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Phonemes and Morphemes: Support for Readers

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What does it take for children to succeed in mastering the first R? How can we help children down that path towards becoming skilled readers and consumers of texts? While some children seem to learn to read as easily as they learned to speak, others have considerable difficulty. We would like to ease their paths so that school becomes a positive environment where reading is the gateway into all of the marvels of literature, science, social studies and math.

Reading is a complex task that draws upon the ability to see the differences between the various letter shapes. But it is so much more than just a visual skill. True, the shapes of letters like '*b*' and '*d*' and the order of letters in words like '*saw*' and '*was*' may be confusing, but very rarely do children fail to learn to read because they can't keep the shapes and order straight. Reading '*d*' as '*b*' or pronouncing '*saw*' as '*was*' are behaviors that usually correct themselves over time. Indeed, they are often symptoms of the fact that children do not understand what the letters stand for and are resorting to the best guess they can make.

So what **do** the letters stand for? The letters of the alphabet stand for or *transcribe* units of spoken language, and realizing just what those units are is a remarkable achievement. Reading and writing are language skills that depend heavily upon the spoken language skills that children begin to use as soon as they are born. For example, reading and writing share the comprehension mechanisms in the brain that support spoken language. However, they also tap into the very units that make up spoken languages, units of which we would otherwise be blissfully unaware.

Research over the past 40 years, conducted here and abroad and in many different laboratories, has shown us that deficient spoken language skills and deficient awareness of the units of language are two attributes of young children and poor readers. A lack of awareness of the units of language is probably the most common deterrent to becoming a skilled reader and will be the focus of this paper, which reviews some of the strategies that can be used to help struggling readers and all young children get a handle on how reading works. But first, a few words about how the alphabet works as a system that transcribes spoken English.

How the English Alphabet Works

To read is to 'decode' a transcription of one's spoken language, which in our case is English. It is to recover the spoken words that the written characters 'stand for'. All writing systems share the fact that they transcribe or 'spell' certain units of spoken language. Some systems, like classical Chinese and Japanese Kanji, are focused on the meaningful units within words, the units we refer to as morphemes. Others are focused upon the units of 'sound' within words; some representing syllables (Hebrew and Japanese Kana) and still others representing units within syllables (German and Spanish). These sub-syllabic units are called 'phonemes'; they are the consonants and vowels of language, the smallest units of sound that can make the difference between two syllables like '*cat*' and '*hat*', '*cot*' and '*cut*' or '*cup*' and '*cut*'. Phonemes are the unit of language that makes alphabets possible; all alphabets work to transcribe the phonemes within words and English is an example.

English, however, is not just an alphabet; it is a 'deep' alphabet that can resemble Chinese in that it spells meaningful units – morphemes. It transcribes morphemes as well as, or even at the cost of, transcribing phonemes. One place we see morphemes at work is in homophones: words that share a pronunciation but differ in their spelling. Consider the different spellings of the homophones '*there*', '*their*' and '*they're*'. All three words 'spell' the same three-phoneme

syllable; their common pronunciation despite different spellings is why they are homophones. Their different spellings reflect the three different meanings – three different morphemes – that this particular syllable can have: 1) '*there*' a place ('over *there*') or the existence of something ('*there* is'), 2) '*their*' the possessive third person ('*their* shoes') and 3) '*they're*' the contraction of 'they' and 'are' ('*they're* my friends').

The English language is full of spelling challenges like the one presented by *there*, *their* and *they're*. But this problem can be turned to an advantage if we remember that phonemes and meaning are both the goals of correct spelling. When the two are in conflict, as is the case for homophones, meaning determines the spelling. But sometimes phonemes determine the spelling, in which case we have homographs like '*bear*' (to carry) and '*bear*' (the animal). One problem with homographs is that we have to infer their meaning from context. One advantage to homophones and morphemic spellings in general is that they give us hints as to the meaning of the words we are reading.

Building an Awareness of Phonemes

So how do we introduce children to the complexity of the English alphabet? These days, the scientifically validated method of instruction is called 'phonics' and it emphasizes the phonemes within words and how the various letters and letter combinations spell them. Children learn their letter names and sounds, and then combine letters into syllables and words. They learn to blend letters into a unified syllable or word, and they manipulate letters to see what changes occur. As they are learning how the letters go together to transcribe speech sounds, it is important to encourage the children's phoneme awareness so they will understand what the letters represent. Let's review some ways to do this.

Phoneme Judgment Activities. Various activities can develop and exercise phoneme awareness. These tend to be appropriate for all children preK-grade 1, and for struggling readers in general. One of the easier ones to start with is phoneme judgment: deciding whether words start with the same phoneme. For example, take the letter 'm', show it to the students in your class and say its sound: '*mmm*'. Then give several words that start with that sound – '*moon*', '*mud*', '*mop*' and '*man*' for example – and point out how the words all start with the same sound. Then you can give the students pairs of words that either both start with 'm' (like '*mud*' and '*man*') or have one word start with 'm' and the other one start with another letter/phoneme (like '*mop*' and '*sand*'). Have them tell you when two words start with the same sound and when they do not (this will work best one-on-one in small groups.) Be patient, this will be a new activity for many young students: you are asking them to pay attention to the sounds of words where usually we pay attention to the meaning. Use short, meaningful words with which they are familiar.

You might also collect a mixture of objects that start with 'm' and others that start with different consonants and have the students tell you which objects start with '*mmm*' and which do not. This can then turn into a do-it-yourself picture book with a page for each letter. It can also become a game where you take the objects and pictures away, give the letter sound and have the children think of some words that start with that sound. After working with 'm' you can go on to another phoneme; I recommend '*n*' '*s*', '*z*' '*sh*' as the first consonants to use because these are phonemes which can best be articulated in isolation. Then go on to the other consonants that you have to say with an '*uh*' added – like '*buh*', '*cuh*' '*duh*', etc. Children are fascinated by their own names, so a good strategy is to start the expansion with the first

letter of each child's name. Once they get really good at initial consonants you can move on to vowels in the middle of words, and last of all, to final consonants.

If you find phoneme judgment too hard for some of your students, then back up and do **rhyme judgment** – do '*cap*' and '*lap*' rhyme? Do '*cat*' and '*dog*' rhyme? What words rhyme with '*bee*'? Rhyme judgment is something that most four-year olds can catch onto; phoneme judgment comes in kindergarten and beyond. Work with what is age-appropriate for your children. Both rhyme and phoneme awareness relate to reading success.

Phoneme Manipulation Activities**.** Another, more advanced kind of phoneme awareness involves phoneme manipulation: counting phonemes, or taking off one phoneme and putting another in its place. **For phoneme counting**, start with the two groups of words in Table 1. Each group is a regular progression that goes from 1, to 2, to 3 phonemes.

Table 1

Phoneme counting	**1 phoneme**	**2 phonemes**	**3 phonemes**
Group 1	oo	moo	moon
Group 2	oh	bow	boat

Start with the first group. Tell the children you are going to tap out the sounds in words. Have them watch as you say '*oo*' and tap or clap once, say '*moo*' and clap or tap twice, then say '*moon*' and tap or clap three times. Then invite the children to copy you by saying the word and tapping it out just like you did. It's a good chance to use a drum or tambourine! After the children have learned to do group 1, then go on to group 2, tapping to show them how many phonemes are in each word, then inviting them to copy you. After group 2 is completed, mix up the words from groups 1 and 2 and see how they do without your help. Give help only when it is needed and gently correct any errors. Then try adding some words that you haven't counted and see if the children can do it. Try '*I*, *tie*, *tight*, *a*, *no* and *cat*" – and then add some other words that have 1, 2, or 3 phonemes.

Syllable counting typically develops earlier than phoneme counting. If phoneme counting seems too hard for the children you are working with, then back up and do syllable counting instead. In this case, use the two word groups that appear in Table 2. Begin by saying say 'but' and tapping once, then say '*butter*' and tap twice, and then say '*butterfly*' and tap three times. Have the children copy each word, and when that group is mastered, go on to tap out '*fun-funny-funniest*'. Then scramble the words in Table 2 and see how they do. If children can count the syllables of the words in Table 2, then go on to some other words – '*apple, banana, peach*', for example. Or better still, use their first names and count out the syllables in each name as you go around the class. Liberman and her colleagues found that 90% of children can learn to do syllable counting by kindergarten, and 90% can do phoneme counting by the first grade (Liberman, Shankweiler, Fischer & Carter, 1974) .

Table 2

Syllable counting	**1 syllable**	**2 syllables**	**3 syllables**
Group 1	but	butter	butterfly
Group 2	fun	funny	funniest

Another type of phoneme manipulation is a **name game or secret language** where you substitute a letter for the first letter in someone's name. For example, say everyone's name with an '*s*' as the first sound. (If the name starts with a consonant, change that consonant to '*s*', if it starts with a vowel, add an '*s*' before the vowel.) Or take a tip from Raffi and do '*Willowby-wallowby*' where you substitute a 'w' for the first letter of someone's name: "*Willowby-wallowby 'wusan*', an elephant sat on Susan", "*Willowby-wallowby* 'reacher', an elephant sat on teacher". Another way to do this exercise is to invent a silly language in which every word starts with an '*s*'. 'My name is Virginia' becomes '*Sy same sis Sirginia*'. Manipulation activities readily lend themselves to working with actual letters and are a great way to use refrigerator magnets or alphabet cards (buy 2 sets so you have duplicates of the letters). Spell simple, meaningful words that have 3 letters: '*cat*', '*lip*', '*man*', '*car*', '*dot*', for example. Then show your students how the sound of the word changes when you put an '*s*' in the front of each word.

I find Dr. Seuss's wonderful books are great to use in both judgment and manipulation activities, as well as with recognizing function words by sight. Dr. Seuss's ABC's has a lot of examples of words that start with each letter of the alphabet. One Fish, Two Fish, Red Fish, Blue Fish is a good place to start seeing the effects of phoneme manipulation, and then have a blast with Green Eggs and Ham and The Cat in the Hat.

Sitting and sharing a good book is a great way to build a reader, but phoneme awareness can also be exercised with activities that you can do at other times than reading. In this regard I particularly like Linda Clinard's book (2002) on family reading activities, and Cecile Spector's (2009) book on phoneme awareness activities. Whatever activities you choose, remember to have fun and make it developmentally appropriate.

Morphemes and Early Reading

Now let's turn to morphemes, the other 'half' of the English writing system. As students become better readers who are more and more fluent with decoding phonetic spellings like '*cat*' and '*dog*', they will start to encounter multisyllabic words that challenge the exclusive use of simple grapheme-to-phoneme rules. Around third grade, we find that phoneme awareness accounts for less of the variation among readers and morpheme awareness begins to count for more and more. In third grade and beyond, it is important to start bringing attention to the different spellings of homophones and to the prefixes and suffixes and bases of words, both for proper decoding and for vocabulary building. In both upper and lower grades, be sure your students are developing a rich vocabulary of base words, compound words, suffixes and prefixes. Help them to use graphic organizers as you discuss how to approach new words. For example, word maps can be drawn for word content (see Fig 1. What does it mean? What do I know about it?). Word maps also work for morphological form (see Fig. 2, What are the forms of a base? What prefixes and suffixes apply?). The 'Vocabulogic' website created by Susan Ebbers, http://vocablog-plc.blogspot.com/, is a great resource for vocabulary building with morphemes, as is The Reading Teacher's Book of Lists. Another website with lots of reading lists and applications for vocabulary, phonemes and morphemes is Free Reading: http://www.freereading.net/.

Figure 1: Content word web for 'play' – what does it mean?

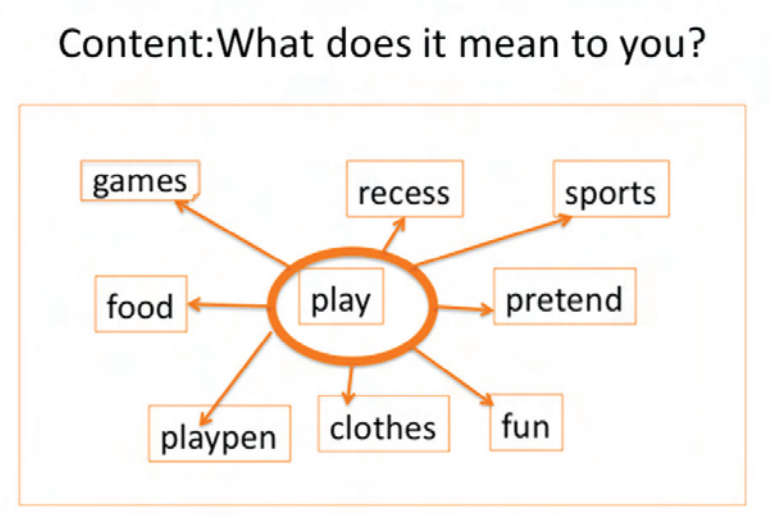
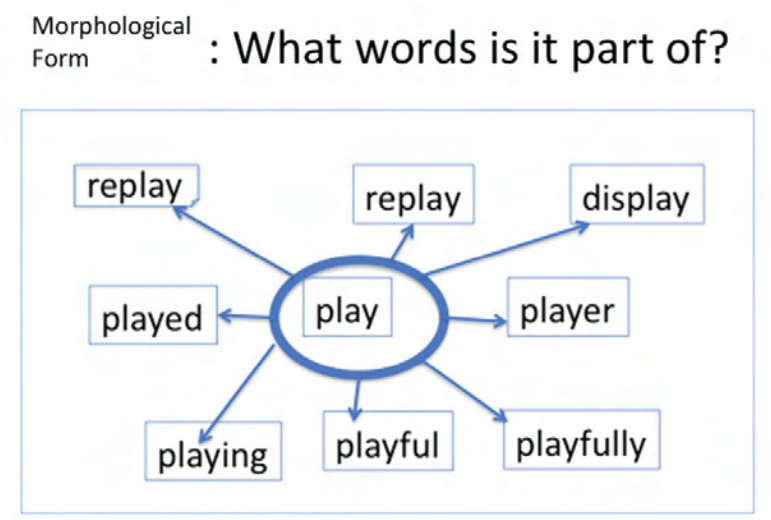


Figure 2: Morphological 'form' word web. For 'play' – what are its forms?



Sight words

From the start, readers will need to be able to decode some very common morphemic spellings that challenge the letter-to-phoneme correspondences they have learned. Take '*have*', for instance. Why doesn't the silent 'e' make the vowel sound like the vowel in '*wave*'? The answer lies in the history of our language and in morphemic spelling. Some morphemic spellings are involved in very frequent words that we use in any book or conversation. These are often the 'function' words that hold nouns, verbs, adjectives and adverbs together in a sentence. Lists of frequent words can be found in The Reading Teacher's Book of Lists, cited below. Each of these frequent words is a morpheme and studies show that readers recognize them and other high frequency words as wholes instead of letter-by-letter. Almost any children's book will use lots of these frequent words and you can start helping children to recognize these words by sight as he or she is sounding out the nouns, verbs, adjectives and

adverbs. Working with a small number of books is a good strategy here; you want the children to memorize the story so that they can make educated guesses.

Homophones are another common occurrence of morphemic spelling. A good exercise is to work with sets of homophones and have the students try to create sentences that use the whole set in one sentence. As you write the sentences on the board, you can show the correct spelling of the homophone in each position and explain the different function and meaning of each word. Table 3 gives some examples of homophones and sentences, there are great lists of homophones in The Reading Teachers' Book of Lists by Fry et al (2000) and you can also find lists online. Homophones are also a great source of jokes and humor, and Spector's As Far as Words Go (2009) has a great compendium of these, along with vocabulary-building activities for homophones and multiple-meaning words.

Table 3

Homophone set:	**Sentence**
weak/week	I was too weak to go out to play last week."
to,too,two	" I bought two carrots to eat for lunch, too."
there, their, they're	"They're going to put their books over there."
our/hour	"It will be our lunch time in one hour."
its/it's	"It's time to give the dog its bath."

Prefixes, suffixes and roots

Working directly with root words, prefixes and suffixes is a great strategy for building morpheme skills in reading as well as in vocabulary. **Prefixes** like '*re-*', '*pre*', and '*non-*' are good ones to start with because they do not tend to alter the pronunciation of words. For example, help children create a list of 'prefix' words that start with the prefix '*re-*', where it means 'to do something again': "*redo, reply, repay, recall, rewrite*", for example. Then have them make another list of words that start with 're' when it is 'not a prefix' and does not mean do something again: "*real, red, rent, ready, reef*", for example. Put the two sets of words on the board and draw contrasts between them. For example, show the children how you can take the '*re-*' off of the 'prefix' words and find a word, but that you cannot do this with the words in the case of the other column, where the '*re-*' doesn't always sound the same, and taking the sound '*re-*' off of the word doesn't give a word. Ask if they can come up with other examples where the first few letters at the beginning change the meaning of the word. If you have older readers, having made the point that when "*re-*" is a prefix it has a long 'e' and it means something about doing things again, but can also mean 'back' as in '*recall*, *repay*' and '*reflect*, *rebate*', the latter pair of words brings you to a third category, namely, roots that are not words, but are used productively with other prefixes and suffixes. You could create a web of 'root words that take 're' and put in it words like "*reflex, resign, report, reflect, rebate*" and show how removing the prefix leaves not a word but a 'base', which is something like a word in that can be combined with other prefixes and suffixes to make other words (*flexible, signature, export, inflection, debate*," for example), they just can't stand alone.

After working on prefixes and how they change meaning, you can have your students search through some of their textbooks to find more words that start with 're-' and group them according to whether the 're-' is a prefix or not, and whether they have discovered any other base words that aren't words but combine with other prefixes and suffixes to form words.

In this way, you start to teach them to take apart words and locate the prefixes, bases and suffixes. The Teacher's Book of Lists has a great section on both prefixes and bases (roots), to give you some more examples and ideas. You can do this exercise with other prefixes like '*in-*' and '*im-*' and with some suffixes as well (plural '*s*' or '*-ment*' for example). Ultimately, you will want to have your students find words they do not know and then see if there are prefixes, suffixes and bases they can use to figure out what the word is likely to mean. They can then look it up to see if they are correct.

Suffixes are like prefixes in that they contribute to the meanings of words, but they can also provide clues about a word's part of speech. There are two kinds of suffixes: inflectional and derivational. **Inflectional suffixes** specify whether a word is singular or plural, present or past tense, and they are learned relatively early in children's reading development. Very young children appear to master some of the regular inflectional suffixes like '*–ed*', and ' *-s*.' The challenge in this case is to learn the irregular nouns (*ox-oxen*) and verbs (*take-took*) that do not use these regular rule-governed suffixes. The other type of suffix, **derivational suffixes**, leave number and tense alone but determine the part of speech, changing a noun to an adjective, a verb or an adverb, etc.. There are many more of this type of suffix, they involve more rules (such as Greek vs. Latin origins) and they take longer to learn. They are very important for all vocabulary development from middle elementary school onward. Some suffixes do not change the sound of the root to which they attach (*judge-judgment*) but many do (*heal-health*), and you will want to clue children in on the difference. A good exercise with derivational suffixes is fill-in-the-blank sentences that require a child to choose between words that have the same base but different suffixes. Some examples are shown in Table 4.

Table 4

Inflectional Morphology

1. *cap*-- "One bottle *cap* and another bottle cap makes two bottle____." (*caps*, capped)
2. *hole*--"A sock with more than one *hole* has many ____." (*holes*, hole)
3. *play*--"I like to *play*. Yesterday, I ____ all day." (*played*, plays)
4. *melt*--"Ice *melts*. The ice turned into water because it ____." (*melted*, melting)
5. *draw*--"I like to *draw*. Yesterday, I ____ a face." (*drew*, drawing)
6. *take*--"It's fun to go for a walk. Last week, I ____ to the park." (*walked*, walking)
7. *leave*-- "We leave the house to go to school. Today, I ____ the house to go to school." (*left*, leaving)
8. *drum*-- "A person who plays the *drums* is called a ____." (*drummer*, drums)
9. *art*-- "A person who makes *art* is an _____." (*artist*, artful)
10. *magic*--"A person who can do *magic* is called a ____." (*magician*, magical)

Derivational Morphology

1. *argue*-- "When people *argue*, they have an ____." (*argument*, arguing)
2. *babysit*-- "A person who *babysits* is called a____." (*babysitter*, babysitting)
3. *electric*-- "An *electric* fan needs ____." (*electricity,* electrical)
4. *brush*-- "This is a *brush*. The girl is ____ her hair." (*brushing*, brushes)
5. *camp*-- "We have a *camp* in the mountains. That's where we go ____." (*camping*, camper)
6. *empty*-- "The garbage is *empty*. Here, we see the boy ____ it." (*emptyin*g, emptiness)
7. *drink*-- "You are in good *health* You are a ____person." (*healthy*, healing)
8. *cuddle*-- "It's nice to *cuddle* things that are ____." (*cuddly*, cuddling)
9. *beauty*-- "Wow! She looks ____ ." (*beautiful*,beautify)
10. *danger*— "Bears can be very ___." (*dangerous*, danger)

Point out to your students that when the derivational suffixes changes the pronunciation of the word, as in "*electric-electricity*",the spelling stays the same but the pronunciation changes because '*c*' is sounded as '*s*' when it is followed by '*i*' or '*e*'. Have your students decide what part of speech goes in the blank and show them how this can help them decide which suffix is the right one. The example sentences in Table 5 illustrate some sentences and some of the alternative forms of words that fit in the blank.

Table 5

1. A famous doctor performed the (*operation, operational, operative, operationalize*).
2. He likes to (*gratuity, grateful, gratify, gratification*) his desires.
3. Watch carefully, I will (*demonstration, demonstrative, demonstrable, demonstrate*).
4. Age improved her (*personify, personalize, personality, personal*).
5. He's too old to be (*productivity, productive, production, produce*).
6. She works hard. She's very (*industrialization, industry, industrious, industrialize*).
7. Farmers (*fertilize, fertilization, fertility, fertilizer*) their fields.
8. Those two dogs are almost (*identical, identify, identification, identity*).
9. He's always going to meetings. He's an (*active, activate, activist, activize*).
10. He was blinded by the (*brighten, bright, brightly, brightness*).

Concluding remarks

The intent of this paper was to provide some information about how the alphabet 'spells' both phonemes and morphemes, and to provide some exercises that can help attune children to phonemes and morphemes and how they function in reading. These are just a few examples of the types of practices that you can use to build phoneme and morpheme awareness. The web sites mentioned above and the references that appear below will give you many more activities and ideas. As you work on phoneme awareness and morpheme awareness, be sure to connect your activities to reading. Tie phonemes to their letters and to phoneme-to-grapheme rules. Tie morphemic word decomposition activities to the new vocabulary students are reading in their subject matter – it's a win-win strategy as it helps with both pronunciation and comprehension.

Bibliography and further reading:

Carlisle, J.F. & Stone, C.A. (2005). Exploring the role of morphemes in word reading. Reading Research Quarterly, 40(4), 428-449.

Clinard, L. M. (2002). Family time, Reading Fun. Dubuque, IA: Kendall Hunt Publishers.

Fry, E. B., Kress, J. Q & Fountoukidsis, D. L. (2000). The Reading Teacher's Book of Lists. San Francisco, CA: Jossey-Bass.

Liberman, A. M. (1989). Reading is hard just because listening is easy. In C. von Euler (Ed.), Wenner-Gren International Symposium Series: Brain and Reading. Hampshire, England: Macmillan. (pp. 197-205.)

Liberman, I. Y., Liberman, A. M., Mattingly, I. G., & Shankweiler, D. (1980). Orthography and the beginning reader. In J. Kavanaugh and R. Venezsky (Eds.) Orthography, Reading and Dyslexia. Baltimore: University Park Press, 137-154.

Liberman, I. Y., Shankweiler, D., Camp, L., Blachman, B., & Werfelman, M. (1980). Steps toward literacy: A linguistic approach. In P. Levinson & C. H. Sloan (Eds.), Auditory processing and language: Clinical and research perspectives. New York: Grune & Stratton.

Mann, V. A. (2002). Reading Disorders, Developmental. In V. S. Ramachandran (Ed. The Encyclopedia of the Human Brain (pp.141-154). San Diego: Academic Press.

Mann, V. A. (2003). Language Processes: Keys to Reading Disability. In H. L. Swanson, K. R. Harris and S. Graham (Eds.) Handbook of Learning Disabilities (pp. 213-228). New York: Guilford Press.

Nagy, W., Berninger, V., Abbott, R., Vaughan, K., & Vermeulen, K. (2003). Relationship of morphology and other language skills to literacy skills in at-risk second grade readers and at-risk fourth grade writers. Journal of Educational Psychology, 95, 730-742.

Spector, C. C. (2009). Sounds Like Fun: Activities for Developing Phonological Awareness. Baltimore, MD: Paul H. Brookes.

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