Das Logogen-Modell der Sprachrezeption: Das Basismodell von Morton und seine Modifikationen

Literatur zum Logogen-Modell:
der Start-Punkt:

einige weitere Studien:

Die Kurzbeschreibungen zum Logogen-Modell aus Ellis, A. & Young, A. (1988)
1. The function of the auditory analysis system is to extract individual speech sounds (possibly phonemes, though there are other candidates) from the speech wave. It does this despite differences in accent, voice, speech rate, etc. and so must have the flexibility to cope with these variations. It must also cope with the fact that speech is often heard against a substantial level of background noise.

The acoustic analysis system may be impaired selectively in some patients with "pure word deafness" (pp. 146-153) who have difficulties understanding and repeating heard words though they can still speak, read, and write normally. They still hear speech, and may be able to identify vowels but not consonants (which require the analysis of rapidly changing acoustic signals). Speech comprehension may be aided by lip reading cues, by context, and by slowing the speech to a rate which may allow the less efficient acoustic analysis system of the right hemisphere to sustain phonetic perception.

2. The function of the auditory input lexicon is to recognise familiar spoken words. It simply signals that a word has been heard before—knowing what the word means requires subsequent activation of its semantic representation in the semantic system.

Selective impairment of the auditory input lexicon would result in a patient who could no longer recognise many or all spoken words but could repeat them correctly using the by-pass route from the acoustic analysis system to the phoneme level. Intact repetition distinguishes this impairment from "pure word deafness" (see 1 above). Speech production should be intact as should most aspects of reading (though not the ability to comprehend misspelled pseudo homophones like "bookshop" or "neffue") and most aspects of writing (though the patient should tend to misspell dictated homophones like peak and pique when these are not understood). Certain patients with "word meaning deafness" (pp. 153-155) may fit this description (though see 3 below).

3. The link between the auditory input lexicon and the semantic system allows heard words which have been recognised as familiar to access their meanings in the
semantic system. Selective impairment to this connection will result in a patient who can
distinguish heard words from non-words (auditory lexical decision), and can repeat both
words and non-words, but fails to understand many words. This failure of auditory word
comprehension need not be accompanied by any problems in understanding familiar
written words, nor any problems with speech production.

Some patients with "word meaning deafness" who can still write to dictation
irregular words they cannot understand may fit this description (pp. 153-155 and p. 177).
Impairment of 3 is also seen in patients with "semantic access aphasias", which may be
specific to certain categories of words (pp. 156-158).

4. The semantic system is the (grossly underspecified) component in which word
meanings are represented. It corresponds to the "semantic memory" component of many
cognitive theories of memory. According to some theorists, the semantic system should be
divided into a verbal semantic system where word meanings are represented and a non-
verbal semantic system in which such things as one's knowledge of objects and people is
stored.

Several different neuropsychological conditions may include semantic system
impairments. Among these are dementia, category-specific impairments which
compromise equally the production and comprehension of both spoken and written words,
"deep dysphasia" where semantic errors are made in auditory-vocal repetition (pp. 157-
158), and "deep dyslexia" in which both semantic errors in reading aloud and the
characteristic imageability effect (better reading of concrete than abstract words) have
been attributed to semantic system impairments (pp. 212-217).
5. The visual analysis system has three functions: (1) to identify letters in written words (or non-words or letter strings); (2) to encode each letter for its position within its word; and (3) to group perceptually those letters which belong together as part of the same word. One or other of these functions may be disturbed in patients with certain "peripheral" acquired dyslexias. Thus patients with "neglect dyslexia" may fail to identify letters at one end of a word (pp. 195-197), whereas "attentional dyslexics" may have problems with perceptual groupings which result in errors which incorporate letters from two or more words present in the visual field (pp. 197-199).

Normally the visual analysis system can identify several letters simultaneously and in parallel (hence word length has little effect on the recognition of familiar words). On one theory of "letter-by-letter reading" (pp. 199-201) letter identification has been reduced to a serial process with only one letter at a time being transmitted from the visual analysis system to the visual input lexicon (Patterson & Kay, 1982). An alternative theory (Warrington & Shallice, 1980) holds that transmission of information from the visual analysis system to the visual input lexicon is completely severed, so that letter information must be transmitted instead along connection 22 to the spelling system which effects recognition in a slow and laborious manner (possibly back up through the graphemic output lexicon to the semantic system, though this is highly speculative).

6. The function of the visual input lexicon in reading is analogous to that of the auditory input lexicon in speech perception. It identifies strings of letters which form familiar written words. It can respond to an unfamiliar word (or non-word) by declaring it unfamiliar, by allowing it to activate the representation of a visual similar real word (hence perhaps allowing a patient to respond "table" to the non-word toble), or possibly by initiating an attempt at pronunciation based on analogy with familiar words. The visual input lexicon indicates that a word has been seen before, but if the word is to be understood it must activate its semantic representation in the semantic system (4), and if it is to be pronounced correctly it must activate its spoken form in the speech output lexicon (8).

Impairment to the visual input lexicon may account for visual errors such as misreading arrangement as "argument", or calm as "clam". These are the predominant error forms in "visual" dyslexia (p. 202), but accompany other symptoms in many other forms of acquired dyslexia.

7. The link between the visual input lexicon and the semantic system allows written words which have been recognised as familiar to access their meanings in the semantic system (4). Selective impairments to this connection will result in a patient who can distinguish written words from non-words (visual lexical decision) but fails to understand many written words, or understands them only slowly and incompletely. Auditory word comprehension, speaking, and writing could remain intact. Patients with "semantic access dyslexia" may approximate to this description (pp. 211-212).

8. The function of the speech output lexicon is to make the spoken form of a word available to a speaker. In speech production this will occur in response to activation from the semantic system; in reading it may occur through a combination of input from the semantic system and more direct connections from the visual input lexicon (see 14 below).

Evidence from both normal subjects and brain-injured patients suggests that ease of activating entries for words in the speech output lexicon is a function of word frequency, with commonly used (high-frequency) words being easier to access than less commonly used (low-frequency) words. This pattern may be seen in "anomic" aphasics with word-finding problems for words whose meanings they have full awareness of (pp. 119-124). Such patients may only be able to retrieve reliably high-frequency words, though for less common words they may show partial access, generating approximations to words which
can also be seen in normal subjects caught in tip-of-the-tongue states. These neologistic approximations may occur frequently in the speech of patients with "neologistic jargonaphasia", a condition in which word retrieval is also frequency-related (pp. 124-129). Target-related neologisms (phonological approximations) also show that retrieval of word-forms from the speech output lexicon is not an all-or-nothing affair.

9. At the phoneme level are represented individual distinctive speech sounds. These could be positionally coded, as letters are thought to be in the visual analysis system. The phoneme level receives inputs from three different sources. The first is the auditory analysis system. This provides a mechanism for the auditory-vocal repetition of both familiar and unfamiliar words (or non-words)—see 11 below. The second input is from the speech output lexicon: phonemes may be activated in the course of spontaneous speech production or reading aloud or semantically mediated repetition or object naming, and so on. Thirdly, the phoneme level may be activated by grapheme-phoneme conversion when unfamiliar words or non-words are being read aloud (see 15 below).

The phoneme level guides speech production through as yet unspecified processes which end in the articulation of speech sounds. The phoneme level can also guide "sub lexical" or "assembled" spelling of words whose spellings are not represented in the graphemic output lexicon (see 16 and 17 below).

Slips of the tongue made by normal speakers involving substitution or misordering of phonemes may be attributed to errors at the phoneme level. One hallmark of such errors seems to be that they involve the replacement of phonemes by other phonetically similar phonemes (e.g. replacement of /b/ by /p/, or /g/ by /k/—see Ellis, 1979a; 1980). Errors arising at this level may also be seen in the speech of some Broca's aphasics and possibly some "conduction" aphasics.

10. The two-way arrow connecting the speech output lexicon to the phoneme level is meant to represent the notion that the lexicon and the phoneme level exist in a state of mutual, interactive activation. This means that as an entry in the speech output lexicon is activating its phonemes at the phoneme level, so activation is fed back up to the speech output lexicon in a form of positive feedback. The normal function of this interactive activation is to hasten the selection of entries in the lexicon and the activation of phonemes at the phoneme level, but it may occasionally err, resulting in the production of errors known as malapropisms, where a word similar to an intended target word is spoken by mistake. These word substitution errors are quite common in normal slips of the tongue and may also occur in aphasic patients. It may also be possible to invoke this interactive activation in order to account for certain spelling errors of normals and acquired dysgraphics in which a real word misspelling is produced which is similar or identical in sound to the intended word. This can be done if we postulate a direct link between corresponding entries in the speech output lexicon and the graphemic output lexicon (16; see also pp. 171-172).

11. Both normal speakers and many aphasic patients are able to repeat aloud unfamiliar words or invented non-words for which there will be no entries in the auditory input lexicon or speech output lexicon. This means that we must postulate a route from input to output which does not go through the two lexicons: This is provided in the model by the direct link between the auditory analysis system and the phoneme level. Although repetition of unfamiliar words is relatively uncommon in adulthood, it is a necessity which must arise very commonly in childhood where children repeat words they have not heard before in order to question adults about their meaning. In this respect, non-lexical repetition is more important in childhood than in adulthood, as may be non-lexical reading (see 15 below). The provision of a direct link between the auditory analysis system and the phoneme level provides a mechanism whereby unfamiliar words may be repeated without comprehension or recognition. This route is impaired in certain aphasic patients,
e.g. "auditory phonological agnosics" and "deep dysphasics", whose repetition of non-words is much worse than their repetition of words.

The link between the auditory analysis system and the phoneme level is represented as a two-way link. This means that activation of phonemes at the phoneme level can be fed back to the auditory analysis system. This could provide a mechanism for what we experience in everyday life as "inner speech", where we appear to hear our own silent speech internally. This inner process of generating what is effectively an acoustic image from a phoneme level representation may also be important in the silent comprehension of written words which have been read aloud using grapheme-phoneme conversion, as when a child reads silently an unfamiliar written word, recognises its sound form as one which has been heard before, and understands the word.

12. As an alternative to the internal feedback from phonemes to the auditory analysis system afforded by 11 above, one may speak a word aloud and monitor one's own speech output by external feedback. The inability to monitor one's own speech and detect one's own errors may be a contributing factor in certain forms of aphasia. Thus it is suggested in Chapter 5 that "neologistic jargonaphasics" may freely produce large numbers of errors in their speech precisely because an accompanying speech perception disorder prevents them from detecting their own errors and therefore from knowing that their own speech is replete with mispronunciations.

13. A direct connection between an auditory input lexicon and a speech output lexicon appears in several models, including the logogen model (e.g. Morton & Patterson, 1980). The evidence for its existence is slim, however, and its presence makes models with separate input and output lexicons harder to distinguish empirically from models with a single input-output lexicon for spoken words (e.g. Allport & Funnel, 1981).

The main argument in favour of this connection is the fact that it helps complete a whole-word route from auditory input to written output that by-passes the semantic system (auditory analysis system to auditory input lexicon to speech output lexicon to graphemic output lexicon to writing or oral spelling). Such a route seems necessary to explain the ability of some patients with "word meaning deafness" to spell to dictation irregular words they appear not to understand (see p. 177). Better evidence for such a connection would be provided by a patient who could repeat words but not non-words without understanding the words he could repeat correctly.

It is a measure of the incomplete development of models such as Fig. 8.3 that we do not feel the need for a comparable connection between the visual input lexicon and the graphemic output lexicon.

14. Patients have been reported who can read aloud irregular words correctly without appearing to understand what those words mean. This has been taken to imply the existence of a whole-word route from the visual input lexicon to the speech output lexicon, by-passing the semantic system. Unlike route 13, this route is also supported by evidence from normal, intact subjects who are able to read aloud familiar, irregular words faster than they can perform any form of semantic categorisation upon those words. This finding is compatible with the notion that the retrieval of the pronunciation of a word following its recognition by the visual input lexicon can operate simultaneously and in parallel with the retrieval of the word's meaning from the semantic system.

15. Normal readers can read aloud unfamiliar words or non-words which they have never seen before. Hence we must incorporate into our models a route from letter recognition to speech output which does not depend on words being recognised as familiar by the visual input lexicon. One option is to postulate a distinct sublexical route by which unfamiliar words or non-words can be read aloud through a process of dividing a word up into letters or letter groups and translating those visual units into corresponding
phoneme strings. This route would be relatively little used by skilled adult readers, but used extensively by children, for whom far fewer words are represented as wholes in the visual input lexicon, or by unskilled adult readers.

Some aspect of grapheme—phoneme conversion is impaired in "phonological dyslexics" who can read aloud real words much better than they can read aloud unfamiliar words or non-words. Grapheme-phoneme conversion is also severely impaired in "deep dyslexics".

On pp. 203-233 we acknowledge the existence of alternative theoretical accounts of how we might read aloud unfamiliar words, including accounts which would effectively merge grapheme-phoneme conversion with the whole-word route (14), which connects the visual input lexicon with the speech output lexicon.

16. The function of the graphemic output lexicon is to store the spellings of familiar words and make them available in the process of writing. It is particularly important for a language like English that spellings should be retrieved as wholes from memory, because of the presence in the language of so many words with irregular, unpredictable spellings. Words can be retrieved from the graphemic output lexicon in response to input from three different sources—the semantic system, the auditory input lexicon, and the speech output lexicon. We have discussed in 10 above the fact that an input from the speech output lexicon may allow us to explain certain types of spelling errors in which words are produced which are similar in sound to the intended word. An input from the semantic system may allow explanation of semantic errors in writing, both as made occasionally by normal subjects and as made in large numbers by "deep dysgraphics". Retrieval of spellings from the graphemic output lexicon is not all-or-nothing: We can see both in normal subjects and in a variety of acquired dysgraphic patients the occurrence of errors which incorporate unpredictable elements of a word's spelling, while nevertheless being incorrect. Arguably, such errors result from incomplete activation of entries in the graphemic output lexicon.

17. The reasons for including a connection between entries in the speech output lexicon and the graphemic output lexicon are discussed in Chapter 7 (pp. 170-172). They include the fact that normal writers will produce involuntary "slips of the pen" occasionally, where an intended word is miswritten as another real word which is identical or similar in sound to it (e.g. writing scene for seen, or surge for search). Some dysgraphics produce similar errors at higher frequencies.

The connection also plays a part in explaining how some "word deaf" patients may be able to write to dictation irregular words they do not understand (see 13 above).

18. Skilled writers can devise plausible spellings for unfamiliar words or invented non-words. In English this is a hazardous enterprise given the variability and unreliability of sound-to-spelling correspondences in English. The ability to generate spellings for unfamiliar words is explained in the model in terms of a system of phoneme-grapheme conversion connecting representations at the phoneme level to representations at the grapheme level (i.e. a system for mapping sounds onto spellings).

The hallmark of phoneme-grapheme conversion is the occurrence of "regularisation" errors which sound like the intended target word (e.g. misspelling biscuit as "biskit"). Such errors are seen in large numbers in the spelling of "surface dysgraphic" patients in whom the process of whole-word retrieval from a graphemic output lexicon is impaired. Conversely, phoneme-grapheme conversion is itself impaired in "phonological dysgraphic" patients whose spelling of familiar real words is much better than their spelling of unfamiliar words or non-words.
19. At the grapheme level are somewhat abstract representations of each of the letters used in English. These representations are abstract because it is assumed that the upper- and lower-case versions of a letter will be represented by a single entry at the grapheme level. Selection of particular letter forms and particular modes of spelling output (handwriting, typing, spelling aloud, etc.) is made downstream of the grapheme level.

The grapheme level receives three inputs—one from the visual analysis system permitting words to be copied directly from print, a second from phoneme—grapheme conversion, and a third from the graphemic output lexicon. Certain slips of the pen made by normal writers may be attributed to errors at the grapheme level, as may the more frequent errors of some "peripheral" dysgraphic patients (pp. 181-182).

20 and 21. At the allograph level letters are represented in spatial form. Each grapheme has at least two allographic variants—its upper- and lower-case form. At the level of graphic motor patterns the letters are represented as the movements necessary to create particular allographs. Certain letter-level slips of the pen in normal subjects, and also certain forms of "peripheral" dysgraphia, may be interpreted in terms of problems arising at the allograph level or the level of graphic motor patterns (pp. 182-187).

22. This link from writing back to the visual analysis system represents the external feedback which can be gained by reading one's own writing. Patients with "afferent" dysgraphia appear not to attend sufficiently to external visual feedback, as they also fail to attend sufficiently to internal kinaesthetic feedback. As a result, they make characteristic errors involving repetitions or omissions of strokes or letters in sequences of similar items. The same sorts of errors can be induced in normal subjects by depriving them of visual feedback (e.g. having them write with eyes closed), and these errors may reach levels in normal subjects comparable to those seen in "afferent dysgraphics" if the removal of visual feedback is combined with a secondary task such as tapping or counting while the person is trying to write. The secondary task probably interferes with attention to kinaesthetic feedback in normal subjects (see pp. 183-187).

23. The provision of a direct connection between the visual analysis system and the grapheme level allows words or non-words to be copied without being recognised or understood. The copying in question is not slavishly pictorial, but involves copying of the stimulus material in the subject's own handwriting. Making the connection between the visual analysis system and the grapheme level two-way provides a mechanism whereby subjects might image visually words retrieved from the graphemic output lexicon or assembled by phoneme-grapheme conversion. This internal feedback would be analogous to the internal feedback from the phoneme level to the auditory analysis system (see 11 above).

Note: Some of the arrows connecting components are two-way, whereas others are shown as unidirectional. The conservative rule we have followed is only to show a connection as two-way if we have evidence that two components can exert a mutual influence on one another. Thus, two-way arrows connect the auditory and visual analysis systems to the auditory and visual input lexicons as a device for explaining the "top-down" word-superiority effect, whereby phonemes and letters are perceived more rapidly and more accurately in words than in non-words. Similarly, the semantic system has bidirectional connections to the auditory and visual input lexicons to explain semantic priming and other "context effects" (see McClelland, 1987, for a review of such interactive phenomena in language processing). In contrast, there are grounds for believing that grapheme—phoneme conversion is a one-way translation process distinct from phoneme-grapheme conversion. Other connections shown as one-way may, in reality, be two-way connections allowing interactive activation between components.