WHERE RESEARCH HAS FAILED IN THE STUDY OF TEACHING
BEGINNING PHONEMIC AWARENESS AND DECODING
Compiled by Charles Arthur (April 2018)

Annotated REFERENCES: Notes and Highlights

Chall, Jeanne S., **"The Roswell-Chall Diagnostic Reading Test of Word Analysis Skills**: Evidence of Reliability and Validity." *The Reading Teacher, 11, 179-183,* (1958)

Chall, Jeanne S., Roswell, F.G., & Blumenthal, S. **Auditory blending ability**: A factor in success in beginning reading. *The Reading Teacher, 17, 113-118*. (1963)
These authors reported a correlation of about .6 between performance on blending tasks and later reading performance, without phonemic awareness instruction.

Chall, Jeanne S. **Learning to Read**: The Great Debate, 1963. (Up-dated in 1983). Chall was the true pioneer in this effort.

Venesky, R. L., **English orthography**: Its graphical structure and its relation to sound. Reading Research Quarterly, (1967), 2, 75-106.

Haskins Laboratory

The Science of the Spoken and Written Word (excerpt from on-line pamphlet)

Research on reading acquisition and reading disabilities

"Two realizations prompted research on reading at Haskins in the 1960s. "

First, literacy skills stand in stark contrast to the innate basis of spoken language abilities. Whereas people everywhere learn to talk and do so proficiently, to this day the majority of the world's population remains illiterate. Even in the U.S. with widespread educational opportunities, large proportions of students fail to become skilled readers. Researchers at Haskins began to ask why learning to read and write is so much more challenging than learning to perceive speech and to produce it.

The second impetus for research on reading hinged on the discoveries at the Labs of the coarticulatory nature of speech production. In speech production talkers overlap the production of speech sounds temporally. A consequence is that the acoustic speech signal does not have segments in it that correspond to the consonants and vowels (phonemes) of the spoken language that letters of the alphabet represent. This makes it difficult for children to discover the individual phonemes represented in our alphabetic writing system. Because letters and letter patterns in written English correspond with individual speech sounds, the child or adult learning to read has to become aware of those individual speech sounds in spoken words in order to understand how the writing system works and to master the patterns. To skilled readers, this insight seems trivially easy, yet research at the Labs proved otherwise.

Young children focus on the meanings of words and find it much more difficult to become aware of the phonemes making up those words. Importantly, those youngsters who in the early grades of school still are not fully aware of the individual speech sounds in spoken words are the ones struggling with learning to read. For example, the student who is not aware that the final sound in 'dog' is 'g' will not grasp why it is spelled with the letter g. Subsequent studies found that limitations in phoneme awareness are one of the hallmarks of reading weaknesses at any age, even for adults.

The finding of the importance of phoneme awareness for learning to read led to numerous areas of investigation on phoneme awareness and other components of reading.

Fowler, C. A., **Obituary for Alvin Liberman**. 1917-2000, American Psychologist. (2001)

"Alvin Liberman, …professor emeritus at the University of Connecticut and Yale University and **former president of Haskins Laboratories.**, was a pioneer in the experimental study of speech and, with his wife, the late Isabelle Liberman, in the development of the modern understanding of the role of speech in learning to read, died January 13, 2000.

(In his early days with Haskins, he) supervised the training of users of a reading machine for the blind to be developed at the laboratories. This early device was designed to provide a distinct, arbitrary sound for each letter of the alphabet, thereby substituting an acoustic alphabet for the written one. … this training failed to produce fluent, practically useful reading. If the sounds were sequenced slowly enough that listeners could identify the individual sounds and determine their order, the rate was too slow for practical use. Listeners had little hope of remembering the beginning of a sentence by the time its end came around. Faster sequencing caused the sounds to integrate into a holistic blur, and different blurs characterized the same word presented at different rates." (This raised questions about human listening to speech.)

"Al recognized that the failure of these efforts raised deep and interesting questions. Why had the variety of acoustic alphabets hat he and his colleagues tried failed to be useful when speech is used so readily? Is speech not an acoustic alphabet itself? These questions led to investigations of the acoustic support for speech perception that charted and put the Liberman stamp on the course of scientific research on speech, a stamp that endures to the present time." (Further work provided) findings that served to crack the speech code. The researchers learned that speech is not an acoustic alphabet. Rather, because speackers coarticulate and vocalic segments spatially (??) and temporally – the speech signal is not composed of descrete, segment-size units, and the acoustic structure for consonants and vowels is highly context sensitive."

"These findings distinguished speech signals from acoustic alphabets, but they did not explain why speech perception is easy and efficient whereas perception of acoustic alphabets is difficult and inefficient. …Research … suggested an explanation. The research yielded findings that convinced Al that speech perception is special – distinct from perception of other acoustic signals—and is a consequence of the human biological adaptation to language. … (In the 1970s, it was found) that, apparently, the same acoustic fragment can be heard simultaneously in two ways: phonetically as part of a syllable and auditorily as a stray sound accompanying the syllable. … Al identified speech perception as a component of the human biological adaptation as a component of the human biological adaptation for language use. Coarticulation, which allows efficient production of speech segments, also causes acoustic signals that are complex codes on the consonants and vowels of the language. In Al's view, the speech code necessitated evolution of a perceptual system that could disentangle effects of coarticulation on consonants and vowels."

"In the 1970s, with Isabelle Liberman and Donald Shankweiler, Al as why reading is difficult whereas speech perception is easy….. The Libermans ascribed the greater difficulty of reading than of listening to speech to the human biological adaptation to speech. A phonetic module extracts consonants and vowels automatically from acoustic speech signals, and, like other modules, its inner workings are opaque to consciousness."

(also see) Shankweiler, D., & Fowler, C. A., **Seeking a Reading Machine for the Blind and Discovering the Speech Code** *History of Psychology*. Vol. 18, No. 1. (2015)

Liberman, Alvin M.,Harris, Katherine Safford,Hoffman, Howard S.,Griffith, Belver C**. The discrimination of speech sounds within and across phoneme boundaries.** Journal of Experimental Psychology, Vol 54(5), 358-368 (Nov. 1957)

Ss can discriminate phonemes presented singly and in random order. Ss discriminated better between speech sounds to which they have attached different phonemic labels than between sounds in which they normally put in the same phoneme class.

Liberman, Alvin, Cooper, F.S., Shankweiler, D., and Studdert-Kennedy, M. **Perception of the speech code**. *Psychological Review*. 74:431-461. (1967)

Siegfried Engelmann, **Preventing Failure in the Primary Grades**. Simon & Schuster, 1969. Chapter 4, Reading for the Nonreader. This book takes a similar approach to beginning reading as found in the DISTAR reading program, with more examples for teaching phonemic-awareness and decoding skills

Douglas Carnine, Jerry Silbert, Edward Kame'enui, & Sara Tarver. **Direct Instruction Reading** (5th ed.) Merril, 1st ed. 1979, 5th ed. 2010. Chapter 6. "Phonemic Awareness and Alphabetic Understanding". (electronic copy available on website: arthurreadingworkshop.com) This chapter contains a detailed description of one "effective instructional approach" that meets criteria for teaching both tier one and tier two children in a classroom. It was also contained in the earlier 1st ed. of 1979.

Direct Instruction Reading, early development

Siegfried Engelmann. **Teaching Needy Kids in our Backward System**: 42 Years of Trying. ADI Press, (2007). https://www.nifdi.org/store. (copy available on website: arthurreadingworkshop.com)

In the first chapter, "1964-1968, Before Project Follow-Through", Engelmann describes how teaching methods were worked out in the first two years of their pre-school program at the University of Illinois, located in the ghetto of Champaign-Urbana. This led to field-testing sites in various parts of the country, before entering Project Follow-Through in 1968 with DISTAR programs for reading, math and language. Chapters 2 through 6 described this process and experience. The last chapter, chapter 7, discusses what came after Project Follow-Through.

Chapter One:

(In working out new reading methods, several) "discoveries" stand out. One fact was clear to all (of their team): You can't say the sounds for all the letters, (in a word) and, for some reason, the words were not a sum of the individual sounds."

(Because of the scripted lessons), "trainees were also able to concentrate on student mastery. Mastery is essential for lower performers. Unless the practice children receive occurs over several lessons, lower performers will not retain information the way children from affluent backgrounds do. …. If you present something new to advantaged children and they respond correctly on about 80 percent of the tasks or questions, their performance will almost always be above 80 percent at the beginning of the next session. In contrast, if you bring lower performers to an 80 percent level of mastery, they will almost always perform lower that 80 percent at the beginning of the next session."

"The reason for this difference is that higher performers are able to remember what you told them and showed them. The material is less familiar to the lower performers, which means they can't retain the details with the fidelity needed to successfully rehearse it. After at-risk children have had a lot of practice with the learning game, they become for more facile at remembering the details of what you showed them. When they reach this stage, they no longer need to be brought to such a rigid

criterion of mastery. At first, however, their learning will be greatly retarded if they are not taught to a high level of mastery." (chapter one)

(In regards to yearly kindergarten group performance standards): "A top homogeneous group in a classroom would be expected to complete more than one level of the program during the school year, a middle group would be expected to complete a level, and a low group less than a level. Teachers were not to skim through the program but teach to mastery." (chapter two)

Siegfried Engelmann, Forward, **Introduction to DIRECT INSTRUCTION**. Nancy E. Marchand-Martella, Timothy A. Slocum & Ronald C. Martella. Pearson Education, Inc. 2004.

Engelmann describes how phonemic-awareness with "say the sounds without stopping" was found and why it solved an instructional problem experienced by the developers of the DISTAR Reading Program in the early 60s. (Later changed to Reading Mastery K)

"The overall strategy that evolved was to let these children's performance show where they could begin an instructional sequence –- a point at which we could start a small-step staircase of skills that didn't attempt to teach everything in one 'lesson', or even in a few days, but that built progressively, **little by little** during each lesson. The idea was that, if children were able to learn only so much new information at a time, we would teach only that much. But if we designed the sequence properly, any child who could stand firmly on the first step of the staircase – performing perfectly on the basic skills – could learn enough to reach the next step and the next and, ultimately, reach the goal of the sequence."

"The result would be that we would be able to teach children anything. The trick was simply to start them where they would be successful and to design a sequence that would not overwhelm them by trying to teach too much new material during any lesson…… In addition to be sequential and characterized by small steps, the instructional sequences had to be scrupulously efficient. (teaching more within the time allotted.)"

"If we expected beginning readers to 'sound-out' a word by saying the 'sounds' of the letters in sequence and then identifying the word, we have to make sure that they have the skills they need. Again, we were able to identify some of these skills by observing the mistakes they made. Some children we worked with could not identify the word if they sounded it out in the traditional was – with pauses between each sound – for instance, in saying the sounds for the word mat, 'mmm, aaa, t.' By teaching these children so sound out without pauses, they would actually be saying the word slowly (mmmaaaat); this made it a lot easier for them to identify the word."

"But even with this modification, some children could not identify the word. Even when teachers tried to correct by modeling the sounding-out procedure, the children would either produce no response or would say the last part of the word, at."

"The correction didn't work because the children lacked (a more basic or simpler) skill. The simplest form of the task they failed was a verbal task that involved no written word. (just the spoken word) … The solution is to introduce easier examples and work up to the harder ones. Again, the children's responses showed us when we had reached the appropriate starting point, which was verbal words presented in two parts with a pause between them. 'Listen, ham burger, Say it fast.' With the starting point in place, the children practiced saying it fast with simple words, starting on the first day of reading instruction (many days before they would read their first word). These examples were followed by progressively harder words until the children practiced three-sound words and two-sound words (the hardest for them). 'Listen: nnnnnoooo. Say it fast." When they completed this sequence, children had the phonemic skill they needed to approach written words."

Siegfried Engelmann, "**The Dalmatian and Its Spots**" Excerpts from Column in Education Week, 2004. (copy available on website: arthurreadingworkshop.com and nifdi.org)

"At least part of the problem educators have in establishing effective instruction has to do with the illogical recommendations that researchers make. This illogical reasoning occurs in just about all research-based recommendations since 1985, when "Becoming a Nation of Readers" was published. "

"This illogical practice is the confusion about what follows from a true statement. Here's a non-educational example:
If a dog is a Dalmatian, it has spots. Therefore, if a dog has spots, it is a Dalmatian.
The first statement is true. The second statement doesn't follow from the first."

Why research-based recommendations fail logic 101.

"The probable response from most readers is that nobody could be naive enough not to recognize this flaw. English setters, some terriers, sheepdogs, and many mutts have spots. Unfortunately, there are many educational parallels to the argument that all dogs with spots are Dalmatians. Here's one:

If a beginning-reading program is highly effective, it has various features: phonics, phonemic awareness, and so on. Therefore, if a program has these features, it will be highly effective."

"Current reform practices revolve around this logic, but the logic is as flawed when it refers to effective programs as it is when it refers to Dalmatians. "

"Here's how the flawed reasoning occurs. Investigations like that of the 2000 report of the National Reading Panel start by sorting through research studies to identify specific programs that work. Call this group of programs *Dalmatians*.
Next, the investigators analyze the group of Dalmatians to identify their common features. Call each feature a *spot*. They find that the more effective beginning-reading programs have common features (phonics, phonemic awareness, decodable text, oral practice formats, and others). So they have formulated the true statement parallel to: *If a program is a Dalmatian, it has spots.* (If it is an effective program, it has the common features A through N.)"

"Next, investigators formulate their flawed recommendations, which assert (or imply) that if a program has phonics, phonemic awareness, decodable text, oral practice formats, and so forth, it will be highly effective. In other words, the investigators' conclusion is parallel to the conclusion, *If a dog has spots, it is a Dalmatian*. "

"The conclusion has no logical basis. There is a lot more to a Dalmatian than having spots, and a lot more to programs that generate superior outcomes than having the features that are specified in recommendations. The additional features would include the amount of new material introduced on each lesson, the nature of the reviews that children receive, the ways in which the program tests mastery, the number of times something is presented in a structured context before it occurs in other contexts, and many more technical details about how the material is sequenced and field-tested."

"But the investigators do not simply flunk Logic 101. They set the stage for a daisy chain of illogic. Because the analysis has removed spots from Dalmatians, they are no longer Dalmatian spots, just spots. So the analysis moves from a more careful articulation of each *Dalmatian* (effective program) to an elaboration of *spots*, now freed from the constraints of the effective program."

"Phonemic awareness is a spot. The analysis of the spot goes something like this: "Let's see, there are different types of phonemic-awareness activities. There's oral blending, rhyming, alliteration, segmentation, phoneme insertion, and phoneme deletion. Therefore, any combination of these activity types would meet the requirement of phonemic awareness, and the best versions of phonemic awareness would have all types."

"If researchers conduct experiments to validate their notion of phonemic awareness, they typically don't compare their results with those of a highly effective program in terms of total time required and the performance outcomes. They are satisfied if their intervention results in a gain in performance on some standardized measure."

"Note that the illogical formula for the design of programs would create benefits for districts that were using programs that had no spots. A program constructed from spots would probably produce results better than those of the programs the districts are using. So if a little better is what districts want, that's what the "spots first" reasoning will probably deliver. Unfortunately, the criteria become a double-edged sword that may reject truly effective programs."

"The full circle of the daisy chain occurs when a state takes these "research based" recommendations and uses them as adoption criteria for programs that are supposed to be effective, but rejects a true Dalmatian because it does not meet the "standards" the state has set. For instance, a "standard" might indicate that the program had to have the full range of phonemic-awareness exercises (including activities that are ill-suited for beginning at-risk students, like phoneme deletion). If effective program X does not have *all of them*, it fails to meet a "research based" standard, even though it is highly effective and there is no evidence that the adopted programs are effective."

"**April 2000 "Report of the National Reading Panel: Teaching Children to Read" discusses phonemic awareness, and the panel makes this recommendation: 'There are many ways to teach [phonemic awareness] effectively. In implementing [phonemic-awareness] instruction, teachers need to evaluate the methods they use against measured success in their own students**.'"

"The assumptions are that a mix-and-match creation by the typical teacher will be effective, and that the teacher knows how to evaluate the methods he or she uses against measured success. There is no data showing that typical teachers are able to successfully combine components to make superior instruction, and none to suggest that a significant number of them have the knowledge or the resources needed to operate on the implications of "measured success," particularly if they are unaware of what a truly effective program is able to achieve. Before issuing this recommendation, a research-based panel would first have gathered data to address some practical issues:

How many years would it take for an average teacher to "discover" or "create" an excellent combination (given that it would be hard to try out more than one or two combinations a year in a classroom)? What kinds of records would be needed to make this enterprise systematic? How does this pursuit fit in with the district-adopted program and practices? Where does the teacher get the funds and the time that may be necessary to evaluate the results?"

Paul Weisberg & Christopher F. Savard, **"Teaching preschoolers to read**: Don't stop between the sounds when segmenting words." *Education & Treatment of Children*, 16(1), 1. (1993) (copy available on website: arthurreadingworkshop.com)

Excerpts:

"Among the factors typically cited for the estimated 27 million adults unable to read beyond fourth grade (the level of functional literacy) or the 45 million unable to read beyond eighth grade, are either an absence of or an imperfect mastery of decoding skills (Chall, Heron, & Hilferty, 1987).

Those proposing phonic approaches to the teaching of beginning reading have emphasized that the new reader sound out or decode words by saying the constituents in a word, either the series of individual sounds, sound combinations, syllables, or other phonological components (Adams, 1990; Carnine & Silbert, 1979; Gleitman & Rozin, 1973). Despite the emphasis in phonic- or code-based reading programs on segmenting and blending activities, phonic advocates are far from united in how the segmenting and blending processes should be carried out (Beck & McCaslin, 1978).

In one developmental reading program (Engelmann & Bruner, 1983), segmenting skills are employed as one attempts to say the discrete sounds in a word continuously in a left-to-right order, as is depicted in Figure 1. Blending skills are used to recombine the subdivided units to arrive at the word at its normal spoken rate. For example, after initially segmenting mad, as mmaad, the reader during the blending component would be expected to say mad!

In some phonic-based programs, the segmented units are said with silent pauses of unknown duration between them, as in "mm (pause). . .aa (pause). . .d." The apparent justification for interjecting pauses between sounds is to facilitate the segmenting process: to demonstrate to the naive reader that words are divisible into parts. However, although pausing may serve this

discriminative function, it could also create behavioral problems during blending. Having paused between each sound, the reader could now find it difficult to recombine or blend the interrupted sounds in order to produce the whole word.

With respect to standardized procedures that evaluate oral blending, pausing between segmented sounds or syllables is a typical presentation feature, and pausing is also inherent in the procedures of developmental and training studies of oral blending (Weisberg, Andracchio, & Savard, 1989). Despite the apparent simplicity involved in recombining an ordered but non-continuous set of spoken sounds to form a word, oral blending tasks have been troublesome for low-performing readers. For example, low SES, inner-city children in Grades 1, 2-3, and 4 could blend correctly only 8%, 25%, and 42%, respectively, of the sounds in CVC words (e.g., r-u-g) (Chall, Roswell, & Blumenthal, 1963). Even children from higher SES levels experience blending difficulties (Weisberg et al., 1989). When a narrator paused between successive sounds in one-syllable words for as little as one second, the percent of correctly blended words was a dismal 16% for non-reading kindergarteners and only 50% for first graders. When the narrator did not pause, the levels rose to 60% and 73%, respectively, for both groups. Direct training in oral blending also made a difference; kindergarteners accustomed to hearing a teacher segment words without pausing were 85% correct in identifying both familiar words and pseudo-words.

The effects of pausing between sounds when decoding printed words has not been investigated. In Beck and McCaslin's (1978) descriptive analysis of how eight major beginning reading programs teach code-breaking abilities, the procedures used to generate synthesizing abilities were summarized, but the effect of pausing was neither highlighted nor its likely impact considered. An analysis of those same programs by the first author revealed that except for Distar Reading, now called Reading Mastery, in which the teacher and children are continually prompted not to pause between sounds, the other seven programs have the teacher either explicitly model pausing, set up the conditions for pausing to occur, or leave the possibility of pausing up to the children. Thus, it can be said that pausing between the sounds to decode printed words is a common and socially valid classroom practice.

Teaching naive or unskilled readers to say the sounds in words continuously without pausing should make the segmented word functionally more like the actual blended word (mmaad and mad) than when pausing is involved (mm-aa-d and mad). There is, thus, the increased probability that non-pausing during segmenting will enable the reader to come up with the correct word, whereas pausing should invite sound deletions, hesitations, and guessing.

The present study evaluated the long-term effects of pausing between sounds by comparing the segmenting and blending abilities of preschool children taught to pause one second as against those taught not to pause. Once the benefits of not pausing were apparent, the effectiveness of this procedure was further evaluated by determining if it could remediate the poor decoding abilities of children taught to pause. The expectation was that the longer the children were trained to pause, the more difficult the remediation efforts would become.

(In this study), Nine preschoolers were taught the sounds for letters and a segmenting blending strategy for decoding words. .... Once mastered, segmenting by not pausing engendered high and sustained levels of word identification in the five children. In the others, segmenting by pausing led to poor blending, which improved following remediation through training in segmenting by not pausing, which was introduced according to a multiple-baseline design across the four children. Their rate of reading improvement was negatively related to the number of prior segmenting-by-pausing lessons. Other findings implied that: (a) sound identification abilities were necessary but not sufficient for decoding and (b) not-pausing-based blending errors were different and probably easier to correct than pausing-based blending errors."

Savin, H. B. What the child knows about speech when he starts to learn to read. In J.F. Kavanagh & I. G. Mattingly (Eds.) Language by ear and by eye. Cambridge, MA MIT Press (1972)
The author noted that many children who were having reading problems could not segment a word into its phonemes.

Shankweiler, D. and Liberman,I. Y. **Misreading: a search for causes**. In Language by Ear and by Eye: the Relationship between Speech and Reading, J. R. Kavanagh and I. G Mattingly, Cambridge, Massachusetts. MIT Press. (1972)

Isabelle Liberman, **Segmentation of the spoken Word and Reading Acquisition**. Haskin Laboratory, Bulletin of the Orton Society, (1973).

Also cited:

Liberman, Alvin, The Grammars of speech and language. *Cognitive Psychology*, 1:301-323. (1970)

Klima, E. S., How alphabets might reflect language. In **Language by Ear and by Eye**: the Relationship between Speech and Reading, J. R. Kavanagh and I. G Mattingly, Cambridge, Massachusetts. MIT Press. (1972)

Excerpt:

"Beyond identification of letters, learning to read requires mastery of a system which maps the letters to units of speech. .... Children can generally make appropriate sounds in response to single letters, but are often unable to proceed when they encounter the same letters in the context of words. .... Even when the items to be read are carefully chosen so as to include only those words which map the sound in a simple, consistent way and are part of the child's active vocabulary, many children continue to have difficulties.

Reading requires of the child an awareness of the structure of his language, an awareness that must be more explicit than is ever demanded in the ordinary course of listening and responding to speech. Since an alphabet is a cipher on the phonemes of a language, we should think that learning to decipher an alphabetically written word (as opposed to memorizing its visual configuration as may be done in learning so-called "sight" words) would require an ability to be quite explicit about the phonemic structure of the spoken word.

An alphabetic method of writing, which rests upon an explicit phonemic analysis of the language, has been invented only once and is a comparatively recent development in the history of writing systems. (Even though a child may be able to identify the correct sound for letters) if he is then pressed to try to "sound it out", or otherwise to use what he knows about the letter-to-sound correspondences, he is likely to produce /b/ /a/ /t/. At that point, he may be urged by the teacher to "say it faster", "put the sounds together", or in the phrase commonly used, to "blend it". But no matter how fast he produces those sounds or how desperately he tries to put them together, he produces a nonsense word "buhatuh" containing five phonemic segments and not the word "bat", which has only three. Somehow, he cannot relate the three letters of the printed word to the three phonemic segments of the spoken word.

But why should it be so difficult for the child to become explicitly aware of phonemic **segmentation**? …As extensive research in speech perception has shown, the segmentation of the acoustic signal (what can be dominantly heard) does not correspond directly or in any easily determined way to the segmentation (individual phonemes) at the phonemic level. (this assumes that segmentation of the phonemes is the key issue, not simply the detection of the individual phonemes, un-segmented. The point is: the individual phonemes are not heard and detected in the ear, in any way, because of the dominant "acoustic" sound that over-covers the phonemes.) Moreover, this lack of correspondence (in the ear) does not arise because the sounds of the phonemes are merely linked together, as are the letters of the alphabet in cursive writing or as may be implied by the reading teacher who urges the child to blend "bahatuh" into a (indistinguishable) word that he knows. Instead, the phonemic segments are encoded at the acoustic level into essentially unitary sounds of approximately syllabic dimensions (one for each phoneme) In the case of "bat", for example, the initial and final consonants are folded into the medial vowel, with the result that information about successive segments is transmitted more or less simultaneously on the same parts of the sound. (Liberman, A. 1970) In exactly that sense, the syllable "bat", which has three phonemic segments, has but one acoustic segment (heard within the human ear).

This is not to say that the phonemic elements are not real, but only that the relation between them and the sound is that of a very complex code, not a simple, one-to-one substitution cipher (Liberman, et al 1967). To recover the phoneme segments (segments?), to sort them out from the complex code, requires a correspondingly complex decoding process. In the normal course of perceiving speech, these processes go on tacitly and automatically. To understand speech, the listener need not be any more aware of the phonemic structure than he is of the rules of syntax.

Since the acoustic unit into which the phonemic elements are encoded is of approximately syllabic dimensions, one might suppose that the number of syllables (though not necessarily the exact location of the syllable boundaries) would be more readily apprehended than the phonemes. Syllable segmentation may be easier than phoneme segmentation for another reason as well. There are peaks of acoustic energy (hence loudness) that correspond at least roughly to the vocalic nucleus of the syllable. Thus the syllable is acoustically marked, while the phoneme is not." (it remains partially hidden)

(An attempt to find which age children, from preschool to first grade, ages 5-7, would typically be able to identify the number of phonemes (questionably using the term "segmentation" for identification) in a single syllable words, the authors conducted an experiment with 135 children, approximately equally representing each age. They found that none of the preschoolers could pass their test, 17 percent kindergarteners and 70 percent first graders could. The 30 percent of first graders that failed was "substantial". **This same result was found in a 1994 study by Torgensen**. (see below) It also highly correlated with the reading level at the end of first grade. It was surmised that knowledge of first and last phonemes in a three-phoneme word would not be sufficient in making "explicit the sound structure of the language". What would?)

Isabelle Liberman, Donald Shankweiler, et al. **Explicit Syllable and Phoneme Segmentation in the Young Child.** *Journal of Experimental Child Psychology* 18, 201-212 (1974)

Excerpt:

"To write a language, one must first **abstract the unit to be used from the acoustic stream of speech**. Writing systems based on the meaningless units, syllables and phonemes, were late developments in the history of written language. The alphabetic system, which requires **abstraction of the phonemic unit of speech**, was the last to appear, evolved from a syllabary and, unlike the other systems, was **apparently invented only once.** It might therefore be supposed that phoneme segmentation is particularly difficult and more difficult, indeed, than syllable segmentation. Speech research suggests reasons why this may be so. ….. analysis into phonemes was significantly harder and perfected later than analysis into syllables. The relative difficulties of the different units of segmentation are discussed. "

Sally Shaywitz in her book, **<u>Overcoming Dyslexia</u>**, explains how phonemes are particles of speech not elements. Phoneme particles can be combined to form a word without losing their individual identity, like blended colors.

Segmented phonemic units only exist in the abstract. They are not segmented in speech, with clear boundaries like syllables. They are continuous stream of sounds and remain attached and overlapping with each other. The ear picks them up as one word or syllable, as a single burst of sound, that has meaning. The individual phonemes are not obvious to the ear of a non-reader. The brain automatically detects the individual phonemic particles, for the listener, and translates them to a word or syllable. An alphabetic writing system, with practice and explicit instruction, exposes the phoneme particles to the reader. This assists in learning to read and in reading fluently.

"What, then, is known about speech that might lead us to expect that a child who readily perceives speech might nevertheless find explicit segmentation into phonemes more difficult that explicit segmentation into syllables? If the **acoustic structure of speech** bore a simple one-to-one relation to the phonemic structure, just as the letters do (at least in the regular base), it would indeed be hard to see how why phonemic analysis should pose special problems.

However, as extensive research in speech perception has shown (1962, 1967) the segmentation of the **acoustic signal** does not correspond directly or in any easily determined way to the segmentation at the phonemic level. Moreover, this lack of correspondence does not arise merely because the sounds of the phonemes are superficially linked……Instead, the phonemic segments are encoded at the acoustic level into larger units of approximately syllabic size. .. information about successive segments is transmitted more or less simultaneously on the same parts of the sound. (A. Liberman 1970). In exactly this sense, the syllable bat, which lhas three phonemic segments, has but one acoustic segment. There is, the, no acoustic criterion by which one can segment the sound into its constituent phonemes. To recover the phonemes from the sound into which they are so complexly encoded requires a decoder, which segments the continuous acoustic signal according to linguistic rules. Though we can only guess how such a decoder might works, we know that it functions quite automatically for all speaker-hearers of a language, even very young children. (1967, 1974). In perceiving a spoken message, therefore, the listener need not be explicit about its phonemic structure – no more explicit, indeed, than he need be about its syntax. (thus making it) apparent why explicit segmentation into phonemes might be difficult.

Sounding-out. (Experimenters found that children) cannot map the printed word bat, which has three segments (non-segmented phonemes), onto the spoken word bat, though it is already part of their lexicon, unless they are explicitly aware that the spoken word consists of three segments. (this is highly questionable. Not that knowing the three phonemes isn't important, it is possible to use a continuous sounding-out procedure to identify the word without knowing that the word bat 'consists of three segments.')"

Liberman, I. Y., Shankweiler, D., Fischer, F. W. & Carter, B**. Reading and the awareness of linguistic segments.** Journal of Experimental Child Psychology, 18, 201-212. (1974)

Venezky, R. L. Prereading skills: Theoretical foundations and practical applications. (Theoretical Paper No. 54). Madison, Wis: Wisconsin Research and Development Center for Cognitive Learning, Univ. of Wis, May, (1975)

This report suggests that segmentation is an important component of a successful decoding strategy.

Roberts, T., **Skills of analysis and synthesis in the early stages of reading**. British Journal of Educational Psychology, (1975), 45, (11) 3-9.

Helfgott, J. A. **Phonemic segmentation and blending skills of kindergarten children**: Implications for beginning reading acquisition. *Contemporary Educational Psychology*, (1976), 1, 157-169.

Both of these studies reported that Five and six year olds could learn blending (telescoping) more rapidly than segmenting. Auditory blending was easier for children than sounding out printed words.

Isabelle Liberman, Donald Shankweiler, Alvin Liberman, et. al., **Phonetic Segmentation and Recoding in the Beginning Reader.** IN A.S. Reber & D.I. Scarbough (Eds) Toward a psychology of reading. (1977)

This article goes into more detail analysis of the structure of the sounds in spoken words. It continues to characterize the structure by the abstract term "segmented" rather than as particles or identities of continuous sounds that have elusive acoustic signals. The attempt seems to be to think of phonemes as segmented units, in the abstract, in comparison to real units like sentences, words, or syllables. Yet phonemes do not exist in similar units, even though their letter representations are in clear segments. Here is the rub. They do not have nearly the same defined beginning and ending boundaries or clear "acoustic" signals to the human ear. This amounts to a flaw in their thinking that has teaching implications. In applying phonemes to the converting process of print to speech (reading) it would be more easily done, at least at the very beginning in getting non readers started, if they are thought of, more realistically, as **continuous flows of sound**.

"what other abilities, not required for mastery of speech, must he (the beginning reader) have if he is to cope with language in its written form?.... he must convert print to speech or, more covertly, to the phonetic structure that in some neurological form (?) must be **presumed to underlie and control overt speech articulation**. For convenience, we will speak of phonemes, phonetic segments, and phonetic structures without meaning to imply any differences in the abstractness of the units being referred to. " (???)

The Need to Segment Phonetically

"In the early stages of learning to read, there are at least two possibilities (for strategies the beginning reader might use to recover a phonetic representation of the written word) the child might work analytically, by first relating the orthographic components of the written word to the segmental structure of the spoken word, or he might do it holistically. **What special ability does the child need?** In our view, it is the ability to become **more explicitly aware of the fact that speech consists of phonetic segments. (????)**

It is patent that if he is to map the printed three-letter word *bag* onto the spoken word bag, which is already in his lexicon, he must know that the spoken syllable also has three segments. (or a flow of three phonemic particles?) There is most commonly no

acoustic criterion by which the phonetic segmentation of a given word is dependably marked. Phoneme boundaries are not marked acoustically because the segments of the phonetic message are often coarticulated with the result, for example, that la consonant segment will, at the acoustic level, be encoded into –that is, merged with – the vowel. The word bag, for example, has three phonetic segments but only one acoustic segment. Thus, there is no acoustic criterion by which one can segment the word into its three constituent phonemes.

We should remark here that the encoding or merging of phones at the level of sound not only complicates the task of **explicit segmentation but also makes it impossible to read by sounding out the letters one by one.** … **Hence, the analytic strategy we have been talking about does not – indeed, cannot – mean reading letter by letter.** To recover the spoken from the reader must, before making the conversion to speech, **take into account** all the letters that represent the several phonetic segments that are to be encoded. The child has no difficulty in speaking and listening to speech because there the segmentation of the **largely continuous acoustic signal is done for him automatically by operations of which he is not conscious**. But reading, unlike speech, **does require a more explicit analysis if the advantages of an alphabet are to be realized**.

That **explicit phonetic analysis** might be difficult is suggested also by the history of writing. More to the point of our resent concerns, one would suppose that for the child there might be the same order of difficulty and, correspondingly, the same order of appearance in development. "

Phonetic Complexity's Contribution

"Although (spelling is sometimes complex and irregular) undoubtedly contributes to the difficulties of reading acquisition, we do not believe that the complexity…. Is the principal cause. Indeed, we know that it cannot be the only cause since many children continue to have problems even when the words are carefully chosen to include only those which map the sound in a consistent way and are part of the child's active vocabulary. * It is recognized that the "irregularities" of English spelling are more lawful that might appear….. However, it must be said that this lawfulness can be appreciated only by the skilled reader and probably does not aid the beginner."

Phonetic Recoding in Reading as a Way to Tap Primary Language Processes

"One could think of at least two reasons why phonetic recoding (analytic decoding) might occur even with frequently read materials. A not very interesting reason is that, having adopted the **phonetic strategy to gain advantages** in the early stages of learning, the **reader continues with the habit** although it may have ceased to be functional or even have become, as some might think, a liability.

There is **a more interesting reason**, however, and one we are inclined to take more seriously. It derives from the possibility that working **from a phonetic base is natural and necessary if the reading (including one who is highly practical) is to take advantage of the primary language process that are so deep in his experience and, indeed, in his biology**.

Consider, for example, the normal process for storing, indexing, and retrieving lexical entries may be carried out on a phonetic base. If so, it is hard to see why the reader should develop completely new processes suited for visual system and less natural, presumably, for the linguistic purposes than the old ones.

There are, of course, other natural language processes that the reader can best exploit by constructing a phonetic representation. Among them is short-term storage. …the phonetic representation… is uniquely suited to the short-term storage requirements of language. …. Indeed, the tendency to recode visually presented items into phonetic form is so strong that adult subjects consistently do so recode even in experimental situations in which it is clearly disadvantageous to do so.

Even skilled readers might recode phonetically, and that in so doing they might gain an advantage in short-term memory. Among the primary language processes that the child can exploit by conversion to speech is the use of a phonetic representation to **store smaller segments until the meaning of larger segments can be extracted**. … Now we have evidence that, among second graders, **good readers rely more on a phonetic representation than poor readers do**.

Phonetic representation ??

Gleitman, L, & Rozin, P. **The Structure and acquisition of Reading**. Relations between orthographic structure and the structure of Language. In A. Reber andD. Scarboro (Eds.) Toward a psychology of reading (1977)

Fowler, C. A., Liberman, I. Y., & Shankweiler, D. **On Interpreting the error patterns in beginning reading**. *Language and Speech.* (1977)

Mark, L.S., Shankweiler, D., Liberman, I.Y. & Fowler, C.A**. Phonetic recoding and reading difficulty in beginning readers**. *Memory and Cognition*, Vol 5 (6), 623-629. (1977)

Shankweiler, D., & Liberman, I. Y., **Exploring the relations between reading and speech**. In R. Knights & D. Bakker (Eds.) *Neuropyschology of Learning Disorders: Theoretical approaches*. (1977)?

Fowler, C. A., **"Perceptual Centers" in speech production and perception**. *Perception and Psychophysics.* Vol. 25 (5). (1979)

Liberman, Isabelle, Liberman, Alvin, Mattingly, I., and Shankweiler, D. **Orthography and the Beginning of Reading.** Paper presented Sept. 18, 1978 at Cross-language Conference on Orthography, Reading, and Dyslexia, sponsored by NICHD. (similar content to above 1977 publication)

(available at Haskins Laboratories, Status Report on Speech Research SR-57 (1979)

Isabelle Liberman & Donald Shankweiler. **Speech, the Alphabet, and Teaching to Read**. In Lauren Resnick & Phyllis Weaver (Eds.) Theory and Practice of Early Reading, Vol. 2 (1979)

Shankweiler, D., Liberman, I.Y., Mark, L.S., Fowler, C.A., and Fischer, F.W., **The Speech Code and Learning to Read.** *Journal of Experimental Psychology: Human Learning and Memory*. (1979)

Liberman, I.Y., Shankweiler, D., Camp, L., Blachman, B., and Werfelman, M., **Steps Toward Literacy: A Linquistic Approach.** IN P. J. Levinson, & c/. Sloan, (Eds.) Auditory Processing and Language: Clinical and Research Perspectives. (1980) Chapter 10, In J.F. Kavanagh & R. L. Venezky (eds.) Orthography, Reading, and Dyslexia, (1980)

Williams, J. P., **Teaching Decoding With an Emphasis on Phoneme Analysis and Phoneme Blending**. *Journal of Educational Psychology*, Vol. 72, No. 1, 1-15. (1980)

Stanovich, K., Cunningham, A., & Cramer, B. **Assessing Phonological Awareness in Kindergarten Children: issues of Task Comparability.** *Journal of Experimental Child Psychology*, 38, 175-190 (1984)

Also Cited:

Blachman, J. The Role of psycholinguistic skills in reading acquisition: A look at early readers. *Reading Research Quarterly*, 18, 466-479. (1983)

Bradley, L., & Bryant, P. Difficulties in auditory organization as a possible cause of reading backwardness, *Nature (London)* 271, 746-747. (1978)

Bradley, L., & Bryant, P. Categorizing sounds and learning to read: A causal connection. *Nature (London)* (1983)

Helfgott, J. Phonemic segmentation and blending skills of kindergarten children: Implication for beginning reading acquisition. *Contemporary Educational Psychology*, 1, 157-169. (1976)

Lewkowicz, N. Phonemic awareness training: What to teach and how to teach it. *Journal of Educational Psychology*, 72 686-700 (1980)

Treiman, R., & Baron,J. Segmental Analysis: Develoment and relation to reading ability. IN T. Waller & G. Mackinnon (Eds.) Reading Research: Advances in theory and practice (Vol.3) New York, Academic Pr. (1981)

William, J. Teaching decoding with an emphasis on phoneme analysis and phoneme blending. Journal of Educational Psychology, 72, 1-15 (1980)

This review does not test any PA tasks for teaching purposes. As impressive as it is, for diagnostic and predictive purposes in kindergarten and first grades, it does not include any blending or segmenting phonemic awareness tasks. Although the tasks examined here do find their way into later recommendations for teaching PA.

Excerpts:

The interest in this particular cognitive skill has been fueled by recent evidence indicating that the early development of phonological awareness is causally linked to rapid reading acquisition (Bradley & Bryant, 1983; Perfetti, Beck, & Hughes, 1981; Treiman & Baron, 1983; Williams, 1980).

A large number of different experimental paradigms have been used to assess phonological awareness, including rhyming tasks, phoneme segmentation tasks, matching tasks, phoneme substitution tasks, blending tasks, and phoneme counting tasks, to name just a few (see Lewkowicz, 1980, for a useful typology). The plethora of tasks, however, has made a consolidation of the knowledge gained from studies in this area very difficult. All of the tasks that have been used involve many cognitive processes (e.g., short-term memory, stimulus comparison, processing of task instructions) in addition to the phonological analysis ability that is the focus of interest. Without careful task analysis and comparison it will remain unclear to what extent the predictive power of these tasks resides in the phonological ability or the other extraneous cognitive processes.

After a thorough review of the existing research **Lewkowicz (1980) observed that**

"There has been surprisingly little comparison, at least in print, of one phonemic awareness task with another. There has been little analysis of similarities and differences between tasks, of relative difficulty of tasks or of which tasks are most closely related to the reading process and are most likely to facilitate learning to read. In my opinion, this lack of in-depth analysis of phonemic awareness tasks and their relationship to reading has resulted in the obscuring of some important differences between the tasks, and, as a consequence, in the failure of researchers to focus on the most important tasks and questions that need to be asked about them. (pp. 686-687)

Three years later the situation remained much the same, and Backman (1983) concluded from her results that

"Tasks which on the surface appear to be measuring the same phenomenon may in fact require different degrees of linguistic awareness, or may differ in their cognitive requirements. . . We must not talk about phoneme segmentation per se in relation to reading, but segmentation within the context of a particular task. . . . Obviously, ease of understanding task requirements is intimately related to the phenomenon of "linguistic insight" we are interested in." (pp. 476-477)

"The general absence of direct comparisons between tasks in the published literature places arguments for convergence on shaky ground. ...Thus, it is essential that some attempt be made to directly assess the relationships between phonological tasks and determine their degree of convergence."

The present study attempted to address these issues. **Ten different phonological tasks** were administered to a group of kindergarten subjects. The tasks were of several different types, covering many of the categories (e.g., **word-to-word matching,**

rhyme recognition, phoneme deletion, phoneme substitution, and identification of missing phoneme) included in the classification system developed by Lewkowicz (1980).

Thus, correlations between the performance on the phonological measures in kindergarten and reading achievement at the end of first grade could be assessed. The order of presentation was rhyme supply, rhyme choice, initial consonant same, final consonant same, strip initial consonant, substitute initial consonant, initial consonant not same, final consonant different, initial consonant different, and supply initial consonant. "

DISCUSSION

"Descriptively, the ten phonological tasks broke down into three groups. Three tasks that required a rhyming response were very easy. Ceiling effects were apparent on these three tasks. The distribution of responses was negatively skewed and the variance was highly restricted. As a result of the restriction of range these three tasks displayed low correlations with the other phonological tasks and with first-grade reading ability. One task (strip initial consonant)was extremely difficult. The distribution of responses on this variable was positively skewed and displayed a tendency toward bimodality. The other six measures were of intermediate difficulty and had distributions of responses that were more nearly symmetrical.

The seven non-rhyming tasks were highly interrelated. Despite the differing task requirements there was every indication that these tasks were tapping a similar construct. Performance on each of the seven nonrhyming tasks was related to first-grade reading ability.

At the end of kindergarten the skilled readers were near ceiling on several tasks, while the less-skilled readers were getting barely half of the items correct. The correlational data also suggest that the seven nonrhyming tasks are quite impressive predictors of first-grade reading ability.

From this standpoint, the diagnosticity of the phonological measures was truly impressive. All seven non-rhyming measures correlated with first-grade reading more strongly than did a standardized IQ test (see Stanovich, Cunningham, & Feeman, 1984, where a similar result obtained when all the tests were administered at the end of first grade). Three of the phonological tasks displayed correlations with first grade reading as large as those obtained from a standardized readiness test that was designed to tap a variety of reading-related cognitive skills

The results of this investigation bode well for the future use of phonological awareness measures in both research and educational settings. (teaching?) The wide variety of tasks that have been employed appear to be tapping a similar ability.

Finally, the uniformly moderate predictive accuracy of each task, coupled with the impressive predictive power **when sets of these measures are used together**, is an encouraging sign as regards future practical applications . While we must reiterate the caution that the relationship between reading ability and phonological awareness seems to be characterized by **reciprocal causation** (seeBaron& Treiman, 1980;Ehri, 1979;Morais,Cat-y,Alegria, & Bertelson, 1979;Perfetti et al., 1981), the **causal connection at the earliest stages of reading acquisition is probably most strong from phonological awareness to increased reading acquisition**(Bradley& Bryant, 1983;Treiman & Baron, 198)"

Liberman, I.Y., & Shankweiler, D., **Phonology and the Problems of Learning to Read and Write**. *Remedial and Special Education RASE* 6 (6) (1985)

Perfetti, C.A., Beck, I., Bell, L. & Hughes, C. **Phonemic knowledge and learning to read are reciprocal: a longitudinal study of first grade children.** Merrill-Palmer Quarterly, 33, 283-319. (1987)

Wagner & Torgesen, **The Nature of Phonological Processing and its Causal Role in the Acquisition of Reading Skills.** Psychological Bulletin. 101. 192-212. (1987)

Perfetti, C.A., Bell, L. C., and Delaney, S.M. **Automatic (prelexical) phonetic activation in silent word reading: Evidence from backward masking.** Journal of Memory and Language, 27, 1-22. (1988)

Yopp, H.K., **The validity and reliability of phemic awareness tests.** Reading Research Quarertly, 23, 159-177 (1988)

Lunberg, I., Frost, J. and Petersen, O., **Effects of an Extensive Program for Stimulating Phonological Awareness in Preschool Children**, *Reading Research Quarterly*, Vol. 23, No. 3 (summer) (1988)

This study set the standard and model for how phonemic awareness should be taught and when. It was replicated in English by a team of researchers headed by M. Adams in 1998. (see below)

Liberman, I.Y. l **Phonology and Beginning Reading Revisited**. Haskins Laboratory, (1989) In C. von Euler (Ed.), Wenner-Gren International Symposium Series: *Brain and Reading*, 207-220. Hampshire, England: Macmillan.

Fowler, C. A., Best, C. T., & McRoberts, G. W. **Young infants' perception of liquid co-articulatory influences on following stop consonants.** *Perception & Psychophysics*, 48, 559-570. (1990).

Adams, M. **Beginning to Read:** Thinking and Learning about Print. (1990)
Chapter 12, Phonological Prerequisites; Becoming Aware of Spoken Words, Syllables, and Phonemes. P. 294.
" Across this book, I have argued that proficient reading depends on an automatic capacity to recognize to recognize frequent spelling patterns visually and to translate them phonologically. .... Programs explicitly designed to develop sounding and blending skills produce better word readers than those that do not. I have even argued that synthetic phonics is of special value for young readers. Yet, on top of all that, I have just argued that the basic phonic curriculum is inherently intractable, slow, inefficient, and worse: Except for students who essentially know how to read before it is begun, it is also likely to be ineffective."
"We are now in a far better position to respond to each of these issues. We now know what must be learned for proficient word recognition. We know a lot about the mental architecture and processing that must be involved in the acquisition of word recognition skills." (Beg. Rdg., 1990)

"Educators have found that attending to children's phonemic awareness removes phonics from the realm of drill and skill and **makes it learnable and interesting** to their students." (Am. Ed.,1998)

Alexander, A. W., Andersen, H.G., Helman, P. C., Voeller, K. K. S., & Torgesen, J. K., **Phonological Awareness Training and Remediation of Analytic Decoding Deficits in a Group of Severe Dyslexics**. *Annals of Dyslexia*, Vol. 41, (1991)

Ball, E.W. & Blachman, B.A. **Does Phoneme Segmentation Training in Kindergarten make a difference in early word recognition and developmental spelling?** Reading Research Quarterly. 26, 49-66, (1991)

Gough, Juel, & Griffith, **Reading, Spelling, and the Orthographic Cipher.** In READING ACQUISITION, Philip B. Gough, Linnea Ehri, & Rebecca Treiman. (Eds.) (1992).

Griffith, P. L., & Olson, M. W., **Phonemic awareness helps beginning readers break the code**. *The Reading Teacher,* Vol. 45, No. 7. March (1992)

Stahl, S., & Murray, B. A., **Defining phonological awareness and its relationship to early reading**. *Journal of Educational Psychology*, Vol. 86, Iss. 2, (1994)

Comment: In this study, Stahl increases our understanding of phonemic awareness beyond the classification of various tasks used to evaluate a child's skill and knowledge of PA. He then seeks to understand how this way of understanding PA correlates to beginning reading. He is not concerned about what task is most useful in teaching PA and facilitates learning to read. Unfortunately, he makes the same mistake that other researchers, like Linnea Ehri and Philip Gough, make in studying ways in which "early literacy" is acquired. He only studies children who learn to read a particular way, usually found in basal readers of the time. He somehow neglects to acknowledge that many children are taught differently.
He finds that children in his study learn to decode words according to the alphabetic principle in a gradual way from a collection of memorized sight words. From these words, children gradually learned how to apply the alphabet to parts of words. This is only a partial direct/systematic approach to teaching. Based on this assumption, from this selected observation, he concludes that certain PA skills and knowledge are more closely related to early reading than others. Does this make them more useful in teaching?
He Concludes: "As to the amount of phoneme awareness necessary for reading, it appears that the ability to manipulate onsets and rimes within syllables relates most strongly to reading, once an adequate level of letter recognition is achieved." Stahl also defined blending and segmenting the same as the early phonemic awareness researchers, as segmented phonemes. "Blending required the child to synthesize segmented phonemes to recognize a word. ,,,, Segmentation required pronouncing all phonemes of a word" Segmenting phonemes into continuous sounds and then returning them to a full word was not acknowledged. These procedures could easily go to the top of the list of being easiest to teac and most relevant to beginning reading if they are used to teach decoding.

If these researchers had studied children who were taught to read through a more systematic and direct approach, they may have found out that other phonemic skills and knowledge would have been more closely related to the early reading process and are more useful in teaching beginning reading than onset-rimes. (Although, they may still give onset-rimes a high place in importance.)

As it turns out, the tasks that were recognized to be important in subsequent studies (seen in the National Reading Panel report of 2000) did not include onset-rime activities. In fact, Stahl's whole premise about

including “linguistic complexity” in the understanding of phonological awareness seems to have been unfortunately unrecognized by the Panel. This may be a failure in the subsequent research, of course.

Abstract Phonological awareness (PA) has been operationally defined by many different tasks, and task comparisons have been confounded by differing levels of linguistic complexity among items. A sample of 113 kindergartners and first graders completed PA tasks designed to separate task difficulty from linguistic complexity. These measures were, in turn, compared with measures of early literacy. Results indicated that the measures loaded on a single factor and that PA measured by differences in linguistic complexity, rather than by task differences, seemed to be more closely related to that factor. A logical analysis suggested that alphabet knowledge is necessary for children to separate onsets from rimes and that awareness of onsets and rimes is necessary both for word reading and for more complex levels of phonemic analysis.

Introduction

The relationship between phonological awareness and early reading has been well established since the 1970s. Phonological awareness is an awareness of sounds in spoken (not written) words that is revealed by such abilities as rhyming, matching initial consonants, and counting the number of phonemes in spoken words. These tasks are difficult for some children because spoken words do not have identifiable segments that correspond to phonemes; for example, the word dog consists of one physical speech sound. In alphabetic languages, however, letters usually represent phonemes, and to learn about the correspondences between letters and phonemes, the child has to be aware of the phonemes in spoken words.

Evidence for the importance of phonological awareness comes from a number of sources. First, correlational studies have shown strong concurrent and predictive relations between phonemic awareness and success in reading (e.g., Liberman, Shankweiler, Fischer, & Carter, 1974; Mann, 1984). In one study (Juel, 1988) it was found that first graders who had difficulty with phonological awareness tasks such as blending sounds together to make words, segmenting words into sounds, and manipulating initial and final consonants typically remained in the bottom quarter of their class in reading 4 years later. Another study (MacLean, Bryant, & Bradley, 1987) found that children's knowledge of nursery rhymes at age 3 years strongly predicted their later development of more abstract phonological knowledge and, more important, their early reading ability.

At least some ability to distinguish phonological elements smaller than syllables seems to be necessary to make use of an alphabetic orthography (**Gough, Juel, & Griffith, 1992**). Preliterate measures of phonological awareness predict achievement in beginning reading more accurately than do many common correlates of school achievement, including IQ scores, age, and measures of socioeconomic status (Share, Jorm, Maclean, & Matthews, 1984). Longitudinal studies locate the development of metalinguistic phonological skills prior to the onset of reading (**Wagner & Torgesen, 1987**). Successful efforts to train phonological awareness have led to significant achievement differences in reading acquisition (e.g., **Ball & Blachman, 1991; Bradley & Bryant, 1983; Lundberg, Frost, & Petersen, 1988;** Wallach & Wallach, 1979; **Williams, 1979**); these are differences that have far-reaching consequences in leveraging reading performance (Stanovich, 1986).

Although the general relationships between phonological awareness and early reading are well established, there are two distinct questions that need to be answered: How should one measure phonological awareness? and How much phonological awareness is needed to learn to read? The first question relates to the nature of phonological awareness and how it grows; the second relates to reading and the phonological features of which a child must be aware to be able to learn to read.

Defining Phonological Awareness

In a synthesis of the literature on reading acquisition, Adams (1990) theorized that the tasks used to measure phonological awareness fall into five levels of difficulty. The most primitive level, according to Adams, consists of having an ear for the sounds of words, which is revealed by the ability to remember familiar rhymes (see Maclean et al., 1987). A second level consists of the ability to recognize and sort patterns of rhyme and alliteration in words, which requires more focused attention to sound components; this ability is revealed in oddity tasks (see Bradley & Bryant, 1983). A third level requires familiarity both with the idea that syllables can be divided into phonemes and with the sounds of isolated phonemes; this level is indicated by blending tasks (see Perfetti, Beck, Bell, & Hughes, 1987) and by syllable-splitting tasks, for example, isolating initial phonemes (see Share et al., 1984; Wallach & Wallach, 1979). A fourth level of difficulty is encountered in tasks that require full segmentation of component phonemes (e.g., tapping tests; see Liberman et al., 1974). Most difficult of all are tasks that require children to add, delete, or otherwise move phonemes and to regenerate the resultant word of pseudoword (e.g., Rosner, 1974).

Although Yopp (1988) seems to demonstrate two clearly different levels of phonological awareness, she noted that there are problems with the tasks commonly used to assess the construct. Items vary greatly both between and within measures on the same type of task. For example, some blending tasks use nonsense words, some real words; some have more short consonant–vowel–consonant (CVC) words, others contain more words with consonant blends. One important source of variability not controlled in Yopp's tasks is linguistic level (Treiman, 1992) ……. Because Yopp used or adapted extant tasks of phonological awareness, it was not possible to directly compare performance on items constructed to be equivalent in linguistic complexity.

As part of this project, we reexamined the items on Yopp's (1988) measures [2] by assigning a weight for each level of linguistic complexity tapped: Recognition of a rhyme (1), manipulating onset and rime (2), manipulating vowel and coda (3), manipulating phonemes within a cluster onset (4), and manipulating phonemes within a cluster coda (5). We rated each item on linguistic complexity and averaged these ratings as a measure of task difficulty. When we correlated task difficulty with the mean score obtained by Yopp's participants on each task (see Yopp, 1988, Table 3), we found a .95 correlation between our post hoc measure of task difficulty and the levels of difficulty obtained by

Yopp. This suggested that linguistic complexity may be an important factor in phonological awareness. It also suggested that Yopp's measures may have confounded linguistic complexity and task.

Relations Between Phonological Awareness and Early Reading

As stated earlier, the correlations between phonological awareness and beginning reading are robust and much replicated. However, a second problem in this literature is the difficulty of establishing to what degree phonological awareness is either a cause or a result of success in beginning reading.

Correlational Studies Early theorists suggested that children's ability to reflect on sounds in spoken words was necessary for them to learn to map letter sounds onto speech sounds (Liberman et al., 1974). Because the sounds in a spoken word are blended together to form a single acoustic unit, the individual sounds in a word are not readily apparent. It has been suggested that children who do not reflect on sounds in words and who cannot segment a spoken word into its component sounds are prone to have difficulty in learning to read (Liberman et al., 1974; Savin, 1972; Stanovich, 1986). Evidence for this view comes from a number of correlational studies involving phonological awareness and beginning reading, in which both concurrent correlations (see Adams, 1990, for a review) and predictive correlations (e.g., Maclean et al., 1987; Perfetti et al., 1987) have been found.

Other researchers, such as Adams (1990), have suggested that children learn about English orthography through both a familiarity with letter shapes and an awareness of phonemes in spoken words. The research reviewed by Adams suggests that letter knowledge and phonological awareness are the strongest predictors of children's success in reading.

Training Studies Further evidence that phonological awareness underlies beginning reading skill comes from training studies. Bradley and Bryant (1983) taught prereaders either to sort words by common sounds or to sort words and to spell these sounds with letters, and they found that the combination program had impressive effects on children's reading acquisition, with the combination group reading a full 9 months ahead of the Hawthorne control and 12.5 months ahead of the no treatment control group by the end of second grade. The effects for the phonological training group alone were less impressive and were not statistically significant.

Other researchers have found that phonological awareness training has a significant effect on early reading without the concurrent use of letter training. For example, Lundberg et al., (1988) administered Danish kindergartners 8 months of phonological awareness training that specifically excluded letter–sound instruction. They found that their training led not only to gains in phonological awareness but also to significant effects on spelling in Grades 1 and 2 and on reading achievement in Grade 2.

It may be that certain levels of phonological awareness, either as measured by different tasks or by different levels of linguistic complexity, precede learning to read, whereas more advanced levels may result from learning to read. Adams (1990) suggests that the tapping test (Liberman et al., 1974), which requires children to tap out the number of phonemes that a word contains, may be influenced by children's reading ability, rather than the other way around. The demands of tapping out the number of phonemes in a word may put an unreasonable load on short-term memory unless the word is mediated by its spelling.

Ehri (1992) has suggested that the relation between phonological awareness and early reading is one of reciprocal causation, where a certain amount of ability to reflect on spoken words is necessary (but probably not sufficient) to understand the alphabetic system and thus to acquire a slight vocabulary. Expansion of a child's sight vocabulary, in turn, requires increasing reflection on spoken words, thus improving children's awareness of phonemes. Having a sight vocabulary also mediates many of the tasks used in phonological awareness, as suggested by Adams (1990). This notion of reciprocal causation suggests that the strong correlations between phonological awareness measures and measures of reading skill mask two different causal patterns.

Our purpose in this study was to examine, first, the relative importance of linguistic complexity and task differences in measuring phonological awareness, and, second, the relationship of phonological awareness to early reading skill with these perspectives. [**this does not imply any particular way of teaching phonological awareness.]**

Tests of phonological awareness

Fourteen tests of five items each (see Figure 1) were constructed so that the items represented the four tasks—phoneme blending, isolation, segmentation, and deletion—at four levels of linguistic complexity (onset–rime, vowel-coda, cluster onset, and cluster coda). The tests are shown in the Appendix. Blending required the child to synthesize segmented phonemes to recognize a word. Phoneme isolation required the child to say the first or last sound of a spoken word. Deletion required the child to remove sounds from the beginning or end of one word and to form another word, such as saying “face” without /f/. Segmentation required pronouncing all phonemes of a word. We derived an extra score from the CVC word segmentation task. Children's scores were based on whether they segmented the onset from the rime and whether they made a complete segmentation of the word. For example, a child who segmented move as /m-uv/ got credit when this item was counted for segmentation of an onset from a rime but not when it was counted for a complete segmentation. These two scores were used to create different composite scores in the linguistic complexity analysis, described below, but only the complete segmentation score was used in the segmentation task score.

	Blending	Segmentation	Phoneme Isolation	Deletion
Onset-Rime	CVC Words	CVC Words (Onset-Rime Score)	CVC Words (Beginning)	CVC Words (Beginning)
Vowel-Coda		CVC Words (Total Segmentation Score)	CVC Words (Final)	CVC Words (Final)
Cluster Onset	CCVC Words	CCVC Words	CCVC Words	CCVC Words
Cluster Coda	CVCC Words	CVCC Words	CVCC Words	CVCC Words

Results

Relative difficulty First, we examined the relative frequencies of students' scores on the various tasks and at the various levels of linguistic complexity. As shown in Tables 1 and 2, phoneme isolation was the easiest task, followed by blending, deletion, and segmentation. This was similar to Yopp's (1988) finding for similar tasks. Using a repeated measures analysis of variance (ANOVA) with Bonferroni t tests for the six pairwise comparisons (familywise $\alpha = .05$), we found that when the scores were calculated by task, phoneme isolation was by far the easiest of the tasks, followed by blending, deletion, and segmentation, $F(3, 451) = 146.55$; $p < .01$, $MS_e = .70$. All of these differences were significantly different from each other (all ps < .001), except the difference between blending and deletion performance (where $p = .011$).

Table 1
Means for the Phonological Awareness Measures

Analysis	*M*	*SD*
Task		
Phoneme isolation	4.02	1.08
Phoneme blending	2.69	1.62
Phoneme deletion	2.44	1.42
Phonological segmentation	2.02	1.34
Linguistic complexity		
Onsets and rimes	3.72	1.35
Vowels and codas	3.36	1.08
Cluster onsets	2.00	1.45
Cluster codas	2.28	1.43

Note. On all subsets, maximum score = 5. $N = 113$.

Table 2
Subtest Means and Standard Deviations

Subtest	*M*	*SD*
Phoneme isolation		
CVC (initial)	4.70	0.91
CVC (final)	4.13	1.45
CCVC (initial)	3.62	1.74
CVCC (final)	3.64	1.73
Blending		
CVC words	3.41	1.59
CCVC words	2.23	1.85
CVCC words	2.44	1.85
Deletion		
CVC (initial)	3.20	1.96
CVC (final)	2.94	1.91
CCVC (initial)	1.27	1.54
CVCC (final)	2.36	1.72
Segmentation		
CVC (onset–rime)	3.57	1.95
CVC (complete)	2.95	1.95
CCVC	0.89	1.47
CVCC	0.69	1.25

Note. All subtests have a maximum score of 5. $N = 113$. C = consonant; V = vowel.

Analyzing the data by linguistic complexity (see Table 1) by using an analysis similar to that described above, we found that the easiest linguistic level was analyzing onsets and rimes, followed by analyzing vowels and codas, followed by analyzing cluster codas, followed by analyzing cluster onsets, $F(3, 451) = 201.32$, $p < .01$, $MS_e = .38$. These differences were all significantly different from each other (all ps < .001).

A comparison of the two loadings however, suggests that the notion of levels of linguistic complexity accounts for somewhat more variance in a common factor. Therefore, it appears that linguistic complexity across tasks is a better way of defining phonological awareness. Our further analysis suggests that this may be a fruitful way of looking at the relations between phonological awareness and reading.

Table 3
Factor Loadings Resulting From Two Analyses

Analysis	Loading
Task	
Phoneme isolation	.74
Phoneme deletion	.89
Blending	.90
Segmentation	.87
% of variance	72.60
Linguistic complexity	
Onsets and rimes	.93
Vowel-codas	.80
Cluster onsets	.94
Complex rimes	.93
% of variance	81.70

Discussion

In this study we addressed two issues in the relation between phonological awareness and reading: What is the best way of conceptualizing (and measuring) phonological awareness for the purpose of examining the relation with beginning reading? and Which abilities involved in phonological awareness are coincident with reading ability?

Comparing the different conceptualizations of phoneme awareness using a measure not confounded by linguistic level or task difficulty, we found that a single factor best described the data, whether analyzed by score, task, or level of linguistic complexity. Through our examination of the distributions of the data, we believe that the notion of levels of linguistic complexity (better than differences between tasks) describes the construct of phonological awareness.

As to the amount of phoneme awareness necessary for reading, it appears that the ability to manipulate onsets and rimes within syllables relates most strongly to reading, once an adequate level of letter recognition is achieved. The ability to isolate a phoneme from either the beginning or the end of a word, the easiest of the phonological awareness abilities, also seems to be crucial to reading, because nearly all children who could not adequately perform this task also had not achieved a preprimer instructional level.

Combining these results with those from the analysis by linguistic complexity, we can speculate on a series of necessary but not sufficient conditions among the variables examined. Knowledge of letter names might enable children to manipulate onsets and rimes, which, in turn, would enable basic word recognition. Basic word recognition might enable more complex forms of phonological awareness, as suggested by Barron (1991).

One scenario might be that children first learn letter names, perhaps through hearing alphabet books read aloud or by singing the alphabet song (see Adams, 1990), and then they learn to match individual letters with their names. As a part of teaching the letter names, sound values are taught. For example, a child might read an alphabet book in which letters are paired with pictures of animals containing their names. The parent or teacher who taught the letter names might also include beginning sound instruction with the letter name instruction. Alternatively because most consonants contain the phonemes most commonly associated with them in their names, learning a letter name helps children identify its sound value. Either way, learning the letter names seems to be necessary but not sufficient for children to mentally separate an onset from a rime. Similar results were reported by Griffith and Klesius (1992), who used cross-lagged correlations as well as scattergrams.

Children may, in turn, use initial consonant knowledge to gain some word knowledge, as suggested by Ehri (1992). In Ehri's model of the acquisition of word recognition, phonetic cue reading was described as a stage in which the developing reader uses initial or final consonant information to help identify words. This is an intermediate stage between visual cue reading, in which the child makes arbitrary associations among the visual features of the word and its meaning, and phonological recoding, in which the child makes full use of sound–symbol correspondences. Ehri and Sweet (1991), for example, found that some degree of phonological awareness seems to be needed for a child to identify words through finger-pointing to memorized text. In both Figure 3 and 5 we suggest that the isolation of initial or final phonemes may be a precursor to developing a rudimentary sight vocabulary. As children acquire more and more words, they become more sensitive to the structure of written words. This sensitivity leads them to greater sensitivity to the phonological structure of words, thus enabling them to analyze rimes, as seen in Figure 4. This greater sensitivity to the phonological structure of words may, in turn, enable more generalizable decoding skill, such as the ability to decode words not previously seen. This "cipher reading" (Gough et al., 1992), often measured by pseudoword decoding tasks, is the hallmark of children who read well. Because we did not administer such tasks as part of this study, we can only speculate about these relations.

It is the nature of phoneme awareness that makes it difficult to measure. On the one hand, it is an insight. As such, it is a new and relatively permanent way of thinking about language. On the other hand, we see phoneme awareness as developing, possibly through the early grades, with children gaining greater and greater sophistication in manipulating sounds in spoken words. In our analysis, the awareness that words can be broken into onsets and rimes leads to an awareness that rimes can be decomposed into peaks and codas and that cluster onsets and cluster codas can be thought of as individual phonemes. As children's reflections on spoken words become more complex, ordinarily with the aid of learning to read in an alphabetic cipher (cf. Perfetti et al., 1987), this series of insights looks like a continuously developing ability.

The development of cipher knowledge may also be a series of insights, one of which appears to be the insight that spoken words can be broken down into at least onsets and rimes. This insight allows children to develop the understanding that letters in written words stand for sounds in spoken words (namely, the alphabetic principle.) More refined understanding of the alphabetic principle also continues to develop. Further development of phoneme awareness, especially awareness of sounds in cluster onsets and cluster codas, may aid spelling development (Treiman, 1991) or in more sophisticated knowledge of sound–symbol relations.

The analysis of blends, either in the onset or in the rime, seems to be relatively unrelated to reading ability, because many children in our sample who could read well for their grade could not analyze blends adequately. Many of these children treated blends as wholes, for example, providing /fl/ as the first sound of flood. The notion that the sound of fl is /fl/ may be all that is needed to read words containing that blend. The knowledge that the sound /fl/ can be broken down into the sounds /f/ and /l/ may not be needed for beginning reading. Stanovich (1992), however, suggests that complete segmentation ability can facilitate reading development.

The relations between spelling and phonological awareness are complex. Because invented spelling is more concrete and minimizes reliance on memory, it seems that invented spelling is an easier task than that posed by the oral phonological awareness measures used here, and it might be more sensitive to the subtle knowledge of phonological segments.

The instrument and conceptualizations that we used are not without their limitations. We did not provide an onset–rime blending task, because pilot testing suggested that such a task was too easy for similar participants. Instead, we assumed that the CVC blending task requires onset–rime blending and thus was included with that score. We included such a measure in another study (Murray et al., 1993), in which we used younger children.

Yopp, H.K. **A Test for Assessing Phonemic Awareness in Young Children**. *The Reading Teacher*, Vol. 49, No. 1 (1995)

Shankweiler, D., (and many others) **Cognitive Profiles of Reading-Disabled Children: Comparison of Language Skills in Phonology, Morphology, and Syntax.** American Psychological Society. Vol. 6, No. 3. (1995)

Spector, J. E., **Phonemic Awareness Training: Application of Principles of Direct Instruction**. Reading & Writing Quarterly. 11:37-51. (1995)

Adams, M. J., Foorman, B. R., Lundberg, I., and Beeler, T., **The Elusive Phoneme**, Why Phonemic Awareness is so Important and How to Help Children Develop It. *American Educator*, Spring/Summer, (1998) Based on, **Phonemic Awareness in Young Children**: A Classroom Curriculum. (1998)

Introduction, by Editor of the *American Educator*

Quoting Adams: "despite myriad proposals to make it easier, alphabetic instruction has been dogged by one problem: Many students find it extremely difficult to induce the words from the code, no matter how they are drilled on the individual letters and sounds." "Research has finally yielded an answer to the question of why learning to use the alphabetic principle is difficult for so many: The impasse lies in the perceptual and conceptual elusiveness of the phonemes." "Educators have found that attending to children's phonemic awareness removes phonics from the realm of drill and skill and makes it learnable and interesting to their students." **M. Adams**

Why has the lack of phonemic awareness "**blocked the doorway to reading** for large numbers of children"? Reviewing the 51 lessons divided into seven steps, in the Classroom Curriculum, gives one the sense that every child who is successfully led through them…. "**will glide ever so more easily** into mastery of the alphabetic code and **the door** to literacy that it **wedges op**en."

The purpose of phonemic awareness instruction: **"To develop the ability to analyze words into a sequence of separate phonemes and to synthesize words from a sequence of separate phonemes**." (or separated??)

"Keep in mind that these activities focus on the structure of spoken language and are **preliminary** to phonics instruction. Their purpose is to **lay the groundwork**, prepare the soil, **get children ready for instruction in phonics and spelling**".

Adams' Introduction to Lessons.

Nature and Importance

"The challenge is to find ways to get children to notice the phonemes, to discover their existence and **separability**.(?) " (Am. Ed. P. 19)

"This book is based on the Lundberg, Frost and Petersen (1988) program developed in Sweden and Denmark. We evaluated it in 23 **kindergarten classrooms** in Houston over a 3-year period, assessing and confirming the children's growth **in phonemic awareness**." (not its effect on learning to read or reading achievement?) (from Curr. Prog.)

"This ability to analyze words into sounds is exactly the skill that promotes successful reading in first grade." (Am. Ed. P. 20 top)

Research

"Measures of schoolchildren's ability to attend to and manipulate phonemes strongly correlate with the reading success through twelfth grade."

"Research clearly shows that phonemic awareness can be developed through instruction and, furthermore, that doing so significantly accelerates children's subsequent reading and writing achievement. (did they test his out, or was it assumed?) (Am. Ed. P.20)

About the Structure of Language.

"(Some) constraints on our ability to produce speech have to do with t**he way our brains classify and perceive the minimal units of sound that make a difference to meanin**g – the units we call phonemes…. The **differences are often subtle**. … This sensitivity to the sounds of the phonemes and the differences between them **is not conscious**. **It is deeply embedded in the subattentional machinery of the language system**." Because phonemes are represented by letters, **"developing readers must learn to separate these sounds, one from another, and to categorize them in a way that permits understanding of how words are spelled**." (???) "Conscious awareness of phonemes **is distinct** from the built-in sensitivity that supports speech production and reception. Unfortunately, phonemic awareness is not easy to established."

"**It is also important to note that phonemes are not spoken as separate units**. Rather, they are co-articulated, that is, when we speak, **we fuse the phonemes together** into a syllabic unit." (Am. Ed. P. 21)

(knowledge at the phonemic level is what is ultimately the goal "because **it is awareness of phonemes that allows children to understand how the alphabet works** – an understanding that is essential to learning to read and spell."

About this Curriculum

"The design and sequence of the activities in this book are intended to help children **acquire a sense of the architecture of their language and the nature of its building blocks**. Thus, across chapters, the children's attention is focused and refocused on smaller and smaller parts, on layers within layers of the language."

"Over the course of all this structural play, the children also learn how to focus on the parts themselves; this is particularly important at the level of the phonemes. As the children practice synthesizing words from phonemes. (making words from dictated phonemes?) and analyzing phonemes from words, (how is this best done?) they are also practicing hearing and saying the phonemes over and over, both in isolation and in context."

"Research shows that once children have mastered phonemic awareness in this way, useful knowledge of the alphabetic principle **generally follows with remarkable ease – and no wonder. (Is the a neurological explanation for this**?) : Having learned to attend to and think about the structure of language in this way, **the alphabetic principle makes sense**. All that's left to make it usable is knowledge of the particular letters by which each sound is represented." "**The reason for training phonological awareness at all is to make spelling-sound correspondences more learnable when they are taught**.

Alvin Liberman. **The Reading Researcher and the Reading Teacher Need the Right Theory of Speech.** , *Scientific Studies of Reading*, Vol. 3 (2), 1999.

Alvin Liberman. **Why Is Speech So Much Easier Than Reading and Writing?** In Reading and Spelling Development and Disorders Charles Hume and M. Joshi, 1998. (Also available at Haskins Laboratory) How speech and alphabetic writing systems are linked.

"(My colleagues, from Haskins Laboratory) appreciated early on that **the connection between speech and reading is a two-way street** and that one is well advised to **look in both directions before proceeding**. "

"Thus**, looking first toward speech**, they observed….. that the **alphabetic structure** of (spoken) words is not to be found at the surface of the acoustic signal but only at a deeper, **less accessible level**."

"Letters are what are seen at the surface. With learning, they provide the learner access into the deeper sources of spoken language, that exist in nature. By identifying and bonding with a matched phoneme within the structure of spoken words, they enable word reading."

("We read with our eyes, but the starting point for reading is speech") Seidenburg

"Then looking in the other direction toward reading, …..they saw that mastery of speech does not normally make a child aware that (spoken) **words do, in fact, have an (oral) alphabetic structure. ….I promote the notion that only the right theory of speech can provide insight into the process by which a child who speaks is converted to one who also reads**." ….

(we read an alphabetic language because we can speak.)

"The unique discovery underlying the alphabet was neither more nor less than what I have already identified as **segmental phonology**, the part of grammar that **generates all words by variously combining and permuting a small number of consonants and vowels**.(into words)"

"Proper use (of an alphabetic writing system) requires that readers **attach the (created) artifacts of the alphabet** to the **natural (alphabetic) structures** of their language, taking care to make the connection at the earliest stage. (**Once this is done**), the **readers get all the rest of the complex processing for free, courtesy of the biological specialization for language that they own simply by virtue of membership in the human race**."

David Chard and Shirley Dickson, **Phonological Awareness: Instructional and Assessment Guidelines** Reading Rockets. and LD on-line. 1999 (Implying some support of the Weisberg studies)

Excerpts:

"As children grow older, their basic phonological awareness does not necessarily develop into the more sophisticated phonemic awareness. In fact, developing the more complex phonemic awareness is difficult for most children and very difficult for some children (Adams et al., 1996). However, it is a child's phonemic awareness on entering school that is most closely related to success in learning to read (Adams, 1990; Stanovich, 1986).

There is ample evidence that phonological awareness training is beneficial for beginning readers starting as early as age 4 (e.g., Bradley & Bryant, 1985; Byrne & Fielding-Barnsley, 1991). In a review of phonological research, Smith et al. (1998) concluded that phonological awareness can be developed before reading and that it facilitates the subsequent acquisition of reading skills.

Documented effective approaches to teaching phonological awareness generally include activities that are age appropriate and highly engaging. Instruction for 4-year-olds involves rhyming activities, whereas kindergarten and first-grade instruction includes blending and segmenting of words into onset and rime, ultimately advancing to blending, segmenting, and deleting phonemes. This pattern of instruction follows the continuum of complexity illustrated in Figure 1. (staircase graphic) Instruction frequently involves puppets who talk slowly to model word segmenting or magic bridges that are crossed when children say the correct word achieved by synthesizing **isolated** phonemes. Props such as colored cards or pictures can be used to make abstract sounds more concrete.

During the last few years, publishers have produced multiple programs in phonological awareness, some of which are based on research. Two of these programs are **Ladders to Literacy** (O'Connor, Notari-Syverson, & Vadasy, 1998) and **Teaching Phonemic Awareness** (Adams et al., 1996).

Most early phonological awareness activities are taught in the absence of print, but there is increasing evidence that early writing activities, including spelling words as they sound (i.e., invented or temporary spelling), appear to promote more refined phonemic awareness (Ehri, 1998; Treiman, 1993). It may be that during spelling and writing activities children begin to combine their phonological sensitivity and print knowledge and apply them to building words. Even if children are unable to hold and use a pen or pencil, they can use letter tiles or word processing programs to practice their spelling.

Instruction in phonological awareness can be fun, engaging, and age appropriate, but the picture is not as simple as it seems.

First, evidence suggests that instruction in the less complex phonological skills such as rhyming or onset and rime may facilitate instruction in more complex skills (Snider, 1995) without directly benefiting reading acquisition (Gough, 1998). Rather,

integrated instruction in segmenting and blending seems to provide the greatest benefit to reading acquisition (e.g., Snider, 1995). **Second**, **although most children appear to benefit from instruction in phonological awareness, in some studies there are students who respond poorly to this instruction or fail to respond at all**. For example, in one training study that provided 8 weeks of instruction in phonemic awareness, the majority of children demonstrated significant growth, **whereas 30% of the at-risk students demonstrated no measurable growth in phonological awareness** (**Torgesen, Wagner, & Rashotte, 1994).** Similarly, in a 12-week training in blending and segmenting for small groups (3-4 children) in 2-minute sessions four times a week, **about 30% of the children still obtained very low scores on the segmenting posttest and 10 % showed only small improvements on the blending measures** (Torgesen et al., 1994).

Torgesen et al. (1994) concluded that training for at-risk children must be more explicit or more intense than what is typically described in the research literature if it is to have a substantial impact on the phonological awareness of many children with severe reading disabilities. Therefore, **we recommend two tiers of instruction**. The first tier of instruction is the highly engaging, age-appropriate instruction that we introduced earlier. **The second tier of instruction includes more intensive and strategic instruction in segmenting and blending at the phoneme level (e.g., Snider, 1995).**

Beside content, another issue that requires attention in phonological awareness instruction is curriculum design. From research, we are able to deduce principles for effectively designing phonological awareness instruction. **These design principles apply for all students but are particularly important for students who respond poorly to instruction. In the design of phonological awareness instruction, the following general principles increase students' success (Chard & Osborn, 1998**):

- Start with continuous sounds such as /s/, /m/, and /f/ that are easier to pronounce than stop sounds such as /p/, /b/, and /k/; Carefully model each activity as it is first introduced;
- Move from larger units (words, onset-rime) to smaller units (individual phonemes);
- Move from easier tasks (e.g., rhyming) to more complex tasks (e.g., blending and segmenting); and,
- Consider using additional strategies to help struggling early readers manipulate sounds. These strategies may include using concrete objects (e.g., blocks, bingo chips) to represent sounds.

Research suggests that, by the end of kindergarten, children should be able to demonstrate phonemic blending and segmentation and to make progress in using sounds to spell simple words. Achieving these goals requires that teachers be knowledgeable about effective instructional approaches to teaching phonological awareness and be aware of the ongoing progress for each of their students. "

Ehri, L., Nunes, S. R., Willows, D.M., Schuster, B.V., Yaghoub-Zadeh, Z., & Shanahan, T., **Phonemic awareness instruction helps children learn to read: Evidence from the National Reading Panel's meta-analysis.** *Reading Research Quarterly*, (2001).

This is the published portion of the NRP report of 2000 on phonemic awareness. For this report, the Panel surveyed 1,962 articles and other sources to find all the teaching activities that had been used for teaching phonemic awareness (PA) in classroom or for assessment in research. The Panel categorized these activities into six kinds. **The Panel recognized 52 well-conducted experimental** studies (some listed above) that focused on the use of one or more of these six kinds of PA activities. Each studied was based on the assumption that activities that had been used in basic research therefore the best choices for instruction. The report is the largest published summary of research on teaching PA and Phonics before or since.

1. Phoneme isolation, which requires recognizing individual sounds in words, for example, "Tell me the first sound in paste" (/p/); (also in the end and middle.)
2. Phoneme identity, which requires recognizing the common sound in different words, for example, "Tell me the sound that is the same in bike, boy, and bell" (/b/); (also in the end and middle)
3. Phoneme categorization, which requires recognizing the word with the odd sound in a sequence of three or four words, for example, "Which word does not belong? bus, bun, rug" (rug); (also in the end and middle)
4. Phoneme blending, which requires listening to a sequence of **separately** spoken sounds and combining them to form a recognizable word, for example, "What word is /s/ /k/ /u/ /l/?" (school); (listening to parts, in sequence and with pauses, and blending them into whole word, parts to whole.)
5. Phoneme segmentation, which requires breaking a word into its sounds by tapping out or counting the sounds, or by pronouncing and positioning a marker for each sound, for example, "How many phonemes in ship?" (3: /š/ /i/ /p/); and (whole to separated parts, with pauses corresponding to letters in words, in one form or another)
6. Phoneme deletion, which requires recognizing what word remains when a specified phoneme is removed, for example, "What is smile without the /s/?" (mile). (manipulating the parts by omitting, adding or substituting)

(see unpublished paper, "Where Research has Failed in the Study of teaching Beginning Phonemic awareness and Decoding" by Charles Arthur, (2018).

Ehri, L. , Numes, S.R., Stahl, S.A. and Willows, D.M. **Systematic Phonics Instruction Helps Students Learn to Read: Evidence from the National Reading Panel's Meta-Analysis.**

Reading Research Quarterly, (2001).
This is the published portion of the NRP report on Systematic Phonics. It drew its conclusions from **38 recognized studies of programs** that compared a phonics approach to teaching beginning reading to non-phonics approach. How much and what kind of PA instruction was included in these is clear in the report.

Castiglioni-Spalten, M.L. and Ehri, L. **Phonemic Awareness Instruction: Contribution of Articulatory Segmentation to Novice Beginners' Reading and Spelling.** *Scientific Studies of Reading*, 2003.
This experiment examined whether kindergarteners who were taught to segment words into phonemes either by monitoring articulatory gestures or by manipulating blocks would benefit in their ability to read and spell. They were divided into three groups, mouth treatment, ear treatment and no-treatment. This study was very short, six sessions each lasting 20 o 30 min. It hardly compares to the programs cited above that were for the whole kindergarten year.

Grand Conclusion (7.26.18)
Research did result in a significant improvement in the teaching of PA and reading, but there are grounds to wonder that if it had used the DI model for teaching PA, plus decoding, strategies the results would and could have been better and therefore, enable the teaching of reading to start at the beginning of kindergarten, not waiting until 1st grade.