SOME THEORETICAL ASPECTS OF THE READING PROCESS

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Since Huey, in his classic work of 1910, noted that reading "as a psycho-physiological process, is almost as good as a miracle"[1] the definitions of the process have multiplied; but our real understanding of that process has advanced little.

Stauffer reviewed numerous descriptions of the reading process and reported universal agreement among authorities on only one point: that comprehension is an invariant condition of reading.[2]

Stauffer himself considers reading a form of problem solving — an active cognitive process of "seeking relationship to, differentiating from and reconciling with"[3] existing ideas. The efficient reader will read with a purpose, abstracting information, testing its value, and then accepting or rejecting his hypothesis.

This type of description is popular at the present time with both educational psychologists and psycholinguists.

For Goodman, reading is a psycholinguistic guessing game. The reader, a user of language, interacts with the graphic input as he endeavours to reconstruct a message encoded by the writer. Language cues are selected from the perceptual input on the basis of the reader's expectations. This information is processed and tentative decisions are made to be confirmed, rejected or refined as the reading progresses.

Holmes, using factor-analysis techniques, attempted to isolate the significant elements of the reading process. The resulting definition is daunting.

> "Reading is an audio-visual verbal-processing skill of symbolic reasoning, sustained by the interfacilitations of an intricate hierarchy of substrata factors that have been mobilized as a psychological working system and pressed into service in accordance with the purposes of the reader."[4]

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1. Huey, E., **The Psychology and Pedagogy of Reading,** Macmillan, New York, 1910, p. 5.
2. Reported in Robeck, M. and Wilson, J., **Psychology of Reading: Foundations of Instruction,** Wiley & Sons, New York, 1974, p. 31.
3. Ibid., p. 33.
4. Ibid., p. 34.

In an attempted simplification of this definition one of Holmes' associates produced.

> "In reading along a particular sentence a reader must retrieve and mobilize systems for recognizing words and phrases, next link the recognized words or phrases to their corresponding meanings, and subsequently utilize various cognitive processes for inferring, interpreting, and inductively or deductively arriving at conclusions or solutions to problems." 5

The linguists have not done much better. They may have supplied simpler definitions — but definitions which do not provide any real answers. Take for example Fries.'

> "One can read in so far as he can respond to the language skills represented by graphic shapes as fully as he has learned to respond to the same language signals of his code represented by patterns of auditory shape." 6

And for Carroll reading is —

> "the activity of reconstructing a reasonable spoken message from a printed text, and making meaning responses to the reconstructed message that would parallel those that would be made to the spoken message." 7

No wonder those concerned with teaching reading have been very cautious.

> "The analysis of reading skills has been very detailed, but we seem to be a long way from understanding the manner in which different features of the skill relate to form one process." 8

A clear definition of reading is essential for the planning of instructional. programmes and yet textbooks giving attention to the definition of reading are the exception rather than the rule. Few systematic attempts to define reading have been made and no satisfactory definition exists at this time. Part of the problem no doubt is the number of areas that seem to be involved in the reading process — perception, educational psychology, linguistics, social psychology, psycholinguistics and language learning.

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5. Robeck and Wilson, op. cit., p. 34.

6. In Clymer, T., "What is Reading? Some Current Concepts," in Melnik, A. and Merritt, J., **Reading Today and Tomorrow,** U.L.P., London, 1974, p. 48.

7. In Allen, J. & Pit Corder, S. (eds.), **Techniques in Applied Linguistics,** O.U.P., 1974, p. 157.

8. Ibid., p. 155.

Jenkinson sums it up thus:

> "...future models should not attempt, at least in the beginning, to be all inclusive. We need a series of models of various aspects of reading which may ultimately be capable of being integrated. But a model which deals with the reading process as such, which includes the cognitive interactions, the import of language and linguistic considerations in the affective as well as the cognitive domain, and will then attempt to relate these reading operations to other aspects of thinking, is perhaps the most urgently needed."[9]

For the practising teacher a good working definition might be that reading is is a process of selectively sampling the pool of graphic, semantic and syntactic cues and arriving at a reasonable reading based on the information provided by these cues.

What does seem clear is that reading exists on at least two levels, that of decoding the graphic symbols of the printed page and that of 'understanding' or comprehension. This dichotomy is clearly indicated in the reported remark of a child "Oh, I read all right, it's just the words that bother me."[10]

One area in the study of the reading process that we now better understand is that of eye movement during reading. The first such observations were published by Javal in 1878. It used to be thought that the eye moved smoothly along each line of print, in the case of English, from left to right. The development in the 1950s of eye movement photography has enabled us to measure the various dynamics of eye movements during reading and has shown that the eye movement in reading is a "jumpy, irregular, spasmodic, but surprisingly accurate leap from one position to another."[11] These jerky eye movements are known as saccadic movements. The eye movement photography technique is simply the reflection of a beam of light from the cornea of the eye onto a piece of moving film.

Reading is, of course, a form of visual information processing and the processing occurs during the fixations rather than during the transition from one fixation to the next. As Smith puts it, "The leaping eye is practically blind."[12] The fixation pauses are the periods of clear vision during which perception occurs.

The average fixation time is 250 milliseconds. Of that time it seems that only some 50 milliseconds is concerned with actual input and that will occur at the beginning of a fixation. The other 200 milliseconds constitute the time necessary for the processing of the input and to enable the oculomotor and visual

9. Jenkinson, M., "Sources of Knowledge for Theories of Reading" in Melnik, A. and Merritt, J., op. cit., p. 103.
10. Clymer, T., op. cit., p. 48.
11. Smith, F., **Understanding Reading,** Holt, Rinehart & Winston, N.Y., 1971, p. 98.
12. Ibid., p. 99.

systems to process position information in order to calculate where on the line the eye will move next. This 200 milliseconds is the minimum oculomotor time between saccadic movements and places a limitation in the rate at which fixations are made during reading.

The saccadic movement may be forward along the line of print or it may be a regression — when the reader wants to check something back along the line of print. Regressions may result from faulty comprehension, a lapse of concentration, the misreading of a word or a misprint. Regressions were once thought of as a good measure between 'good' and 'bad' readers but we now know that the number of regressions are an indication more of the difficulty of the text than of the skill of the reader. All readers make regressions and a regression may be just as productive an eye movement as a saccade in a forward direction.

One parameter that can be adjusted is the number of fixations. Research among American college students reports that for a line of print of ten words there were on average nine fixations. 'Speed reading' programmes have laid much emphasis on the fact that it is relatively easy to reduce the number of fixations for such a line to three.

What is also apparent is that there is no necessary serial sequence to a rapid reader's fixations. Figure 1 shows in sequence the fixation loci of a rapid reader.

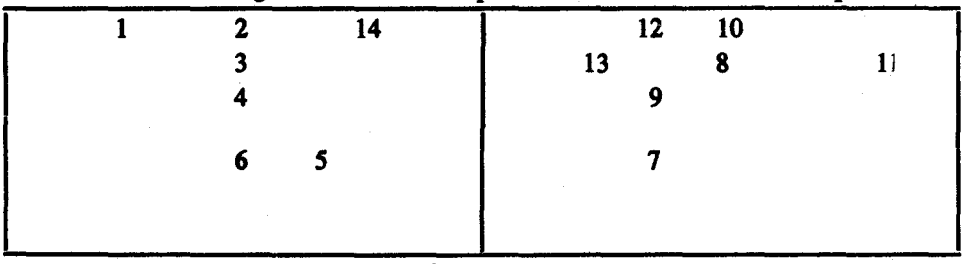

Figure 1 [13]

The same person was variable from page to page with relation to eye movements and other readers of similar speed scanned the same page in different ways. The reader represented in Figure 1 made no fixations in the bottom third of either page. What is evident is a number of fixations in a particular region.

Here we can pose the question, is reading a second language any different in the area of eye movements?

Oller and Tullius, [14] using eye movement photography, studied the following parameters—

1. number of fixations per one hundred words,
2. number of regressions per one hundred words,
3. average duration of fixation,
4. average number of words read per minute, and
5. average number of words taken in per fixation, known as the span of recognition.

13. Kolers, P., "Reading is Only Incidentally Visual," in Goodman, K. and Fleming, J. (eds.), **Psycholinguistics and the Teaching of Reading,** I.R.A., Neward, 1969, p. 14.
14. Oller, J., Tullius, J., "Reading Skills of Non-Native Speakers of English," in **IRAL,** Vol. 11, 1973, pp. 69-80.

In this research, as indeed in all work considered in this discussion, the reading had to be with a minimum of 70% comprehension determined by a multiple choice test on the material read.

The subjects in this research were fifty non-native speakers at the University of California. Their performance was compared with the norms for native speakers established on the data for twelve thousand subjects over various grade levels. The results are shown in Figure 2.

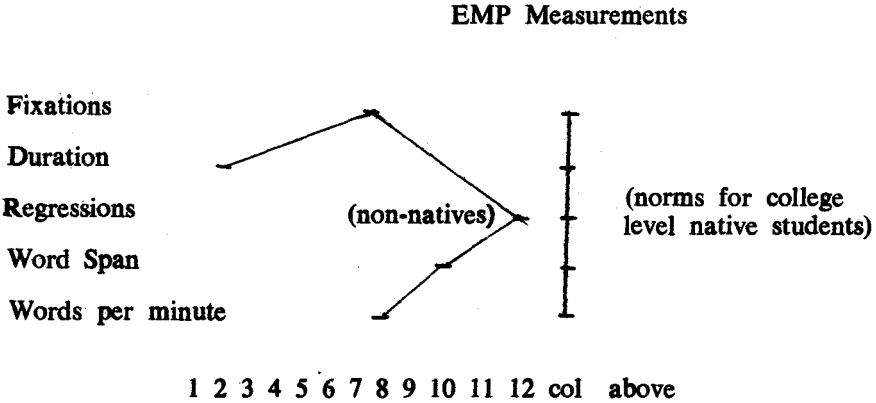

Figure 2 [15]

On a number of the measures the differences are not statistically significant. Perhaps the most important feature to emerge was that the average number of regressions for non-native subjects is insignificantly different from college level native speakers. It had always been assumed that non-native speakers would make more regressions than a native speaker, e.g., "linguistic difficulties....are the main cause of slow reading in foreign students and of the accompanying habits of vocalisation and regression to which they are prone." [16]

However, it must be pointed out that the sample used was rather small and, perhaps more importantly, the authors do not supply a breakdown on the L 1 backgrounds of their subjects. This latter point is of considerable importance in view of findings by Gray that the average number of regressions varied widely between languages. [17] Gray's study was based upon fourteen languages with the subjects each reading in his own native language. His English subjects on

15. Oller, J., in **TESOl Quarterly,** Vol. 6, No. 4, 1972, p. 315.

16. Macmillan, M., **Efficiency in Reading,** CILT, 1965, p. 18.

17. Gray, W., **The Teaching of Reading and Writing,** UNESCO, Paris, 1969, p. 59.

average had one regression for each 10.7 words read. More frequent regressions were found with, for example, Arabic — one regression per 8.7 words read and Hebrew — one regression per 7.7 words read. In the other direction, French speakers had one regression per 13.9 words read and Hindi speakers only one regression per 20.4 words read. The figures for all fourteen languages are given in Table 1. It may be that the bulk of the subjects in the Oller and Tullius research were from L 1 backgrounds having regression rates similar to English. They may have transferred their regression rate to their reading of English. If, on the other hand, it was shown that they came from L 1 backgrounds where the regression rates were dissimilar to the English rate and that they were now 'adapting' to the English native speaker's rate, a case could be made for saying that there is something in the syntactic nature of each language that is a contributing factor to regression rate.

Language Read	No. of sub-jects	Words per Fixation		Duration of Fixation		Words per Regression	
		Oral	Silent	Oral	Silent	Oral	Silent
Arabic	6	1.3	1.4	16.8	13.1	8.7	10.0
Burmese	2	2.5	2.4	15.7	10.6	38.6	32.7
Chinese	7	2.5	2.5	16.5	11.0	36.5	59.8
English	7	1.3	1.6	12.9	9.1	10.7	14.5
French	5	1.3	1.6	14.1	10.8	13.9	20.3
Hebrew	6	1.3	1.3	17.9	10.6	7.7	15.9
Hindi	6	1.6	1.5	17.5	11.7	20.4	21.6
Japanese	7	1.0	0.9	17.3	10.4	16.1	17.4
Korean	7	1.2	1.0	16.4	11.5	40.9	31.6
Navaho	2	0.7	0.7	16.9	15.4	7.2	9.4
Spanish	5	1.4	1.5	15.0	10.0	14.3	25.1
Thai	6	1.6	1.6	17.9	10.5	25.0	27.2
Urdu	7	1.6	1.7	16.0	11.6	14.2	24.9
Yoruba	5	1.4	1.4	15.8	12.7	9.2	16.8
Averages*		1.5	1.6	16.1	11.0	19.3	24.7

*Averages based on sums of all individual records, excluding records for the Navaho language. Because the groups were small and a typical group, standard deviations or similar measures were not used.

Table 1[18]

18. Gray, W., op. cit., p. 59.

However, once again the smallness of the Gray sample, 78 subjects over the fourteen languages with, for example, only two subjects for Navaho, invites us to treat the results with caution.

In fact, both the above pieces of research highlight the lack of rigorous experimental design which characterizes so much 'research' work in foreign language teaching. Often a teacher carries out some work on a current class to test some idea or hunch. His results are published in one or other of the growing number of journals dealing, exclusively or among other fields. with foreign language teaching. This in itself is no bad thing, as it may aid another teacher elsewhere in clarifying or understanding his own difficulties, may indeed solve some of his problems or may prompt him to try some research of his own. The danger however lies in accepting the results of such 'research.' They may have no validity outside the subject class.

Gray's work implied that the general nature of the reading act is essentially the same among readers regardless of the type of script used by a language, (alphabetic, syllabic, etc.) Oller and Tullius showed that there will be changes in some aspects of the reading act when reading in the L2. In addition to the findings on regressions discussed above there was evidence that the duration of fixations was significantly longer for the non-native speaker (see Figure 2). This may indicate that the non-native speaker requires significantly longer for the short-term memory processing which is occurring during the fixation. This contrast in performance in the speed of processing verbal information implies that the reading problem for the non-native speaker is one of central processing rather than of the mechanical skills of eye movement.

Of course, for teaching, the implications of eye movement research will depend on whether the teacher sees eye movements as reflecting reading efficiency or producing reading efficiency. Those who hold the former view will see little to gain by attempting to change eye movements themselves. Taylor[19] has questioned the reader's ability to consciously control eye movement — movements that are occurring at the rate of three to five per second.

It may be that the non-native speaker's longer duration of fixation is due to his 'seeing' too much, i.e., paying too much attention to the graphic display presented to him. There is some evidence to support such a view. Hatch, Polin and Part presented native and non-native speakers with written texts and asked them to read through the texts and cross out every occurrence of a particular letter.[20] They found that non-native speakers were more successful at the task than the native speakers. An analysis of where the native speakers failed to notice the letter showed that they tended not to 'see' them in function words, e.g., articles and conjunctions. Again, while they noticed the letter when it occurred in a stressed syllable they did not notice it in unstressed syllables, e.g., if asked

19. Reported in Macmillan, M., op. cit., p. 7

20. Hatch, E., "Research on Reading a Second Language," in **Journal of Reading Behaviour,** Vol. 6, No. 1, 1974, p. 56.

to cross out the letter 'a' they would do so in the case of the first 'a' in **vocabulary** but not the second 'a.'

Thus it may be that the non-native reader is paying more attention to the graphic information than is actually needed for successful reading. This would account for the longer duration of fixation found by Oller and Tullius.

An alternative explanation of the non-native speaker's longer fixation is that he takes longer to make predictions about the location of the next fixation point. This could be caused by his lack of knowledge about what is and what is not informative in the peripheral vision during each fixation.

Would the fact that an Arabic speaker had learned to read from right to left result in interference when he comes to read from left to right? The eye movements are obviously overlearned habits and may be difficult to adjust. Mishkin and Forgays studied the tachistoscopic perception of single words presented to the right and left of the fixation point for readers of English and Yiddish (like Arabic, read from right to left).[21] English readers found English words more easily recognized when presented on the right while Yiddish readers found those presented on the left more easily recognizable. This implies that experience somehow sensitizes the section of the visual system that plays an anticipatory role in the reading process.

Under the influence of syntactic and sentence methods of reading instruction, emphasis is now usually laid on reading in groups of words:

> "...the student must be taught to read in word groups. Fundamentally this means thinking in word groups. The student must be trained to look ahead and recognize sections of thought as it develops."[22]

This does not mean 'seeing' the word group at a single fixation as a number of writers have assumed. Elliot has spoken of students being taught to read "at least four words at a glance."[23] Plaister talks of training students to read "structures with one fixation of the eyes."[24] But as we have noted earlier the average number of words per fixation for American college level students is 1.11. And non-native readers showed no significant difference on this measure. Grey[25] gives a figure of 2.5 words per fixation for Chinese readers but gives no explanation of what a 'word' is in a non-alphabetic script like Chinese.

What can be taken in during a single fixation — the span of apprehension — varies according to the material; four or five unrelated letters. seven letters in nonsense syllables, three to five unrelated words and four to six words in sentences. What this reflects of course, is more the measure of verbal memory. A subject will do better if he is merely asked, How many? letters or words,

21. Reported in Neisser, U., **Cognitive Psychology,** Appleton-Century-Crofts, N.Y., 1967, p. 37.
22. Rivers, W., **Teaching Foreign Language Skills,** Univ. of Chicago, Chicago, 1971, p. 22.
23. In Oller and Tullius, op. cit., p. 70.
24. Plaister, T., "Reading Instruction for College Level Foreign Students," in **TESOL Quarterly,** Vol. 2, 1968, pp. 164-69.
25. Grey, W., op. cit., p. 59.

rather than having to identify as many as possible. The groups of words then should be seen as the unit of comprehension, a unit perhaps requiring several fixations

When talking of reading in groups of words Rivers is dealing with oral reading and this raises another research problem. The bulk of the research on reading has been within experimental designs that made use of reading aloud. Results have then been extrapolated to cover silent reading as well. It is now realized that this may give misleading results. For example, errors in reading aloud may represent encoding difficulties when the subject comes to respond rather than errors in decoding of the actual text. Silent reading and reading aloud should thus be viewed as distinctive skills although there obviously will be large areas of overlap.

It has been clearly demonstrated that in reading aloud the subject reads ahead, reading in groups of words, in order to acquire meaning. During oral reading the eye will be ahead of the voice by up to five words (and several fixations). The extent to which the eye is ahead of the voice is known as the 'eye-voice span.' It is easily demonstrated by simply turning off the light by which the subject is reading. He will utter a number of words even though he has been deprived of visual information. The critical question is whether this eye-voice span is in any way related to the unit of decoding. Secondly, is the eye-voice span related to the syntactic constituents of the text being read?

Extensive experimentation in this field has been conducted by Schlesinger. [26] His experiments were designed to test the hypothesis that the last word in the eye-voice span tends to be the last word in a constituent or 'would be' constituent. A 'would be' constituent is exemplified by **The woman** in the sentence, **The woman teacher, who taught him Latin, was very pleased.** In other words the subject may well believe that **the woman** is a constituent of the sentence he is about to read. As the subject read the light was turned off leaving a varied number of words to the end of the constituent. The results are shown in Table 2.

26. Schlesinger, I., **Sentence Structure and the Reading Process,** Mouton, The Hague, 1968, p. 34.

Length of EVS (no. of words)	No. of trials for 10 subjects	No. of trials in which	
		U is a V	U is a non-V
0	8	8	0
1	29	15	14
2	83	60	23
3	132	91	41
4	91	59	32
5	22	13	9
6	20	20	0
7	4	3	1
8	1	0	1
Total	390	269	121

TABLE 2

U = Last word in the eye-voice span.
V = A constituent or 'would be' constituent.

For each of the subjects tested more often than not the last word in the eye-voice span was the last word in a constituent or 'would be' constituent. The difference was a highly significant, p = 001. In Schlesinger's initial experiment the variable of word length was not controlled. A subsequent experiment with word length controlled showed similar results. Thus it seems clear that the syntactic constituent has psychological reality for the reader. It may be that the division of the line of print into syntactic units would aid the reading process. Some experimental work along these lines has been reported but the results are as yet uncertain. One kind of error that occurred is worth mentioning. In several trials the subjects changed the form of the last word they reported in their eye-voice span in such a way that it became a constituent — indicating a tendency to perceive a syntactic constituent.

There is additional support for the notion of the psychological reality of the syntactic constituent in the area of auditory perception. Ladefoged and Broadbent [27] superimposed clicks on a tape-recorded sentence. Subjects were asked to judge where in the speech sequence the click had occurred. It was found that subjects often erred by hundreds of milliseconds and several phonemes, suggesting that they are processing the input in 'chunks' that are difficult to interrupt.

The idea of 'chunking' had first been proposed by Miller who proposed a cognitive unit of about three words. For him the input is seen as a code that contains many chunks with a few bits per chunk. The listener or reader records the input into another code that contains fewer chunks but with more bits per

27. Reported in Neisser, U., op. cit., p. 187.

chunk. The span of immediate memory imposes severe limitations on the amount of information that we are able to receive, process and remember — by organization into chunks we can break or stretch this informational bottleneck. 28

Fodor and Bever developed the Ladefoged and Broadbent 'click' experiment to test the hypothesis that the constituent itself was the unit of speech perception. This suggested that the click should tend to be heard at the major grammatical break of the sentence. The test sentences were —

(1) As a direct result of their new invention's
INFLUENCE THE COMPANY WAS GIVEN AN AWARD.

(2) The retiring chairman whose methods still greatly
INFLUENCE THE COMPANY WAS GIVEN AN AWARD.

To ensure that vocal gesture gave no cue, the similar portions of the sentences were reproduced from the same strip of recording tape. The results supported the hypothesis. A click simultaneous with the first syllable of **company** was heard much earlier in sentence (1) than in sentence (2), that is, near the deepest grammatical break in each case. 29

As Neisser says:

> "This result demonstrates that grammatical structure **alone** can be enough to determine where interruptions are heard, and presumably how sentences are segmented. The segments are not necessarily divided by any marker in the stimulus. They depend on a constructive process in the listener, and a grammar-dependent process at that." 30

Given that the syntactic constituent is a unit of decoding in speech perception and in reading aloud there is a strong presumption that it will be a unit of decoding in silent reading.

One of the difficulties in this area of research however, is that syntactic units are to a large extent identical with units of meaning. It may be that the decoding is in semantic rather than syntactic units — or of course, a combination of both.

Schlesinger 31 has proposed a combined semantic-syntactic decoding process. This supposes that both semantic and syntactic units play a part but that in certain circumsances the syntactic structure will be largely redundant — a sentence being understandable if only the content words are supplied. Use will

28. For a fuller account of Miller's pioneering work see Miller, G., "The Magical Number Seven, Plus or Minus Two," in **Psychological Review,** No. 63, pp. 81-97.
29. A full report of this and a number of other relevant experiments will be found in Neisser, U., op. cit, Ch. 7.
30. Neisser, U., op. cit., p. 188.
31. Schlesinger, I., op. cit., Ch. 6.

be made of this syntactic redundancy if the sentence is very complex, e.g., has a high degree of embedding. The syntactic information will be filtered out thus reducing the overload on the decoding system.

Thus in the two sentences[32]

(1) **This is the boy, that the man, whom the lady, which our friend saw, knows, hit.**
(2) **This is the hole, that the rat, which our cat, whom the dog bit, caught, made.**

the high degree of embedding will lead to a breakdown of the 'order information' but in the case of sentence (2) the semantic cues will enable us to 'understand' the sentence. That is, we expect cats to catch rats and dogs to bite cats, etc., but no such semantic cues are given by **boy, man, saw, knows,** etc., in sentence (1).

In the experiment to test this hypothesis all subjects successfully rendered the content of sentence (2) within three readings. In contrast none of the subjects were able to render correctly the content of sentence (1) after four readings. The results were significant, $p = .004$, and indicate that semantic cues contained in a sentence clearly affect ease of decoding.

Furthermore, when presented with sentence (3) —

(3) **This is the hole, that the rat, which our cat, whom the dog bit, made, caught.**

all subjects but one gave its content as the same as sentence (2) — that is they relied on semantic cues. The sentence is in fact nonsense as its syntactic structure states that the cat made the rat.

While such experiments may provide insights into the reading process, they must be viewed with caution. Sentences like those above occur rarely, if ever, outside the laboratory. Much more classroom-based research is needed with the 'real' language that our students are likely to be required to read.

The question of syntactic complexity raises the whole issue of readability — a field in which much research is being conducted at the present time with the consequent development of a number of complex formulae for the establishment

32. Schlesinger, I., op. cit., pp. 130-31.

of a measure of readability. Readability research which originally concerned itself with vocabulary level and density and with sentence length has in recent times moved to consideration of issues such as syntactic complexity, discourse features and cohesiveness.

In the area of syntactic complexity most of the research has been conducted within a transformational framework. The evidence at this point is far from clear. A number of experiments have shown that transformed sentences take up more 'storage space' in the memory than kernel sentences and that transformation times were additional, i.e., a sentence with two transformations would take the summed times for the two transformations when they occurred individually.

Savin and Perchonock [33] asked subjects to repeat a sentence followed by a number of unrelated words. The number of unrelated words remembered fell away as the complexity of the sentence (in terms of transformations) was increased, e.g., kernel — passive — passive negative.

The explanation may be that subjects analyze the sentence syntactically and encode it as a kernel sentence plus the appropriate transformation. As Neisser puts it,

> "...as the syntactic structure becomes more complicated, along dimensions which are still controversial, it becomes a burden in its own right, and performance suffers accordingly." [34]

However, Schlesinger [35] found that embedded clauses had little effect on the reading rate and comprehension level of adult readers. A number of studies on embedding in speech perception have been conducted but as the recall of a sentence requires encoding as well as decoding it is hard to determine at which point the difficulty lies.

Pearson [36] asked subjects to give their preferences with regard to the relative clarity and simplicity of a number of forms, e.g., Why did John sleep all day?

(1) Because John was lazy he slept all day.
(2) John was lazy. So he slept all day.
(3) John was lazy and he slept all day.
(4) John was lazy. He slept all day.

There was a clear trend to select the more heavily embedded forms. The reason may well be that embedded forms have a lower 'inferential burden.' Thus, **Because the chain broke the machine stopped,** will be 'easier' than **The chain broke. The machine stopped.**

33. Reported in Neisser, U., op. cit., p. 272.
34. Neisser, U., op. cit., p. 275.
35. Schlesinger, I., op. cit., p. 106.
36. Pearson, P., "The Effects of Grammatical Complexity on Children's Comprehension, Recall and Conception of Certain Semantic Relations," in **Reading Research Quarterly,** Vol. 10, No. 2, 1974-75, p. 167.

Schlesinger subjects also reported difficulty with reading short sentences.[37] They felt them to be 'cut up.' No studies have been attempted on the optimum length of sentences but it seems clear that sentences can be too short just as they can be too long.

In the area of auditory perception Bransford and Franks[38] asked subjects to state whether or not they had actually heard certain components and to rate the confidence they had in their judgements. Larger components were given higher recognition scores and higher confidence ratings. They felt more confident about **The rock which rolled down the mountain crushed the hut** than they did about **The hut was tiny.** Listening habits may be a factor here — we are more used to hearing the longer type of sentence. The short sentence gives the impression of being out of place.

Studies that do show correlation between sentence length and comprehension difficulty may indicate that rather than grammatical complexity being the problem, the longer sentences are communicating more complex semantic relations.

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37. Schlesinger, I., op. cit., p. 79.

38. In Pearson, P., op. cit., p. 166.