Serious Word Play

How Multiple Linguistic Emphases in RAVE-O Instruction Improve Multiple Reading Skills

by Maryanne Wolf, Stephanie Gottwald, and Melissa Orkin

For many elementary-school children the achievement of reading with fluent comprehension—that is, the ability to read quickly and accurately enough to understand and think about text—remains an essential, but elusive goal. The most used intervention for these children involves "repeated reading" methods, where children read the same text several times till accuracy and fluency are achieved. Proponents of repeated reading make several important assumptions about these *implicit* methods: 1) fluency represents the end result of decoding instruction; 2) fluency gains on practiced texts generalize to new texts; 3) repeated exposures teach new vocabulary words and reinforce orthographic patterns; and 4) fluency gains advance comprehension. Growing evidence from several research directions indicates that these assumptions do not hold for many struggling readers.

In this article, we present an overview of a very different intervention for fluent comprehension, the RAVE-O program, based on a developmental, multicomponent model of fluent comprehension. The assumptions underlying RAVE-O share with repeated reading methods the goals of teaching new vocabulary and reinforcing orthographic pattern knowledge, but have explicit emphases on these and additional major linguistic systems such as syntactic knowledge and morphological processes. Indeed, we argue that the fallacies in past assumptions about indirect reading instruction (i.e., it teaches basic phonological knowledge and decoding principles through exposure and immersion in texts) extend to instruction for fluent comprehension in children with reading difficulties.

Research Background

The first body of evidence comes from research in the cognitive neurosciences regarding how the brain learns to read in typical development and fails to read in children with reading disabilities (Pugh, Sandak, Frost, Moore, & Mencl, 2005; Wolf, 2007). An examination of the young reader's first "reading circuit" illustrates the many components involved—from visual pattern recognition systems to varied cognitive and linguistic systems (Tan, Spinks, Eden, Perfetti, & Siok, 2005; Sandak, Mencl, Frost, & Pugh, 2004). Multiple linguistic systems are essential to understand the many dimensions contained within a spoken or written word: phonology, morphology, syntax, semantics, and pragmatics, with orthography necessary for written words. Each system activates discrete areas of the brain when we read. A leitmotiv in this research and RAVE-O is that *everything* the child knows about oral language contributes to the development of written language.

To bring the multiple emphases in the RAVE-O program to life, we would like you, the reader, to analyze what you know about any single word. In the process, you'll have a bird's eye perch from which to view many of the different linguistic systems important to reading and oral language. Consider the word *duck*. First, the reader begins to process visual features of letters and of the word's shape and to discern the size, shape, and spacing of each symbol. Discerning meaningful visual symbols is an evolutionarily adaptive ability that has developed over thousands of years of token-based economies, hieroglyphic drawings, and other early writing systems (Wolf, 2007). The ability to store representations of visual patterns and connect that information to linguistic knowledge and writing conventions provides the foundation for an individual's orthographic knowledge (Wolf, 2007). During reading, children use their orthographic knowledge to discriminate between letters and recognize common letter patterns in their language. The ability to rapidly identify visual chunks in words (e.g., vowel digraphs, consonant blends, and morpheme units) ultimately increases the speed of reading.

To read *duck*, orthographic knowledge must become automatically connected to corresponding sound or phoneme-based knowledge. The individual visual symbols, *d*, *u*, *c*, and *k*, carry virtually no meaning until paired with their analogous sounds. The alphabetic principle—beginning with the cognitive understanding that each visual letter corresponds to a sound—underlies children's capacity to learn their language's sound-symbol correspondences. To read the word *duck*, children must recognize each symbol, connect the corresponding sounds or phonemes, and blend them together to form the word.

In the process, they utilize the repertoire of skills we call phonological processes. The phonological awareness and proficiency required to segment and blend phonemes in words is honed over hours of explicit instruction and repeated practice. Extensive research confirms the effectiveness of direct sound-symbol instruction on the development of phoneme awareness and decoding skills (Adams, 1990, Lundberg, 1991; Stanovich, 1991; Torgesen et al., 1999). This evidence demonstrates that children benefit most when common structures of sounds are explicitly taught, particularly when special attention is paid to distinctions between onsets, such as *d*, rimes, such as *uck*, and syllable patterns (Goswami & East, 2000). Instruction which provides this phonological foundation alongside multiple exposures to common orthographic patterns results in more efficient word recognition.

Phonological and orthographic knowledge are not the only linguistic components key to reading fluency. Rich semantic knowledge both plays a significant role in children's reading comprehension and impacts fluent word recognition. Semantic knowledge refers both to the size of a vocabulary, and also to the strength and depth of individual word knowledge.

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(Frishkoff, Collins-Thompson, Perfetti, & Callan, 2008). Think of the multiple meanings of the word *duck*. When functioning as a noun, it represents a web-footed, swimming bird; as a verb, it means to avoid. In fact, a great many of the most common children's words have more than one meaning. The more knowledgeable children are about a word, its multiple meanings, and various pragmatic and syntactic contexts of use, the more rapidly the word is processed during reading (Locker, Simpson & Yates, 2003). As a result, children can move into more sophisticated text-level reading with greater fluency and thus, have more time for understanding. In short, the semantic system not only affects the speed of accessing the word, but also impacts deeper comprehension of text.

The implications of this conclusion are significant. Investigations into "word poverty" (Moats, 2000) and the effects of impoverished word environments have demonstrated the significant and long-term impact of a child's vocabulary size on his or her reading comprehension (Stanovich, 1985). Moats (2001), for example, estimates that there is a significant word gap between lower and higher income children who enter first grade. The significance of this finding is brought home by Biemiller (2005) who found that kindergarten children with a vocabulary in the bottom 25% remain behind in vocabulary and comprehension into middle school and often beyond.

Related to both semantic and orthographic knowledge is the least studied linguistic component of reading—morphological awareness—which refers to the conventions that govern word formation, and the ways in which roots and affixes create new word meanings. For example, adding the suffix morpheme *s* to the root *duck*, creates the plural noun *ducks*; adding *ing* creates the present participle *ducking*; adding *ed* creates the past verb form *ducked*. Such morphological knowledge also provides disambiguating syntactic information (e.g., *ed* rapidly clarifies that *ducked* is the verb form). In addition, because the role a word has in sentence structure helps determine its meaning, this collective morphosyntactic information aids comprehension.

Morphological awareness is particularly important in English, which is a *morphophonemic* language that represents both morphemes and phonemes in its spelling. Words that are irregularly spelled no longer seem as arbitrary in their spelling when children understand their morphemic roots. For example, the word *muscle* connects this seemingly irregularly spelled word to its basic roots. In so doing, it illumines the semantic relationships among words like *muscle*, *muscular*, and *musculature* (see Chomsky & Halle, 1968). From this perspective, by conveying semantic, syntactic, and orthographic information, morphological knowledge contributes to the development of spelling, faster word recognition, and fluent comprehension.

Another less emphasized component in fluency intervention concerns syntactic knowledge. Knowledge of how words are used within different grammatical or syntactic contexts is essential for the child's fluency and comprehension, along with a variety of increasingly sophisticated sentence constructions and literary conventions.

In sum, what does the young human brain learn to do when it reads a single word? It uses an exquisitely precise visual system to recognize letters and familiar *letter patterns*; it connects this information to the stored, corresponding *phonemes*; and almost simultaneously, it connects this same information to the *meaning(s)* of the word, to its *grammatical* uses, the potential *morphemes*, and how this word is used in social contexts (i.e., *pragmatic* knowledge). Most importantly, the brain must retrieve, connect, and integrate all this information in a fraction of a second to have time to comprehend the word in text.

RAVE-O Intervention

The RAVE-O program is an innovative reading program whose purpose is to teach the young reading brain how to build up and connect all these sources of visual, cognitive, and linguistic information and rapidly retrieve them during reading. Based on theoretical accounts of reading fluency and comprehension (Wolf & Katzir-Cohen, 2001), the program attempts to simulate what the brain does when it tries to read a single word with fluency and comprehension. RAVE-O's basic premise is that the more the child knows about a word (i.e., phonemes, orthographic patterns, semantic meanings, syntactic and pragmatic uses, and morphological roots and affixes), the faster the word is decoded, retrieved, and comprehended. RAVE-O is not so much a wholly new program, as it is the application of some best teaching practices and some newly-designed practices to systematically address multiple linguistic, cognitive, and affective systems.

Each week children learn all the relevant phonological, orthographic, semantic, and syntactic content for a small group of core words and learn to make explicit connections across these linguistic systems. Making these connections is key to re-enacting what the brain's "reading circuit" does. For example, with the word *jam*, the instructor first reviews the individual phonemes, /j/ + /a/ + /m/, and then teaches the child to find the chunks in jam. That is, the rime (the part of the syllable that consists of the vowel and any consonants that come after the vowel) (/am/) and the onset or beginning consonant (/j/). This step consolidates sound-level knowledge and connects it to letter patterns. In turn, this knowledge is immediately connected to the semantic base. The word *jam* possesses at least three common meanings and can be used in different syntactic contexts (as noun and verb). Moreover, *jam* can be easily changed by the addition of different morphemes (e.g., jams, jamming, unjammed) to show how words can change but still have their root visible. The uniqueness of RAVE-O is that explicit attention is given to learning and connecting each of the five major linguistic components in every word, in every unit.

The overall structure of the RAVE-O curriculum emphasizes systematic instruction with a repeating format within each unit and each individual lesson. The general movement is from accuracy to speed: from the multicomponential introduction of words, through activities that build accuracy in letter-pattern and word recognition, to building speed and understanding in ever increasing levels of complexity in words and connected text.

Games and activities exemplify the progression from activities that emphasize accuracy of retrieval early in the unit to speed of retrieval by the end of the unit. For example, a variety of activities and games are used to enhance the child's ability to connect multiple linguistic processes. *Spelling-Pattern Cards* are small color-coded cards that are divided into starters, rimes, and affixes and teach phoneme patterns and morphemes. *Speed Wizards* is a set of computerized games designed to reinforce these same sets of processes at different levels of complexity and three speeds of recognition. *Word Webs* are a regularly recurring semantic exercise that provides a simple, visual way of illustrating how words are interconnected and that gives visual images to aid memory. All of these game-like activities offer whimsical means to teach children to connect individual phonemes, to orthographic units, to meanings, to uses. In turn, these connections facilitate rapid decoding and comprehension processes and improve spelling along the way.

A range of metacognitive strategies (called *Magic Tricks*) enables children to segment the most common orthographic and morphological units in words. The tricks are quick, often humorous mnemonics that teach key strategies about words. For example, the strategy called "Ender Benders" helps children quickly recognize common morpheme endings that "bend" (i.e., change) the word's meaning. The "Think Thrice" comprehension trick is a set of three comprehension strategies to enhance the child's prediction, comprehension-monitoring, and analytical and inferential skills.

Within every unit, fluent comprehension for connected text is addressed through metacognitive comprehension strategies implemented with a series of specially written RAVE-O *Minute Stories*. The stories' controlled vocabulary incorporates the phonemic and orthographic patterns, multiple meanings, and varied syntactic contexts of core words. The *Minute Stories* are multipurpose vehicles for facilitating more automatic rates within phonological, orthographic, syntactic, and semantic systems at the same time that they reinforce connections across these systems. In the process, the stories build overall fluency and comprehension skills. An important affective dimension in these stories is that the content provides a platform for exploring feelings struggling readers often have about learning to read.

Although these tricks and emphases on word play may appear deceptively fun-filled, what we hope to achieve with them is very serious. Children who are struggling readers need to learn the interconnected nature of words, and they usually don't. These strategies are elaborated in the weekly lessons for the teachers and provide a foundation for many of the most important comprehension skills used in all later learning. The end goal of RAVE-O, therefore, is ultimately not about how rapidly children read, but about *how well they understand and enjoy what they read*.

Summary of Results

The effects of RAVE-O with struggling readers have now been studied for 10 years in 3 research contexts: 1) a pull-out intervention during the school day; 2) an intensive summer-school remediation program; and 3) an after-school intervention. In each of these studies, RAVE-O is combined with a systematic phonological analysis and blending program (such as SRA Reading Mastery or Orton-Gillingham) and taught to small groups of four children.

Recent results come from a three-city, federally funded (National Institute for Child Health and Human Development), randomized treatment-control study. In this study, children who represented the most impaired readers in grades 2 and 3 were randomly assigned to four treatment conditions and were controlled for socioeconomic status (SES), race, and IQ. Each group received 70 hours of treatment throughout the school year. Each of the sessions had one-half hour with a phonological decoding program. RAVE-O and another theoretically multidimensional treatment (PHAST; see Lovett's extensive work in references) went beyond a phonological approach to include different multidimensional emphases in the second half-hour. Specifically, PHAST employed multiple emphases on phonological, orthographic, and morphological processes, as well as distinctive metacognitive strategies for word identification and comprehension.

We compared the effects of the four types of treatment on an extensive battery of tests on all aspects of reading—from accuracy and fluency in word attack to comprehension—and on many language measures. When compared to a control group receiving a math treatment, the RAVE-O group and the PHAST group outperformed the control group on every measure. When compared to a group who received only the systematic phonological analysis and blending treatment, the RAVE-O and PHAST groups again proved better on every measure. When compared to PHAST, RAVE-O made similar significant gains on standardized measures of decoding, and superior gains on the GORT-3 Oral Reading Quotient, a combined fluency and comprehension score, and on measures of vocabulary and semantic flexibility (see overview in Morris, Lovett, Wolf, et al., submitted 2009). In other words, students who received instruction in programs that emphasized multiple dimensions of linguistic knowledge, performed equally well or better on every word attack and word identification measure (the specific emphases of the more unidimensional decoding treatment). RAVE-O also outperformed all other treatments in vocabulary and the GORT fluency-comprehension measure.

The theoretical implications of these outcome data are critical. The premise of RAVE-O is that the plural linguistic emphases will enhance decoding, as well as vocabulary and comprehension. The fact that RAVE-O spent far *less* time on specific decoding skills and yet made comparable or superior gains in word attack and word identification to programs which spent more of their instructional time on these skills is compelling evidence supporting the theoretical premise of RAVE-O: the more the child knows about a word, the faster and better the word will be decoded and understood.

In addition, and very importantly, this NICHD study demonstrated that impaired reading children could make significant gains in reading regardless of initial SES, race, or IQ factors (Morris et al., submitted 2009; Wolf et al., 2009). The latter set of results cannot be overemphasized. It suggests that despite these known impediments to achievement, the two multidimensional interventions produced similar gains in children from privileged and unprivileged backgrounds regardless of

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IQ level or race. This result directly answers the question whether the linguistic demands in RAVE-O are too heavy for children in poverty or for children with lower cognitive aptitudes.

In fact, these results point to the success and the importance of explicit emphases on the multiple dimensions of language in our interventions. They also raise the issue of assessing and knowing the needs of each individual child before deciding what type of intervention is most appropriate. There are no silver bullets or one best program. Future analyses by our NICHD group will examine differential treatment response by subtype. Understanding research on different forms of remediation—what works best for which child and when—is like having a "toolbox" from which to create better-tailored teaching. It is not that many of our children can't learn to read; it is that we haven't found the right ways to teach them. The onus is upon us, their teachers, not the children, to find ways that work. Within that context, our collective findings underscore that explicit teaching of multiple linguistic systems propels our teachers and our students.

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RAVE-O is a program designed by the first author, with assistance from the Center for Reading and Language Research and many teachers. Although it is not at this moment a commercially available program, it may be in the future.

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