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CENTRAL DETERMINANTS OF PERIPHERAL MANIFESTATIONS IN READING

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Numerous investigations have shown that poor reading is accompanied by irregularities in the eye-movements of the reader. The most marked of these is regressive movement, that is, backward movement of the eyes to places previously looked at. Clinicians in remedial reading have been much struck by the presence of these irregularities, and have sometimes attempted to improve reading by treating the eye-movements as such. The question investigated by this research is: Do irregular eye-movements cause poor reading, or does poor reading cause irregular eye-movements? If poor reading is shown to be the cause of poor eye-movements, then it is obviously fallacious to attempt the improvement of reading by working on the eye-movements.

The procedure was to study the relationship between the eyes and voice in oral reading. A camera was developed which photographs simultaneously and on the same film the movements of the eyes and the sound waves from the voice, and which permitted us to determine what both eyes and voice were doing at any time during the oral reading of a passage.

We set out to answer two specific questions: (1) Are oral reading errors accompanied by irregularities in eye-movements? and (2) If irregularities do occur, do they precede or follow the errors?

Two extreme groups of readers were selected on the basis of their scores on the Iowa Silent Reading Test, and eye-voice records were made of these subjects while reading a passage of moderate difficulty. It is not the purpose of this report to discuss the differences between the groups; it is enough to say that wide and consistent differences were found in all measures made.

In answer to the first question "Are oral reading errors accompanied by irregularities in eye-movements?" the records first were examined to see if words upon which errors were made were actually "looked at." It was found that 80 per cent of all error words were fixated with great precision before the error was made, even though the criterion of precise fixation which was used excluded many fixations which certainly presented the words

visually. This factor was ruled out, therefore, as a cause of error.

Next the initial eye-movement to each point of error was paired with an initial eye-movement to the same point by a reader of the same ability who did not make an error at that point. Control groups thus were secured. The eye-movements to these points made by the error and control groups were compared for possible differences which might be the causes of errors. (It should be recalled that all of these eye-movements occurred before the error words were read aloud.) The comparison revealed that the eye-movements were practically identical as to number of fixations made on the words, the duration of the fixations, their distance from the midpoints of the words, the extent of the forward shifts to and from the words, and the amount of eye-voice lead. It is thus seen that the first eye-movements to words upon which errors are subsequently made do not cause the errors, since substantially the same eye-movements are present when no errors are made.

The errors were then examined as to the number of regressive movements which were made to those points. Over 50 per cent more regressions were present when an error was made than when it was not made. This was the only eye-movement feature found which differentiated the error from the control groups, and which might be called an irregularity in eye-movements. The answer to our second question, "Do the irregularities precede or follow the errors?" was given very simply, therefore, by an analysis of the time of occurrence of the regressions relative to the time of the error. It was found that 79 percent of these regressions in poor reading, and 77 per cent in good reading occurred after the error had begun. And it is obvious that the percentages would be higher if the exact times of the central errors could be recorded. These particular regressions, therefore, cannot have caused these particular errors.

The few remaining regressions, which were made to points of error before the errors occurred, were examined for characteristics which might possibly make them causes of the erors. Comparison of analogous regressions made by the control groups revealed no differences of any magnitude.

On the basis of these results the following conclusions can be drawn: (1) The lack of adequate visual presentation of the words is not a cause of errors in reading, because error words are fixated with as great precision as are other words. (2) The eye-movements to points of error, previous to the errors, are not causes, since they have the same characteristics whether or not an error is made.

(3) The one difference in the eye-movements when an error is made is the presence of more regressive movements to the point of error, and approximately 80% of these regressions could not have caused the errors which they accompanied, because they followed temporally even the overt errors. (4) The remainder of the regressions cannot be named as causes, because they differ in no respects from regressions to the same points when errors did not occur.

The major finding of his research is, therefore, that regressive eye-movements are symptoms, rather than causes of poor reading. It may be inferred from this and other evidence that training the eye-movements is not the best clinical practice, and that remedial training in reading should be directed toward the central rather than the peripheral factors.

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