Chapter One

Reading Comprehension: A Conceptual Framework from Word Meaning to Text Meaning

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Reading comprehension is widely agreed to be not one, but many things. At the least, it is agreed to entail cognitive processes that operate on many different kinds of knowledge to achieve many different kinds of reading tasks. Emerging from the apparent complexity, however, is a central idea: Comprehension occurs as the reader builds one or more mental representations of a text message (e.g., Kintsch & Rawson, 2005). Among these representations, an accurate model of the situation described by the text (Van Dijk & Kintsch, 1983) is the product of successful deep comprehension.

A COMPONENTIAL FRAMEWORK FOR COMPREHENSION

The comprehension processes that bring about these mental representations occur at multiple levels across units of language: word-level (lexical processes), sentence-level (syntactic processes), and text-level. Across these levels, processes of word identification, parsing, referential mapping, and inference all contribute, interacting with the reader's conceptual knowledge to produce a situation model of the text. Figure 1.1 represents the components of comprehension in a way that is probably more orderly than how they exist in reality. Even so, the framework is useful for providing a freeze-frame view, necessary to address issues of assessments in any way short of tools that could capture the dynamics of real-time processing.

Figure 1.1 includes two major classes of processes along with linguistic and conceptual knowledge sources. The processes involve: (1) the identification of words and (2) the engagement of language-processing mechanisms that assemble these words into messages. These processes provide contextually appropriate word meanings, parse word strings into constituents, and provide

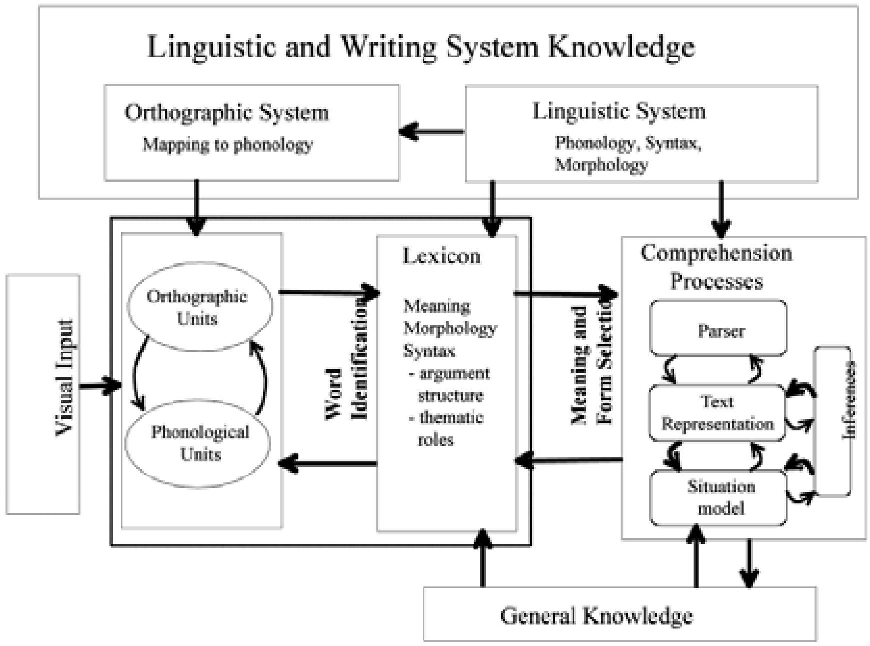

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Figure 1.1. Schematized model of comprehension components.

inferential integration of sentence information into more complete representations of extended text. These representations are critically enhanced by other knowledge sources.

SKILL IN COMPREHENSION COMPONENTS

In this framework, all the processes and component knowledge sources become points of interest for analysis and assessment of comprehension skill. In fact, the knowledge sources can be so general that comprehension can resemble general intelligence, entailing highly general processing constraints (e.g., working memory, retrieval speed) along with the use of general conceptual knowledge. But conflating comprehension with cognition carries costs to conceptual clarity. One cost is the loss of a focus for assessment. Indeed, variability of focus is the current state of affairs among published reading comprehension assessments, each of which differ in the degree to which they test word reading, background knowledge, and inference skills (Bowyer-Crane & Snowling, 2005; Coleman, Lindstrom, Nelson, Lindstrom, & Gregg, 2010;

Cutting & Scarborough, 2006; Francis, Fletcher, Catts & Tomblin, 2005; Keenan, Betjemann & Olson, 2008).

Such variability may be inevitable, given different beliefs about what comprehension is and what parts of it can be efficiently measured. However, adopting a conceptual framework for comprehension components that reflects both theory and evidence is valuable in guiding assessment. Use of the framework can make clear which components are being assessed and which are not. An assessment that makes its focal points clear is useful to test consumers (e.g., teachers, parents, and administrators) and researchers.

It is unlikely that all components are equally important for variability in overall skill, equally independent, and equally measurable with conventional assessments. Each of these three considerations (skill-related variability, independence, and measurability) constitutes a reasonable criterion for nominating a component for assessment.

In this context, the first criterion, skill-related variability, is important in identifying "pressure points" in the comprehension system. A pressure point must have face validity as an intrinsic component of comprehension, as opposed to being only a correlate. It should also pass an additional test: showing robust variation among individuals that is associated with overall comprehension skill. Lastly, test consumers are often interested in tests that can identify targets for instruction and intervention; thus, all other things being equal, components that represent malleable targets for intervention would have priority over other components that might not be malleable targets.

In the following discussion, we briefly review some of the components that have attracted research on individual differences and thus may be pressure points that make a difference in overall comprehension skill. If so, they meet one of the main criteria for inclusion in comprehension assessments.

Word Identification

We begin with the lower-level components in the left-center part of the framework diagram in Figure 1.1. Word identification is a critical first component of reading comprehension. Substantial correlations between word reading ability and comprehension are observable widely across age ranges, even into adulthood (Adlof, Catts, & Little, 2006; Bell & Perfetti, 1994; Braze, Tabor, Shankweiler, & Mencl, 2007; Perfetti, 1985; Sabatini, 2002; Sabatini, 2003). But while any single component, including word identification skill, may be necessary, it may not be sufficient by itself for comprehension. Some components may not even be necessary for shallow levels of comprehension.

Until recently, the bulk of research investigating sources of reading difficulties focused solely on word reading. However, in recent years, it has become clear that some children and adults display *specific* problems with reading comprehension. That is, they show low reading comprehension performance in spite of seemingly adequate word reading skills (Catts, Adlof, & Ellis Weismer, 2006; Hart, 2005; Landi, 2010; Nation & Snowling, 1999; Yuill & Oakhill, 1991). The existence of this subgroup of individuals suggests that additional sources of comprehension problems are implicated. Our goal in the remainder of this chapter is to explore some of these additional sources of difficulty.

It is important, however, that examinations of these additional sources of difficulty take word identification into account. Higher-level components of comprehension depend on the effective operation of lower-level components, including word reading. The research on comprehension skill has been inconsistent in the extent to which it takes these dependencies into account.

As we review studies in the next section, we use two different labels to refer to individuals with reading comprehension difficulties. We use "SCD" (specific comprehension difficulties) to refer to participants in studies whose selection criteria required low skill in reading comprehension relative to word reading skills. [2] We use "less skilled comprehenders" to refer to participants in studies where word reading ability may have varied or was not explicitly controlled.

HIGHER-LEVEL COMPONENTS OF COMPREHENSION

Most of the research on individual differences in reading comprehension has focused on higher-level components, such as those comprehension processes in the right-center of Figure 1.1. These higher-level processes are at work as the reader recognizes words, retrieves their context-appropriate meanings, and builds phrases (parsing) from words. Thus, they depend on the operation of the lower-level components of Figure 1.1. Accordingly, making strong inferences about skill problems in higher-level processes requires the assumption that the lower-level processes are operating smoothly.

Although much of the research targeting higher-level processes as the source of comprehension problems has not met this assumption, some studies have tried to meet it, providing leads on higher-level pressure points in comprehension. For example, studies by Oakhill, Cain and colleagues have implicated higher-level comprehension problems by matching readers with SCD with control groups of skilled comprehenders on both word reading accuracy and print vocabulary knowledge (e.g., Cain & Oakhill, 1999; Cain, Oakhill, Barnes, & Bryant, 2001; Cataldo & Oakhill, 2000; Oakhill, 1984; Oakhill, Hart, & Samols, 2005).

With either sample—readers with SCD or less skilled comprehenders—research has been directed at a number of higher-level comprehension components. We next review three of those: inference making, comprehension monitoring, and comprehension strategy usage.

Inferences

To make sense of a text, skilled readers make inferences that bridge elements in the text or otherwise support the coherence necessary for comprehension. Inferences come in a variety of forms, with various taxonomies proposed (e.g., Graesser, Singer, & Trabasso, 1994; Zwaan & Radvansky, 1998). Most important for routine comprehension are inferences that help the reader build a coherent mental representation of the text.

For example, skilled readers form causal inferences to help make sense of actions in a story, even when those actions are not explicitly connected syntactically (Graesser & Kreuz, 1993; Trabasso & Suh, 1993). However, skilled readers do not make predictive and other elaborative inferences routinely because such inferences are not compelled by a need for either textual or causal coherence (Graesser et al., 1994; McKoon & Ratcliff, 1992). In sum, readers are more likely to make inferences that support coherence than those that merely elaborate.

Several studies have shown that children with SCD have more difficulty making inferences than do skilled comprehenders (e.g., Cain & Oakhill, 1999; Oakhill, 1984; Cain et al., 2001). Because inferences are triggered by missing or inexplicit elements of the text, one important aspect of inference making is the availability and accessibility of the background knowledge required to draw the inference.

Such background knowledge is another example of a component that is necessary but not sufficient for comprehension. For example, by teaching children knowledge about a novel situation, Cain & Oakhill (1999) and Cain et al. (2001) attempted to control for potential differences in background knowledge. They concluded that even when knowledge availability was controlled, children with SCD still displayed difficulty in making inferences. What else children with SCD need to support their reading remains an open question, but one likely candidate is help in setting high enough standards for coherence (van den Broek, Risden, & Husebye-Hartmann, 1995; this volume).

Comprehension Monitoring

Comprehension monitoring allows the reader to verify his or her understanding and to make repairs where this understanding fails. The research has produced ample examples of failures by skilled adults ~~to monitor comprehension~~ (Glenberg, Wilkinson, & Epstein, 1982)~~,~~ as well as ~~among~~ children (Baker, 1984; Garner, 1980), with differences found across age and skill levels (Hacker, 1997).

Monitoring comprehension is not a single skill that is simply added to basic comprehension processes; rather, it depends in part on the reader's ability to construct an accurate representation of the sentences in the text (Otero & Kintsch, 1992; Vosniadou, Pearson, & Rogers, 1988). As is true for inferences, retrieval of knowledge (from memory of the text or from general background knowledge) is necessary for monitoring whether a text makes sense.

Although most research on comprehension monitoring has not controlled for lower-level skills, a few recent studies have employed behavioral and eye-tracking methods to examine comprehension monitoring children with SCD (Oakhill et al., 2005; van der Schoot, Vasbinder, Horsely, Reijntjes & van Lieshout, 2009). These studies find that children with SCD are less effective than skilled comprehenders at monitoring their own comprehension. Thus, at least some children with SCD not only gain less knowledge from text, they are also less aware of inconsistencies in the text and of instances where they fail to understand.

As is the case with inference making, the reader's standard for text coherence is relevant. It is only by expecting a text to make sense that a reader can notice when it does not. A reader's standard for coherence can change as a function of circumstances that affect his or her interest or engagement with a text.

This may imply that some differences in monitoring are situational rather than stable individual trait effects. A trait hypothesis would seem to assume that some readers have a dysfunction in a "monitoring system." A more likely alternative in our opinion is that to the extent poor monitoring is an individual trait, it reflects that less skilled comprehenders have become accustomed to not understanding texts, meaning they have adopted a low standard for coherence.

Comprehension Strategies

Skilled readers implicitly use strategies in comprehension. These strategies can be considered adjustments to reading procedures that reflect the reader's goals, the difficulty of the text, or some combination of the two. For example, readers can slow down to increase their understanding of a text or speed up (i.e., skim the text) to ~~find information for which they are looking.~~ A broader view is seen in the research on teaching comprehension strategies, in which strategies are viewed not only as implicit adjustments to goals and texts, but also as explicit procedures to enhance comprehension. The National Reading Panel (2000) identified seven strategies for which there was sufficient evidence that direct instruction supported comprehension gain: (1) comprehension monitoring; (2) cooperative learning; (3) use of graphic and semantic organizers (e.g., story maps); (4) question answering; (5) question generation~~,~~;(6) story structure; and (7) summarization. With the exception of comprehension monitoring, we have not identified any of these strategies as pressure points for comprehension assessment. They do not correspond to components of comprehension per se but to comprehension outcomes (e.g., summarization, question generation) or supports (e.g., organizers, cooperative learning). The use of these kinds of explicit strategies may be helpful to the reader in enhancing comprehension (e.g., Kletzien, 1991; Olshavsky, 1977; Wilson & Rupley, 1997), but they are not intrinsic to it.

WORD MEANINGS AND TEXT INTEGRATION

In the research on higher-level comprehension, only a few studies have controlled for knowledge of word meanings. Our view is that word meanings provide an especially potent pressure point among the components of comprehension; in the remainder of this chapter, we turn our attention to this component (shown in the center section of Figure 1.1).

Vocabulary

There are numerous studies that demonstrate a strong relationship between vocabulary knowledge and reading comprehension in both children and adults (e.g., Anderson & Freebody, 1981; Braze et al., 2007; Muter, Hulme, Snowling, & Stevenson, 2004; Storch & Whitehurst, 2002; Wagner, 2005). According to an estimate by Nagy and Scott (2000), a reader needs to know the meanings of 90 percent of the individual words contained within a text in order to comprehend it.

Most studies of the association between vocabulary knowledge and comprehension have used assessments of vocabulary size, such as the *Peabody Picture Vocabulary Test* (PPVT) (Dunn & Dunn, 2007) or the *Expressive Vocabulary Test* (Williams, 2007). Although vocabulary size, or lexical *quantity*, is important, successful comprehension also involves having refined knowledge of words and their relationships to other words (e.g., Nagy & Herman, 1987).

The lexical quality hypothesis claims that successful comprehension depends on accessible, well specified, and flexible knowledge of word forms and meanings (Perfetti & Hart, 2001; Perfetti, 2007). Lexical quality varies across individuals (some people know more about a larger number of words than others), as well as between words in a given individual's lexicon.

For example, some people have a richer representation of the meaning for the word "health" than for the related but less familiar word "salubrious." They may recall that salubrious is associated in some way with health, but they may not know whether it is associated with promoting good health (yes) or poor health (no). They may be able to understand a sentence containing ~~both words,~~ but they may not feel comfortable using ~~the word salubrious~~ in their own sentence constructions.

A high-quality meaning representation includes complete knowledge of relevant semantic attributes as well as sufficient experience in context to support knowledge of appropriate usages and associations. However, the separation of quantity and quality of word knowledge is not straightforward. Indeed, we should expect the number of words known to some minimal standard (*lexical quantity*) and the degree of knowledge about a given word (*lexical quality*) to be closely related on both statistical and cognitive grounds. The more words one knows, the more interconnections there will be among words.

In the case of word meaning (as opposed to word form), this quantity/quality distinction is often operationalized as a distinction of *breadth* (quantity) vs. *depth* (quality) of vocabulary. Breadth vs. depth was the subject of two studies examining their relative contributions to reading comprehension in elementary school-aged children.

Ouellette (2006) examined this question in a sample of sixty fourth-grade students. After controlling for the effects of nonverbal IQ, decoding, and word reading ability, the study determined that only vocabulary depth accounted for unique variance in comprehension,. Both breadth and depth explained unique variance when word and nonword reading were not included in the model, but the contribution of depth was much larger than breadth.

Tannenbaum, Torgesen, and Wagner (2006) examined this question in a sample of more than 200 third-graders and found that both breadth and depth accounted for unique variance; however, the unique contribution of breadth was larger, and the unique contribution of depth failed to reach statistical significance. The studies agreed that most of the variance was shared between breadth and depth.

Several differences between the studies might be relevant for understanding how contrasting answers to a question like this can emerge. For example, comprehension tests vary in which components of comprehension receive implicit focus, and the two studies used very different types of comprehension assessments. In the Ouellette et al. study, comprehension was assessed using the Passage Comprehension subtest of the *Woodcock Reading Mastery Test-*

Revised (Woodcock, 1998), a cloze task that has been shown to be especially dependent on word-level knowledge (Francis et al., 2005).

In contrast, Tannenbaum and colleagues measured comprehension using the *Florida Comprehensive Assessment Test* (Florida Department of Education, 2005) and the *Stanford Achievement Test-9* (Harcourt Assessment, 1996), which use longer text passages that involve greater dependence on higher-level comprehension components. Thus, in the Ouellette et al. study, understanding of the short passages was more likely to hinge on the knowledge of a specific word, whereas in the Tannenbaum study, understanding of the text required integration of ideas across the texts.

Although ~~both~~ studies defined vocabulary breadth and depth similarly, their divergent results were also likely caused by differences in the way these constructs were measured. Across both studies, all but one of the tasks were taken from standardized assessments with adequate reliability. Ouellette and colleagues' breadth tasks assessed children's ability to match pictures with spoken words and to name pictures. Their depth task measured children's ability to generate definitions of words that included relevant semantic features. Tannenbaum et al.'s latent construct of breadth included two measures: one was a word-picture matching test similar to one of Ouellette et al.'s breadth tasks, but the other involved a definitions task similar to Ouellette and colleagues' *depth* task.

Tannenbaum et al.'s latent depth construct included four tasks, which required students to provide synonyms that represent multiple aspects of a word's meaning, list semantic features of words, use target words in sentences, and provide lists of category members, respectively. An examination of the correlation matrices in the Tannenbaum et al. study reveals that the correlation between the breadth measures is much higher (.75) than the intercorrelations among the depth measures (ranging from .28 to .38); furthermore, the correlations between the individual measures of breadth with individual measures of depth were higher (ranging from .39 to .61) than the correlations of the depth measures with themselves. Thus, Tannenbaum et al.'s findings demonstrate how difficult it is to measure vocabulary depth separately from breadth.

Although additional research may clarify the quantity-quality relationship, it is possible that the natural correlation between the two may reduce the practical value of ~~conceptual~~ separation as vocabulary measures. Quantity statistically predicts quality. Acquiring deep knowledge of a word naturally builds on an earlier familiarity of the word form and meaning.

However, whether quantity and quality can be psychometrically separated is only part of the story. During reading it is the reader's knowledge of the form and meaning of a specific word—lexical quality—that matters, not the estimated size of the reader's vocabulary. Thus lexical quality plays a distinctive role in comprehension. In the following section, we review studies in which skilled and less skilled comprehenders appear to differ in their processing of highly familiar words.

LEXICAL KNOWLEDGE

An elaboration of lexical quality includes a core of semantic, syntactic, and morphological attributes along with conditions that allow constrained flexibility of use (as metaphors, for example). In the context of comprehension skill, studies have been largely restricted to measures of meaning attributes, assessed through associative and conceptual structures defined over links to other words.

Two such studies have explored the nature of word knowledge problems for SCD samples by comparing categorical semantic relations with simple associative relations. Nation and Snowling (1999) found that ten-year-olds with SCD showed priming for words that were either functionally related (e.g., SHAMPOO—HAIR) or highly associated category members (e.g., BROTHER—SISTER), but not for category members with low association strength (e.g., COW—GOAT).

Landi and Perfetti (2007) also studied meaning judgments using event-related potentials (ERPs)[3] and found that SCD adults showed a smaller relatedness effect in ERP components (P200 and N400) compared with skilled comprehenders. In contrast to the result of Nation and Snowling (1999), Landi and Perfetti (2007) found ERP ~~component~~ differences for associatively related as well as categorically related words.

Whatever the reason for the different results concerning associative relations—a greater sensitivity of ERPs to associative strength, differences in mode of presentation (auditory vs. visual), or participant ages—the larger point is that the two studies converge to suggest that SCD readers have lower-quality semantic representations (weaker connections to other words) than skilled readers, even for relatively frequent words that are within their functional lexicons.

WORD-TO-TEXT INTEGRATION

In addition to semantic processing at the word level, recent studies using ERPs have demonstrated on-line text comprehension differences between skilled and less skilled adult readers that implicate the processing of word meanings (Yang, Perfetti & Schmalhofer, 2005, 2007). ERP components (especially the N400, a sensitive indicator of integration difficulty) showed the key difference during the reading of a word that must be linked to a referent established in a previous sentence (thus, word-to-text integration).

For example, consider the text segment: *After being dropped from the plane, the bomb hit the ground and blew up. The* <u>*explosion*</u> . . . The reader needs to link the word *explosion* with an event established by the main clause of the first sentence (the bomb blew up). In effect, the reader must treat *explosion* as a paraphrase of *blew up*.

The N400s observed in these studies indicate this paraphrase mapping works fine—easy integration—for skilled comprehenders, but not for less skilled comprehenders. When the words were identical in their lexical stem (*exploded* in the first sentence and *explosion* in the second), comprehension skill differences were not found. Thus, the skill difference seems to involve understanding one word in relation to the referential meaning established by a different word—a paraphrase comprehension factor.

Successful paraphrase comprehension is not about synonyms. Paraphrases in these integration studies represent a wide range of semantic relations. For example, in another text, readers must link *emergency room* in sentence 1 and *hospital* in sentence 2, two phrases that show a part–whole semantic relationship. Emergency rooms are in hospitals, so the mention of an emergency room enables immediate use of the word *hospital*.

Other relations can be present as well, as illustrated by this example: *Brad fumbled through the dark until he located the box of matches and struck one. After* <u>*lighting*</u> *the match, it was easier to see.* If one strikes a match successfully, he or she has lit the match. Still, *strike* and *light* are not synonyms, but, rather, refer to the same event in this context.

In general, the meaning processes of "paraphrase" require the selection of word meanings that are appropriate for a given context. What this means exactly needs to be worked out. If word meaning representations include episodic histories with the word in its contexts, as proposed by Bolger, Balass, Landen and Perfetti (2008), then flexibility of meaning usage is partly based on contextual histories. Such a conceptualization is also consistent with thinking about meaning as situated in a massively multidimensional space of the sort generated through *Latent Semantic Analysis* (LSA) and related algorithms.

The relationship between word knowledge and comprehension skill needs more research, especially at the more fine-grain levels of word knowledge that are reflected in the studies we have reviewed here. Nevertheless, an important conclusion so far is that SCD and less skilled readers show less detailed, less flexible, and/or less connected representations even for words that they know. Thus the word-level knowledge relevant for comprehension includes lexical quality as well as quantity.

From a vocabulary assessment perspective, it remains to be determined whether assessments of fine-grain semantic knowledge do a better job of predicting reading comprehension difficulties than do assessments of vocabulary size. Quantity measures, as we noted above, may prove sufficient for most purposes, because they estimate the number of words that a reader knows, and words of high quality are a subset of that number. We emphasize again, however, that for any encounter with a given text, it is the quality of the reader's word knowledge (form as well as meaning) for the words in that text that is crucial to comprehension.

LINKS TO ASSESSMENT

The componential framework gives a general picture of comprehension from the word identification level through various higher-level processes that are needed for comprehension at the deeper levels (i.e., building a situation model) as well as more superficial levels (e.g., parsing a sentence). The framework provides a set of "pressure points" in text comprehension, components of comprehension that meets three criteria: (1) face validity as an intrinsic component of comprehension as opposed to a correlate of comprehension and (2) robust variation among individuals in the component that is (3) associated with overall comprehension skill.

Any pressure point that meets these criteria is a candidate for assessment. The components of word identification, lexical quantity and quality, inference making, and comprehension monitoring all meet these criteria. So do other components we have not discussed—for example, the ability to recall a brief segment of text, a clause or a sentence, more or less verbatim (the contents of a text working memory that is involved with the text representation in Figure 1.1); or the ability to recognize when two syntactic strings converge on a similar meaning relation (e.g., a longer form of paraphrase than we have previously described) as well as other tests of sentence-parsing processes.

However, as a practical matter, candidates for assessment may need to meet other criteria beyond independent and measurable skill-related variability. These other criteria will vary according to the test purpose. For example, if the purpose of assessment is to identify sources of comprehension difficulty, the assessment needs to meet all of the criteria above, but possibly not any others. However, if the goal of assessment is to identify targets for instruction or intervention, one would add the criterion that the assessed components are amenable to instruction.

Although it is likely that all components of comprehension ~~are processes~~ are acquired largely (identifying printed words) or partly (parsing) through learning, decisions on priorities for instruction take into account additional factors. Some processes are distinct to reading, e.g., word identification. Other processes, e.g. working memory, are general to cognitive functioning. In between are processes that are largely shared between written and spoken language (e.g., parsing and inference making).

In deciding for intervention to increase working memory, one is making a bet on improving functioning broadly across cognitive tasks. Although this bet might pay off (Chein & Morrison, 2010), there is more certainty (and face validity) for instruction on components that are more directly about reading. However, assessments need not be only about diagnosing component weaknesses, whether general cognitive functions such as working memory or specific reading components such as word identification.

An important value of assessment can be to predict risk for reading comprehension difficulties. In this case a "good" assessment is simply one with high sensitivity and specificity (~~c.f.~~ Adlof, Catts, & Lee, 2010). Although determining priorities for assessment entails all these considerations, and probably more, it is important in the long run to have valid assessments for all the components identified in Figure 1.1. The fact that, at the moment, instructional prospects for the components vary is a different matter. Instructional interventions can be improved, and one of the engines for their improvement is valid assessments.

In terms of test efficiency, it may also be useful to ask whether the component is theoretically and empirically dependent on some other component. All components in an interactive system will show some degree of nonindependence. Figure 1.1 shows a number of two-way interactive connections that would multiply the interdependence between components. (With some constraints, these interactions would show more dependence of higher levels on lower levels than vice versa.) This interdependence seems to limit the goal of any pure, single-component assessment, instead supporting the assumption that all task performance depends on multiple components. Nevertheless, the degree of dependence among components is variable, both theoretically and as a question of assessment.

At higher levels of reading comprehension, lower levels are participating fully, whether they are assessed or not. A standard reading comprehension ~~does~~ not measure word identification, but performance on the test requires it. At lower levels, word identification is best measured by presenting isolated words, thus assuring that both the process and the assessment is free of higher-level influences. (Note that word identification depends on visual and phonological abilities not assessed on the same test.)

The variability in interdependence allows for a component sampling strategy: Assess with a small sample of modestly related components rather than a large number of highly related components. This increases the efficiency, understood as an assessment's ability to measure distinctive components of comprehension in relation to testing time.

Of course, there are additional problems of assessment (e.g., models of item selection and other psychometric issues) that are beyond what we can address here. We believe that reading comprehension researchers can play a productive role in working with assessment experts on these problems, however. A framework for the components of comprehension with pressure points identified is a starting point. Alignment to assessment strategies is the next step.

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2. Most studies of SCD readers use word reading accuracy for matching SCD readers with controls (but see Adlof, 2010). Theoretically, speed beyond accuracy is an indicator of word processing efficiency, so naming times or other speed measures are desirable to have a fuller picture of word level skills. Naming speed may have its effect on reading comprehension mainly indirectly through oral language skill, as suggested by the results of Adlof, Catts, & Little (2006).

3. ERPs are shifts in electrical activity in the brain that are time-locked to an event, such as the presentation of a stimulus in an experiment. Shifts in voltage are measured using electroencephalogram (EEG) technology. ERPs are particularly useful for studying cognitive processes because they do not require an external response and because of their excellent temporal resolution. ERP components are frequently described in terms of their polarity (i.e., positive or negative), as well as their latency in milliseconds after the stimulus onset. Thus, a P200 reflects a positive shift in voltage at approximately 200 milliseconds after the stimulus onset.