these would be based on materials of a certain type containing words drawn from a certain range of frequency of occurrence, lexical ambiguity, and morphological structure; sentences of certain word length, syntactic complexity, and propositional content; and subject matter representing certain levels of world knowledge. Overall, reading competence is in practice assessed against a relative standard, not an absolute one, specifying relative proficiencies in reading skills. The SVR allows understanding both these perspectives – that being a good reader in a later grade requires more skill than being a good reader in an earlier one (as the reading materials encountered are more difficult), but that reading at both grades is defined by combining the same set of cognitive skills in the same way.

Predictions of the SVR

There are four central predictions that can be drawn from the SVR based on its defined, theoretical constructs and their interrelationships. The first prediction is that word recognition and language comprehension will each make **separate subcomponent contributions** to reading comprehension. This prediction comes from the

distinct, nonoverlapping definitions of the two subcomponents and the claim that both are necessary, neither sufficient, for reading success.

The second prediction is that word recognition and language comprehension are the **sole proximal causes** of reading comprehension performance with any other cognitive constructs that might influence reading comprehension being distal ones. Thus, any impact(s) of such other factors on reading comprehension are predicted to come indirectly through relationships with the two SVR subcomponents rather than directly as additions to them. If found, the SVR does not address whether (or how strongly) such influences would impact one, the other, or both subcomponents.

The third prediction of the SVR is that beyond the contributions of the two subcomponents to reading comprehension, there will be an additional **contribution of the subcomponent product**. This reflects the claim that while both subcomponents are necessary their interaction with each other is important in determining reading comprehension beyond their individual influences. That is, the multiplicative nature of the combination of subcomponent skills predicts that the impact of one subcomponent on reading comprehension will depend on the skill level represented in the other subcomponent. This does not contradict the second prediction described above: It is not a claim that other cognitive factors are proximally connected to reading comprehension, only that the multiplicative combination of the two hypothesized sole proximal factors is.

The fourth prediction of the SVR is its delineation of **types of reading difficulties**. This prediction holds that all good readers (i.e., those with no reading difficulties) will have good skills in each of the two subcomponents (if they are sufficiently strong when combined), while all poor readers will lack such skills in one, the other, or both subcomponents. Stated in complementary fashion, there will be no good readers who lack good subcomponent skills and no poor readers who have good (and sufficiently strong when combined) subcomponent skills. The inclusion of the parenthetically *sufficiently strong when combined* emphasizes the importance of the subcomponent product, which has not typically been considered when defining reading difficulty; this will be discussed further below.

Evidence bearing on the SVR predictions

There have been many empirical investigations of the SVR, including studies focused on various grade levels and ages (pre-kindergarten to college; child to adult), levels of reading skill (novice to expert; disabled to non-disabled), levels of socio-economic status (low to high), and languages (e.g., Chinese, Dutch, English, Finnish, French, Korean, Norwegian, Spanish). In this brief overview of evidence surrounding the four central SVR predictions described above, only studies of English reading are referenced to maintain a perspective from a single language. Further the studies cited constitute examples rather than exhaustive listings.

Addressing the first prediction of separate subcomponent contributions to reading comprehension, several studies have shown that the SVR subcomponents are separable skills, as they can be distinctly defined, measured, and evidenced in individuals who are good in one and poor in the other: Good word recognition but poor

language comprehension skills (e.g., Catts et al., 2003; Healy, 1982; Hoover & Gough, 1990) and poor word recognition but good language comprehension skills (e.g., Catts et al., 2003; Hoover & Gough, 1990; Hulme & Snowling, 1992; Shankweiler et al., 1999). Further, a number of studies have shown that the SVR subcomponents make separate contributions to reading comprehension skill, based on both regression analyses of singly measured constructs (e.g., Aaron et al., 1999; Catts et al., 2005; Chen & Vellutino, 1997; Cutting & Scarborough, 2006; Georgiou et al., 2009; Hoover & Gough, 1990; Joshi & Aaron, 2000; Savage, 2006; Spear-Swerling, 2004; Tunmer & Chapman, 2012) as well as latent variable modeling using combined measures for each construct (e.g., Adlof et al., 2006; Foorman & Petscher, 2018; Foorman et al., 2020; Kim, 2017; Language and Reading Research Consortium, 2015; Language and Reading Research Consortium & Chui, 2018; Lonigan et al., 2018; Sabatini et al., 2010; Vellutino et al., 2007). Several meta-analyses have also found overall support for this prediction (e.g., Garcia & Cain, 2014; Quinn & Wagner, 2018, Ripoll Salceda, Alonso, & Castilla-Earis, 2014). Across studies, the total amount of explained variance in reading comprehension by the two subcomponents widely varies, generally ranging from 50 to 90%, with the higher amounts usually associated with studies employing latent variables over single observed ones. Further, with increasing age or advancing reading ability, the contributions made by word recognition tend to decline while those by language comprehension increase (e.g., Catts et al., 2005; Gough, Hoover, & Peterson, 1996; Language and Reading Research Consortium, 2015).

Several studies have found that the two SVR subcomponents account for nearly all the variance in reading comprehension (e.g., Adlof et al., 2006; Hoover & Gough, 1990; Kim, 2017; Language and Reading Research Consortium, 2015; Language and Reading Research Consortium & Chui, 2018; Lonigan et al., 2018), leaving little that might be explained by any additional variables. This supports the idea that the two SVR subcomponents are the sole proximal causes underlying reading comprehension. But the added contribution of several variables has been explicitly tested, including rapid automatized naming (e.g., Georgiou et al., 2009; Joshi & Aaron, 2000; Language and Reading Research Consortium & Chui, 2018), phonemic awareness (e.g., Georgiou et al., 2009; Language and Reading Research Consortium & Chui, 2018), letter knowledge (Language and Reading Research Consortium & Chui, 2018), fluency (e.g., Adlof et al., 2006), vocabulary (e.g., Braze et al., 2016; Kim, 2017; Tunmer & Chapman, 2012), grammatical knowledge (e.g., Kim, 2017), background knowledge (e.g., Talwar, Teghe, & Greenberg, 2018), and executive functioning (e.g., Kim, 2017). While somewhat mixed, these studies tend to show little to no additional contribution to reading comprehension variance made relative to the two SVR subcomponents or that any found relation was mediated by either one, the other, or both subcomponents.

Studies of whether there is a distinct contribution of the subcomponent product of the two SVR proximal variables to reading comprehension have provided mixed support, with some revealing such a contribution (e.g., Hoover & Gough, 1990) while others did not (e.g., Chen & Vellutino, 1997; Georgiou et al., 2009; Savage, 2006). One of the critical issues here is whether the samples used in studies included the full range of subcomponent skill levels. With restricted ranges in samples that do

not include those with the weakest subcomponent skills, distinguishing additive and multiplicative combinations of subcomponent values is highly unlikely as both combinations predict monotonic increases in reading comprehension for non-zero subcomponent values (e.g., Hoover & Gough, 1990; Kershaw & Schatschneider, 2012).

Finally, there have been several studies of whether the SVR accurately distinguishes different types of reading difficulties based on different levels of word recognition and language comprehension skills. These generally show that poor readers have weaknesses in either word recognition, language comprehension, or both, while good readers have strengths in the two subcomponents (e.g., Hoover & Gough, 1990; Nation, 2019). The main exception has come from classification studies that have found poor reading comprehension in the presence of good word recognition and language comprehension, which is the focus of the remainder of this article.

Graphic depictions of the SVR

Figure 1 presents the SVR in a three-dimensional plot employing continuous variables. This shows the predicted levels of reading comprehension as products of different levels of word recognition and language comprehension using the theoretical skill levels that range from 0 (no skill) to 1 (perfect skill). A first point to note, which was mentioned earlier but now can be seen graphically, is that along the subcomponent axes where there is no skill in either word recognition or language comprehension (or both), there is no skill in reading comprehension. But as skill levels increase beyond these two baseline values, skill in reading comprehension also increases.

A second point from Fig. 1 is reflected in the shaded bands, which show that a given level of reading comprehension skill can come from varying combinations of levels in the two subcomponent skills. To take an example, in the band that represents theoretical reading comprehension skills ranging from 0.10 to 0.20, the skill levels of word recognition and language comprehension producing those levels of reading comprehension performance can both be below the midpoint values of 0.50 (e.g., both at 0.40, yielding a product of 0.16) or one can be above and the other below the midpoint (e.g., 0.80 for language comprehension and 0.20 for word recognition, or vice versa, with both yielding the same product of 0.16). This illustrates that knowing one's level of reading comprehension will not be definitive about the relative strengths in the underlying subcomponent skills that produced it.

A final point in Fig. 1 is that from a developmental perspective,[4] the amount of increase in reading comprehension for a given increase in one subcomponent skill is greater the higher the skill in the other subcomponent (the result of taking a fixed proportion of a proportion increasing in value). As an example, improving a hypothetical performance from 0.30 to 0.50 in word recognition when language comprehension is 0.60 results in a change in reading comprehension of 0.12 (namely, [0.50 x 0.60 = 0.30] – [0.30 x 0.60 = 0.18]). But the same hypothetical improvement in word

[4] While the SVR is a static account of reading, requiring that all three of its components be measured at the same point in time, it does have implications for understanding reading development when considering successive assessments of each of these components.

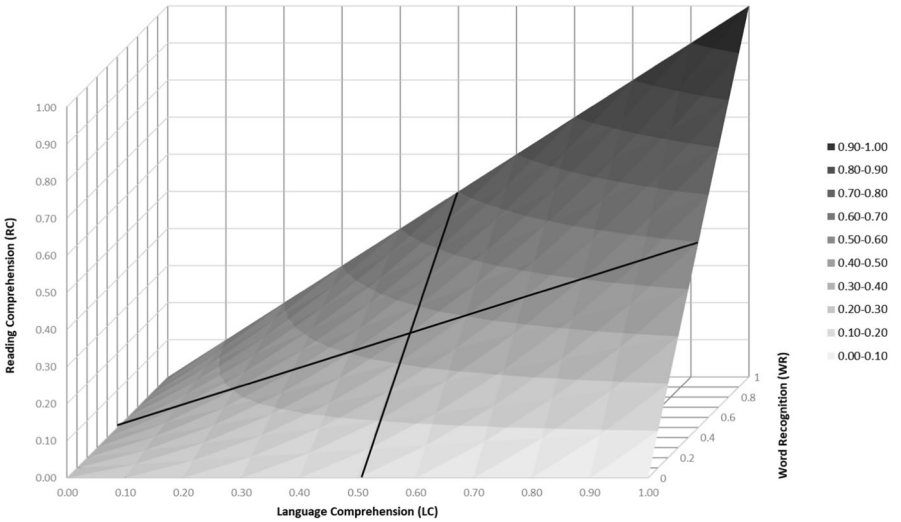

Fig. 1 The simple view of reading represented in a three-dimensional plot of construct values. *Note*: Under the simple view of reading, reading comprehension (z axis with values represented by the shaded bands at .1 intervals, darkening with increasing ability) is the product of word recognition (y axis) and language comprehension (x axis), where each variable can range in value from 0 (no skill) to 1 (perfect skill). The black lines delineate the four quadrants defined by crossing the midpoint values of the two subcomponent scales

recognition (from 0.30 to 0.50) when language comprehension is 0.80 results in a change in reading comprehension that is 0.16 (namely, [0.50 x 0.80 = 0.40] – [0.30 x 0.80 = 0.24]), which is improvement that is larger by a third. The important takeaway is that the improvement in reading comprehension associated with any improvement in one of the two subcomponent skills depends on the skill level represented in the other subcomponent. To make this point even more concretely, any individual improvement in word recognition ability will result in greater gains in reading comprehension if that individual has stronger rather than weaker language comprehension skills. Similarly, any individual improvement in language comprehension will result in greater gains in reading comprehension if that individual has stronger rather than weaker word recognition skills.

Defining types of reading difficulties in the SVR

The dependency between the two subcomponents of reading comprehension is graphically displayed in Fig. 2 to highlight the main theoretical types of reading difficulties defined under the SVR. Here the horizontal dimension is language comprehension, and the vertical dimension is word recognition. The figure only distinguishes poor and good abilities in each subcomponent, thus treating them as dichotomous variables rather than the continuous ones used in Fig. 1. As shown, good readers (i.e., those without any reading difficulties) are only held in the upper right-hand quadrant where abilities in both language comprehension and word

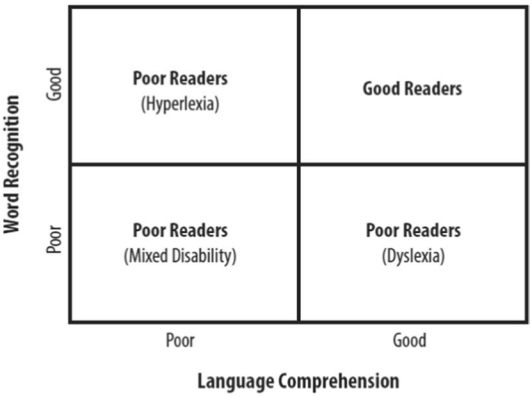

Fig. 2 The simple view of reading represented in a two-by-two matrix delineating four types of reading difficulty groups. *Note*: Under the simple view of reading, good readers are those with good abilities in both word recognition and language comprehension while poor readers are those with poor abilities in either word recognition, language comprehension, or both. *Source*: Hoover and Tunmer (2020), used by permission

recognition are good (Quadrant I),[5] while only poor readers appear in the other three quadrants (Quadrants II, III, and IV).

As shown in Fig. 2, where language comprehension is good, but word recognition is poor, there are only poor readers, these showing specific word recognition difficulties. This category includes the special case of *dyslexics* who show persistent difficulty in word recognition, presumably due to an impairment in phonological processing skills (though other factors may be in play), despite otherwise normal development and exposure to high-quality, evidence-based literacy instruction (Tunmer & Greaney, 2010). Where word recognition is good, but language comprehension is poor, there are also only poor readers. These have specific language comprehension difficulties, including the special case of *hyperlexics* who show relatively remarkable skill in word recognition but extremely poor comprehension skills in spoken (and written) language (Healy, 1982; Stothard & Hulme, 1996). Finally, where both language comprehension and word recognition are poor, there again are also only poor readers, who all show mixed difficulties or disabilities.

It is important to note that in the quadrants containing the parenthetical labels hyperlexia, mixed disability, and dyslexia, a claim is not being made that all individuals whose reading performance places them in any of these three quadrants would have these specific reading disabilities. These labels are used for special, assumed constitutional conditions that describe a small subset of those generally found in the respective quadrants. Also note that these are general categories of reading difficulty. For instance, a difficulty in language comprehension could come from problems in phonology, syntax, or semantics, or from inadequate knowledge of the world. These would all constitute specific difficulties leading to a general difficulty in language comprehension.

The depiction of the SVR in Fig. 2, and variations on it, widely appear in the reading literature. While based on the SVR, these are sometimes called the reading component or quadrant models of reading (e.g., Aaron, 1997; Catts et al., 2003;

[5] In coordinate geometry, quadrants are conventionally labeled as Quadrant I in the upper right-hand corner, then moving counterclockwise to Quadrants II, III, and IV.

Ebert & Scott, 2016; Joshi & Aaron, 2000). Some of these depictions simply show the intersecting axes of the two subcomponents without labelling the quadrants created (e.g., Castles et al., 2018; Stuart, Stainthrop, & Snowling, 2008); others label the quadrants but just with the corresponding values from the two axes (e.g., Rose, 2006). More informative ones label the quadrants with the reading comprehension outcomes they hold each represents. For Quadrant I, where skill levels are good in both subcomponents, these have included the labels *no impairment* (Catts et al., 2006), *typical reading development* (Ebert & Scott, 2016), *typical reader* (Kilpatrick, 2015), *adequate reader* (Spencer et al., 2019), *successful reader profile* (Clarke, Henderson, & Truelove, 2010), *good reading comprehenders* (Miller et al., 2013), *normal readers* (Aaron, 1989), *skilled reading* (Tunmer & Hoover, 1992), and *good readers* (Breadmore et al., 2019; Hoover & Tunmer, 2020; Silva-Maceda & Camarillo-Salazar, 2021). But the SVR is more precise than these labels suggest as it holds there are *both* good and poor readers in Quadrant I rather than just good ones.

To see this, contrast Fig. 1 using its continuous variables with the distinctions among reading skill groups made in Fig. 2 using its dichotomous variables. While both figures show the same boundaries for the three groups of poor readers defined in Quadrants II, III, and IV, Fig. 1 reveals in its bands both good (above 0.5) and poor (below 0.5) reading comprehension values in Quadrant I. The distinctions, though defined on a theoretical basis, could be helpful in practical applications as learners in each category might benefit from different instructional supports, something that would require additional research to determine. A more detailed look at the five reading groups that can be defined in Fig. 1 follows.

The first three groups are *poor readers* characterized by some level of *poor subcomponent skill*. Here all have skill levels in one or both subcomponents that fall below the 0.50 level, as was the case in the dichotomous variables of Fig. 2. This necessarily results in the products of those skills (i.e., reading comprehension) falling below that level as well:

- *Mixed disability poor readers* have multiple difficulties with both subcomponent skills falling below 0.50 levels (thus, leaving their products to range from 0.00 to 0.25).
- *Poor word readers* (often referred to as *poor decoders*) are poor readers who have word recognition difficulties, with those skills falling below the 0.50 level, but with language comprehension skills exceeding that level (and thus, their products range from 0.00 to 0.50).
- *Poor comprehenders* are poor readers who have language comprehension difficulties, with those skill levels falling below 0.50, but with word recognition skills exceeding that level (and thus, their products, as with poor word readers, also range from 0.00 to 0.50).

The boundaries of these three groups of poor readers match those given in Fig. 2, as both figures *can* define them by reference to values on the two SVR subcomponents, namely, poor levels in Fig. 2 or below scale midpoints in Fig. 1, on either word recognition, language comprehension, or both. But this does not mean that the

product is unimportant – it is simply that the upper limit value of the subcomponent as poor or below midpoint constrains the product from exceeding that same value. And, as seen in Fig. 1, the product is necessary to show the full range of reading comprehension skill that falls within each group.

The fourth group shown in Fig. 1 contains two subgroups, one of poor readers and one of good readers. Here all have skill levels in both subcomponents that fall above the 0.50 level, as was the case in the dichotomous variables of Fig. 2. But this does not entail that the products of those skills fall above that level as well:

- *Mixed but insufficient ability poor readers* have subcomponent skills above 0.50 levels, but when taken together these are not sufficiently strong to produce a product above that same level for reading comprehension (yielding values that range from 0.25 to 0.50).

For this subgroup, despite two *good* subcomponent skill levels, their products yield reading comprehension levels on par with some of the poor readers exhibiting a single *poor* subcomponent skill value (e.g., 0.60 on both subcomponents compared to 0.40 on word recognition and 0.90 on language comprehension, or vice versa, with each of these three pairs yielding reading levels at 0.36). The difference is that the poor readers in this group have relatively good skills in both subcomponents, save that when taken together they are not sufficiently strong to allow reading at a 0.50 level or above. In short, they represent those that are *skilled* in both subcomponents, a positive standing, but not *sufficiently skilled* to produce skilled reading when combined. The other subgroup is the single group of *good readers* defined by the SVR:

- *Mixed and sufficient ability readers* have subcomponent skills above 0.50 levels, and when taken together are sufficiently strong to produce a product above that same level for reading comprehension (yielding values that range from 0.50 to 1.0).

Figure 1 can be augmented to emphasize the boundary within the first quadrant that distinguished its poor readers from its good readers; this is presented as Fig. 3. In this graphic, good readers appear only above the dotted line that is the threshold for good (i.e., above 0.50) reading comprehension and poor readers appear everywhere below it.[6] The critical point here is that to be a good reader, one needs generally to be more than just "above average" in subcomponent skills. This is something that is explicitly represented in Fig. 3 but not in Fig. 2, thus allowing a mischaracterization of the SVR on this point. Overall, Fig. 3 offers a clearer depiction of the SVR, showing the specific, varied, theoretical relations between its construct values and the delineation of its general reading difficulty groups.

[6] Note that this is not a problem of where to set "good" performance levels for a component. For example, changing that level from .50 to .70 would still result in cases where subcomponents exceeded .70 but their products did not (e.g., .75 x .80 = .60).

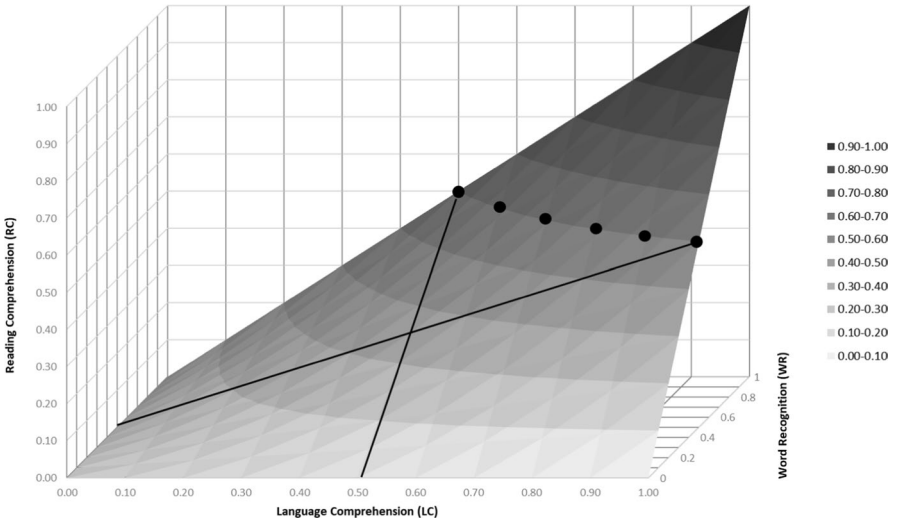

Fig. 3 The simple view of reading represented in a three-dimensional plot of construct values delineating five types of reading difficulty groups. *Note*: Under the simple view of reading, reading comprehension (z axis with values represented by the shaded bands at .1 intervals, darkening with increasing ability) is the product of word recognition (y axis) and language comprehension (x axis), where each variable can range in value from 0 (no skill) to 1 (perfect skill). The black lines delineate the four quadrants defined by crossing the midpoint values of the two subcomponent scales, and the dotted line marks the midpoint value in reading comprehension, distinguishing poor (below) and good (above). The types of reading difficulty groups by subcomponent quadrants, starting in the upper right-hand corner and moving counterclockwise, are as follow. **Good readers** — Quadrant I, upper section: Sufficient mixed abilities in both subcomponents; **Poor readers** — Quadrant I, lower section: Insufficient mixed abilities in both subcomponents; Quadrant II: Poor in language comprehension (i.e., poor comprehenders); Quadrant III: Poor in both subcomponents (i.e., poor word readers and comprehenders); Quadrant IV: Poor in word recognition (i.e., poor word readers)

Figure 2 can be modified to reflect the distinction just made between poor and good readers, and it is presented as Fig. 4. Contrasting these depictions, Fig. 4 shows that all good readers are still in the first quadrant, but now makes clear that not all in that quadrant are good readers. Again, to be a good reader, one generally needs to have very good abilities in both word recognition and language comprehension (or, at the extremes, be perfect in one and good in the other). Note that adding the "insufficient" and "sufficient" values forces a consideration of the continuous product of the two subcomponents, as these terms cannot be defined through the combination of the two dichotomous "good" skill levels of the subcomponents. Thus, while Fig. 4 is an improvement over Fig. 2, the continuous values employed in Figs. 1 and 3 provide a superior representation of the SVR over those using dichotomous values.

Note in both Figs. 3 and 4 there is no claim being made about the frequency of incidence or what is typical reading – both of these would require presentation of data on the reading performance of a definable sample of individuals and reading materials. The claim being made here is only about what is theoretically required

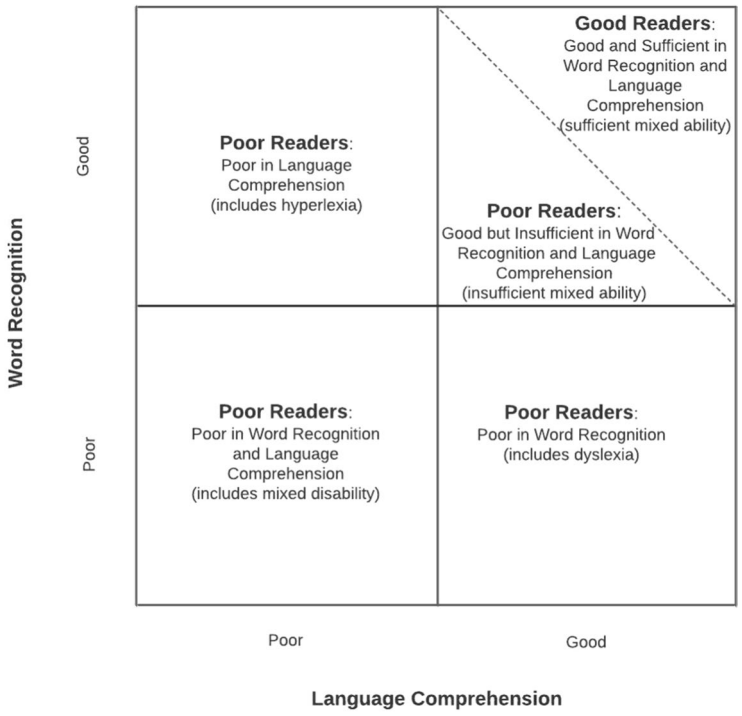

Fig. 4 The simple view of reading as represented in a two-by-two matrix delineating five types of reading difficulty groups. *Note*: Under the simple view of reading, good readers are those with good and sufficient abilities in both word recognition and language comprehension while poor readers are those lacking such abilities in either word recognition, language comprehension, or both

for reading success and when those requirements are not met, what general types of reading difficulties result.

Before proceeding, a word of caution: Do not be misled by the precision of the SVR construct values used above. These are given only to illustrate general points about relationships between SVR constructs. They function to further illuminate the SVR rather than to give precise indications of how data should be interpreted to characterize students screened under actual assessments. They are presented as if they represent true individual values, but interpretations of actual performance data must consider other factors (e.g., assessment instrument reliability and validity, sample characteristics, measurement error).

What has been addressed in this section is how the SVR defines and depicts reading difficulties; it has been a discussion focused on theory. While no new data are being presented in this article, what follows is a discussion of extant studies that bear on the SVR's account of reading difficulties, and how the results of these studies can be re-interpreted given the theoretical clarifications just presented.

Evidence Addressing the SVR's Types of Reading Difficulty

Many have used the SVR to show that those experiencing reading difficulties are not homogeneous but exhibit different types of disability. As discussed above, these broad disabilities are generally labeled dyslexia, hyperlexia (or specific comprehension difficulty), and mixed disability (or language learning disabilities), and are based on weaknesses in either word recognition, language comprehension, or both, respectively (e.g., Aaron et al., 1999; Catts et al., 2003; Ebert & Scott, 2016; Hock et al., 2009; Hoover & Gough, 1990; Morris et al., 2017; Sleeman et al., 2022). But several studies suggest that individuals can struggle with reading comprehension without showing any difficulties in word recognition and language comprehension.

The most relevant evidence bearing on this issue comes from classification studies. These studies typically begin by identifying a set of poor readers using a reading comprehension test cutoff score that ranges from 0 to 1.5 standard deviations below sample average. Once the subsample has been selected, word recognition and language comprehension skills are examined, and cutoff scores are applied to them to define good and poor subcomponent performance. The distributions of the defined groups are then analyzed to determine the degree to which the poor readers show different profiles of performance in subcomponent skills.

Several such studies, discussed further below, identify groups of poor readers that do not evidence difficulty in their word recognition or language comprehension skills. And given different dispositions toward the SVR, the explanations of these have taken two different forms. The first is that the findings are valid and disprove the SVR, either because (1) good subcomponent skills are held to yield good reading comprehension skill; or (2) there are other unmeasured proximal variables beyond word recognition and language comprehension that are contributing to poor reading performance, countering the SVR's claim of two sole proximal causes (e.g., Duke & Cartwright, 2021). The second is that the findings from these studies might be artifacts of spurious measurement or grouping protocols, and thus represent invalid assessments of the SVR (e.g., Catts et al., 2003; Hoover & Tunmer, 2022; Sleeman et al., 2022). Several possible reasons for these include: (1) the reading comprehension cutoff scores fail to accurately define poor readers, either by including some good readers or failing to include all poor readers[7]; (2) the reading comprehension assessments are imprecise, allowing individuals to be included who are not poor readers; (3) the subcomponent assessments fail to provide accurate reflections of subcomponent skills, thereby including individuals who are actually weak in these skills; and (4) the set of assessments used are misaligned across the constructs they are intended to reflect, failing to provide accurate group placements based on strong and weak components. But as argued above there is a third possible explanation, one that has not been addressed in this literature to date. It holds that at least some of the

[7] This is because, given measurement error, the less extreme the cutoff (i.e., the closer to the mean), the more likely the subsample selected will contain a greater number of good readers, and conversely, the more extreme the cutoff, the less likely the subsample will contain a more broadly representative group of poor readers.

findings are valid and represent outcomes predicted by the SVR, namely, that the products of the two SVR subcomponent skills are not sufficiently strong, resulting in the poor reading observed rather than the good reading erroneously expected. Four of the most robust of these studies are described below.[8]

Catts et al. (2003), drawing from a sample of 604 second-grade students who had evidenced some level of language impairment at kindergarten, identified 183 as poor readers based on composite reading comprehension scores that fell at least one standard deviation below the group mean. Using the same cutoff values for word recognition and language comprehension composite scores, they identified four types of poor readers: three were weak (at least one standard deviation below the mean) in either word recognition (dyslexic), language comprehension (hyperlexic), or both (which they labeled language learning disabled), while a fourth group had word recognition and language comprehension scores that fell above the cutoff points. Within this latter group of 24, which represented 13% of the poor reader sample, four had above average skills in word recognition, one had above average skills in language comprehension, none were above average in both, and 19 had below average skills in both. Catts et al., (2003, p. 160) labeled this group as "non-specified" because "its presence was not predicted by the Reading Component Model... [as]... children with relatively good word recognition and listening comprehension should not have difficulties in reading comprehension." As this was part of a larger study, the entire sample had also been tested at fourth grade with a similar set of word recognition, language comprehension, and reading comprehension assessments to those used in second grade. In comparing the progress made by the four defined groups of second-grade poor readers through fourth grade, all remained poor readers except those in the non-specified group, who all showed reading comprehension scores within the fourth-grade average range.

There are two things to note about this study. First, it is based on a subsample of poor second-grade readers drawn from a larger sample of students who were selected at kindergarten because of language difficulties. Thus, it is not indicative of the general population, but one where reading comprehension would be expected to be difficult or delayed. Second, in general, the improvement found in fourth grade by the non-specified group is consistent with the SVR in that the relative strengths and disparities between their subcomponent skills, as compared with those in the other three groups, would allow more rapid improvement to a product combination sufficient for good reading comprehension.

In a similar study, Hock et al. (2009) looked at 202 struggling adolescent readers (late eighth and early ninth grade). This study reported that while all were below cutoff points that defined poor reading comprehension (at or below the 40th percentile), 27 (13%) were above the similarly defined cutoff points for poor performance

[8] Two additional studies that are relevant in classifying poor readers based on word recognition and language comprehension skills are problematic because of the samples studied. Aaron et al. (1999) included just 16 poor readers across grades 3, 4, and 6, while Ebert and Scott (2016) had a larger sample of 112 individuals, but their ages ranged from 6 to 16 years. The small number of individuals in each grade or age category limits the generalizability of the findings from these studies and they are not further described here.

in word recognition and language comprehension. The study used composite measures of language comprehension and reading comprehension based on standardized measures that tapped sentence comprehension and vocabulary knowledge for the former, but passage comprehension for the latter. As discussed earlier, proper testing of the SVR entails that parallel measures of comprehension be used. The measures used by Hock et al. (2009) were not parallel, and it is not surprising that language comprehension based on vocabulary and sentence-level understanding might be high relative to reading comprehension based on passage comprehension (Hoover & Tunmer, 2022). But if this discrepancy is discounted, these results for adolescents are similar to those reported by Catts et al. (2003) for early-elementary grade students, and they allow a similar interpretation.

Morris et al. (2017) studied a sample of 65 fifth and sixth graders who had performed below the 50th percentile on a standardized end-of-grade (EOG) reading test the previous spring. They administered assessments of word recognition (speed and accuracy in reading short passages) and language comprehension (Peabody Picture Vocabulary Test) to each child in March of their current grade level and categorized their performance on each as either low or high. For vocabulary, they used a cutoff score of at or above the 40th percentile for high performance; for word recognition, high performance was defined as reading at a rate of at least 105 words per minute with at least 94% accuracy. From these they created four groups: High on both, high on one and low on the other, or low on both. Most students fell into the low-low category (48%), but a small percentage (14%) fell into the high-high category, reading accurately and fluently (> 124 words per minute) with average or better vocabulary; their EOG scores for that grade level (administered three months later) were below but nearing the 50th percentile. Thus, this study identified a group of late-elementary school students with indicators of average or better word recognition and language comprehension skills, but below average reading comprehension skills. As with the previous study, the tests of reading and language comprehension used were not parallel. But disregarding this limitation, the findings here are consistent with the other two studies, one based on younger students and one on older students.

Sleeman et al. (2022) looked at 209 third, four, and fifth grade students who scored below the 40th percentile on a standardized reading comprehension test. Using composite measures of word recognition and language comprehension (each based on two distinct assessments) with cutoffs set at one standard deviation below average, they identified four groups of poor readers consistent with the three studies just described, including mixed disability, dyslexia, and specific comprehension difficulty. The largest of their four groups, containing 65 children (or 31%), had above-cutoff averages in both word recognition and language comprehension skills and were labeled "unexplained poor readers" following the same reasoning used by Catts et al. (2003). Sleeman et al. (2022) next used data from ten additional assessments they had administered to predict group membership. Four of the ten measures, one each of language comprehension, decoding, reading comprehension, and phonological awareness, made significant contributions to their model, which accurately predicted 66% of the group assignments. (Two measures of rapid naming, three other measures of phonological awareness, and one other measure of decoding did not make significant contributions to the model.) Next, they took the word

recognition and language comprehension composite scores used to define the original four groups and applied a two-step cluster analysis designed to maximize within-group homogeneity and between-group heterogeneity. This analysis supported three group clusters rather than the original four, reducing the number of children assigned to the mixed disability group, increasing the numbers within both the dyslexia and specific comprehension difficulty groups, and eliminating the group of unexplained poor readers. Using data from the ten additional assessments, the same four assessments again made significant contributions to the now three-group model, which accurately predicted 74% of the three-group assignments. Finally, the cluster analysis was re-done with the stipulation that four groups be identified; an analysis of its predictive capacity through the ten additional assessments showed it accurately predicted 69% of the assignments. This represented a significant improvement over the traditional classification approach (66%) but was no different from the three-group accuracy level (74%). In sum, Sleeman et al. (2022) showed that the accuracy of classifying poor readers could be improved by using a clustering technique over the traditional approach, but that even with that improvement, there was no difference between a three-group and four-group solution. The authors argued that their findings aligned with the view of the SVR as defining three distinct types of reading difficulties.[9]

Given the earlier discussion, those in the fourth group may not be unexplained under the SVR as their above average skills may be too weak to yield above average reading comprehension products. The analyses by Sleeman et al. (2022) essentially split the unexplained poor readers they identified, adding those with relatively weaker language comprehension skills to the specific comprehension difficulty category and those with relatively poorer word recognition skills to the dyslexia category. They argue their classification supports the SVR's three poor reader group prediction, but as argued here, the SVR defines a fourth group, which is what they had initially found but were seeking to eliminate. Overall, across a large grade span, the classification studies discussed show that those identified as below average in reading comprehension have varied skills in word recognition and language comprehension. This includes a small number who have average (or near-average) skills in word recognition and language comprehension but still struggle with reading comprehension. The SVR predicts such a group because the combined products of the two subcomponents skills can be insufficient to reach above average reading comprehension skills. While this group of poor readers might justifiably be divided into those with relatively weaker skills in word recognition or language comprehension, the important question for practice is whether any provided support should be differentiated. Aaron et al. (2008) showed over a seven-year longitudinal study that when a weak subcomponent of the SVR was identified and remediated through

[9] Caution is needed in interpreting the Sleeman et al. (2022) results. While all children included in the study had scores that fell beneath the 40th percentile on a national standardized reading test, when tested on the Passage Comprehension test of the Woodcock-Johnson IV, the average score fell below the 10th percentile. Thus, this is a sample of students with very low reading comprehension skills, and it is not clear that the results would generalize to a population of poor readers who were not as challenged.

appropriate intervention, then there was significant improvement in that skill, which led to higher reading achievement. The question here is: Would those defined within the SVR as insufficient mixed ability poor readers gain more benefit from different instructional support than that offered to their "closest" match in either the poor word reader or poor comprehender group?

Conclusion

Though the SVR has been widely described, many still use depictions that misrepresent how it defines reading groups and difficulties. This article further clarifies the SVR and presents graphics that can help users better understand the SVR, the types of reading groups it delineates, and the great variability in reading comprehension skills that can be contained within each of its defined groups. It provides depictions using continuous values for the three SVR constructs, thereby improving considerations of the product of those values over ones restricted to dichotomous values. Among other advantages, this helps clarify why some classification studies *may* find students who seem to be "above average" in their skills in both word recognition and language comprehension but have reading comprehension skills comparable to those with "below average" skills in one or the other of these two subcomponents. While the discussion here of an *insufficient mixed ability* group of poor readers based in the product of word recognition and language comprehension skills provides a possible explanation, additional empirical work is needed to determine the validity of such an interpretation. Nonetheless, understanding the role the product of such abilities plays in reading comprehension should help users of the SVR better understand struggling readers.

Declarations

Conflict of interest The author has no potential conflicts of interest in carrying out this work and no outside funding was provided in support of this work.

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