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WHAT DOES IT TAKE TO READ A LETTER?

by Graham F. Neuhaus

Reading research has firmly established that word reading ability is influenced primarily by phonological processing skills. (Adams, 1990; Stanovich and Seigel, 1994; Vellutine, 1991). However, there is also evidence that reading accuracy and fluency are influenced by orthographic recognition, the ability to recognize a letter or letter cluster (Berninger, Abbott, Thomson, and Raskin, 2001: Olson, Forsberg, and Wise, 1994), and rapid naming skill (Torgesen, Wagner, Rashotte, Burgess and Hecht, 1997; Neuhaus, Foorman, Francis, and Carlson, 2001; Wolf and Bowers, 1999). While it seems intuitive that knowledge and recognition of the sounds and symbols used in a language are prerequisites for reading that language, what is not as obvious is how rapid naming is related to reading accuracy of fluency.

The Rapid Automatized Naming Tests (RAN; Denckla and Rudel, 1974) are well-established tasks that robustly predict longitudinal word reading and reading comprehension (Neuhaus, Foorman, Francis, and Carlson, 2001; Wolf, Bally, and Morris, 1986). The RAN has been used recently to determine why rapid naming is related to word reading (Neuhaus and Swank, 2000; Neuhaus and Swank, in press). These two investigations used a series of structural models to uncover the commonalities of rapid naming and word reading. First, structural models were used to show what knowledge or processes support RAN letter naming. Then, structural models were used to determine whether the processes and knowledge underlying the RAN letter tasks independently predicted word reading accuracy, or whether the knowledge and processes that predicted word reading predicted word reading only indirectly through RAN letter reading.

The RAN letter subtest was scored using a component scoring system (Neuhaus, 1998) that separated the RAN response into three different measured components; articulation, pause, and consistency of the pause response. The first set of structural models showed that RAN letter component times were associated with phonological awareness, orthographic recognition, general cognitive processing or pause time of RAN objects, and general articulation time of RAN objects (Neuhaus and Swank, 2000). Additionally, it was found that general processing or pause time of RAN objects was predicted by visual attention.

Further analyses (Neuhaus and Swank, 2002) showed that when all the variables were entered in the model, word reading was significantly and directly predicted only by RAN letters and RAN objects tasks. So phonological awareness, orthographic recognition, and general articulation time of RAN objects only predicted word reading indirectly through RAN letters. In other words, the RAN letters test was shown to be a very basic reading test, a letter reading test, and letter reading fluency predicted word reading accuracy.

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The knowledge and the processes found to support letter reading were varied, and exposed the complexity of what many consider to be a simple task. Letter reading efficiency was directly associated with phonological processing, orthographic recognition, general articulation time of RAN objects, general cognitive processing time of RAN objects. It was indirectly predicted by visual attention through general cognitive processing time of RAN objects. In other words, fluent letter reading was supported by the knowledge of sounds and symbols, and the efficiency of general naming and visual attention skills. Fluent letter reading demanded the coordination of visual, verbal, and attentional systems. Importantly, this study suggests that limitations in any of these areas could hamper letter reading efficiency, leading to reduced

word reading accuracy, and diminished reading fluency. These findings have specific implications for parents and teachers.

First, the cognitive processing time of naming common objects was found to predict letter reading. Simply, this task is a general measure of the efficiency of connecting a visual stimulus with a verbal label. The only difference between this task and letter naming is the type of stimuli. The object stimuli were overlearned, and represented general items that were well known to the children. The naming of overlearned general items was associated with the naming of specific items, letters, and this indicated that the quality of general visual-verbal processing is important to support letter and word reading. Parents especially need to appreciate the connection between general oral language and reading. General oral language is supported by verbal memory. The same verbal memory also supports the storage and retrieval of the specific verbal labels we call letter names and sounds that are used for reading. Oral language development begins early in a child's life, and the foundation for later language development is established before a child enters kindergarten. Parents can enrich preschool oral language development through abundant talking, labeling, and reading with their children. Moreover, teachers must attend to oral language development in their students, and understand that general naming ability temporally precedes and directly predicts the ability to efficiently read letters and accurately read words. (See the Carreker article in this issue for specific suggestions for oral language development.)

Second, teachers must acknowledge and understand the importance of individual letter reading. They must teach the bases of knowledge and help develop the necessary processes that enhance efficient letter reading. Beginning reading students need to automatically recognize the orthographic symbols used to represent the sounds of the language. They also need to know the name of the letters, and to be able to match the sound of the letter with its name and symbol. It is easy to assume that primary grade students know the names of their letters; however, in the Neuhaus and Swank (2002) study, although all of the first grade children could name their letters easily and readily, the RAN component times suggested the students had different levels of letter knowledge that was shown through variation in their RAN letters articulation and processing times after general cognitive processing and articulation times were controlled. The variation that was invisible to the human ear or eye became apparent when the computer measured the responses in milliseconds. This finding replicated results found with third and fourth grade students (Neuhaus, Carlson, Jeng, Post, and Swank, 2001). In other words, students may still be familiarizing themselves with the names of letters even into third and fourth grades. Therefore, practice with naming letters should continue even after letters are joined into words.

Word familiarity has been shown to influence the time needed to articulate words (Hulme, Roodenrys, Brown, and Mercer, 1995). Neuhaus and Swank (2000) also showed that articulation time of RAN letters was significantly related to cognitive processing time specific to RAN letters when consistency of the cognitive processing time was controlled. These findings connect more developed letter familiarity with both faster articulation and cognitive processing. Therefore, it is important that all letters be completely familiar to all students.

Letters naturally differ in frequency of occurrence. For example, typical readers encounter the letter *a* more than the letter *w*. However, the frequency of any letter is individually determined because some children read more that others, may be more familiar with particular letters such as those that appear in their name, or some teachers of primers may emphasize certain letters or letter combinations more that others. To overcome the variability in letter familiarity between students, the challenge for the reading teacher is to make all letters high-frequency for all of his or her students through intense exposure. In other words, exposure to each letter must be intense enough that all the letters become overlearned, because each letter counts in the cadence associated with efficient word reading.

Letters are the building blocks of words. A word with an unfamiliar or infrequent letter can cause hesitant reading that interferes with the fluent automatic identification of words that then impacts reading comprehension (Stanovich, 1991). Automatic letter recognition is the key to automatic word recognition. But not all children learn about letters and words at the same rate. Berninger (2000) reported that at-risk children were found to need over 20 times the amount of literacy practice than children who were not at-risk. Therefore, teachers must individualize instruction to provide ample opportunity for all children to

reach an automatic level of letter naming. (See Allen and Beckwith 1999 for activities for developing instant letter recognition.)

What does it take to read a letter? Neuhaus and Swank (2000, 2002) found that the smooth integration of the contributions from visual, verbal, and attentional systems is essential. Letter reading demands knowledge of orthographic symbols, phonological labels and sounds, consistent effort, and general naming ability. In short, letter naming is complex, only slightly less complex than word reading. Lastly, the recent research suggests that letter-naming fluency is dependent upon familiarity of the orthographic and

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phonological properties of letters, so that increased efficiency comes about through increased familiarity with the properties of letters. For beginning readers this means that letter shapes must be associated with letter names and sounds, and these associations need to be overlearned in order to support rapid fluent letter reading that leads to word reading accuracy, word reading fluency, and reading comprehension. Letter reading may be complex, but given appropriate experiential and instructional opportunities that emphasize phonological skills and letter-sound associations, children will be well prepared to read letters efficiently and to read words accurately and fluently.

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