

VISION AND READING: AN OVERSIMPLIFICATION

Guest Editor, Harold A. Solan, O.D., M.A.

"...subtle deficits in ocular functioning within a group of students with 'normal vision' do not seem to have an appreciable influence on their acquisition of reading skills" is the authors' conclusion in an article that appeared recently.¹

Although the data provided in the article was sparse, it appears that Hall and Wick tested 111 children, grades one through six, whose IQ (Test not stated) was greater than 70. Each subject's composite reading score was obtained from the appropriate Stanford Achievement Test, which had been administered prior to the study. The scores from these tests that represented six different grade levels, however, were not provided, nor were the results of the 11 optometric tests. It would have been helpful for the reader to have had available the analysis of the data, bivariate correlations, and a correlation matrix of the independent variables. However, one would not anticipate abnormal findings in accommodation, nearpoint of convergence, and stereopsis, in a group of 111 asymptomatic children who were selected on the basis of no significant refractive errors and minimal heterophorias.

Significant bivariate correlations between the independent variables and total reading (word knowledge and comprehension), for example, would enable one to say that when a child ranks high in one variable he ranks (or scores) high in the other. If this were so, we could then expect that in this population of children with "normal vision" those who had the highest scores in reading would have the largest amplitude of accommodation or smallest measurement of nearpoint of convergence or the highest rate of accommodative flexibility. Among this group of subjects, however, the expectation violates some very basic concepts. First, it suggests a linear relationship between visual factors and reading scores using a constricted range of

binocular vision. The Pearson correlation assumes that the relationship is linear and uniform throughout the range. In this study two factors militate against linearity: subjects with poor binocularity were excluded from the study; and beyond a certain level of visual functioning, further development is not very helpful for cognition (e.g., accommodative amplitude). Also, among children whose visual scores are high, some will perform well in school, while others will perform poorly because of low motivation, lack of interest, poor language skills, or other adverse situations. This condition is known as *heteroscedasticity*.² One final question should be raised: Are the variables involving visual development that effect the learning of a 6-year-old child necessarily the same as those visual factors which have been identified in 12-year-old reading-disabled children? Not usually. The potential effects of visual processing deficits among the poor readers in the primary grades were not addressed. The heterogeneity of the antecedents of reading disabilities has been well documented.³ If their studies are to reveal the true relationships of visual functioning to reading disabilities, optometrists must recognize the need to develop relevant and reliable sub-types. One may predict that unless research protocols establish sub-types of reading disabilities, much of the optometric research will reveal negative results. This will largely be because the average level of performance for a total group composed of diverse sub-types will conceal the diversity and misleadingly suggest that this "technique" is ineffective for everyone. That is, if 15 subjects out of a group of 75 are affected, then it is appropriate to establish the relationship using the affected subjects, not the total group. In this article, the authors concluded that there does not appear to be a statistically significant relationship between ocular

functioning and reading in a population of children with small refractive errors and minimal heterophorias who have "normal" mental ability. These results are not entirely unexpected and, in fact, would be predictable to the experienced optometric practitioner. Hall and Wick certainly do not exhaust the hypotheses using multivariate analysis which may yield sub-groups of visually-related reading disorders. Optometric investigators should continue to address this problem using not only normally distributed samples of readers but also specific groups of poor readers in order to gain a more comprehensive understanding of the relationship of various sub-types of binocular and perceptual dysfunctions to reading and learning. A fuller discussion of these points by the authors would have resulted in an article whose thrust was less ambiguous.

References

1. Hall PS and Wick BC. The relationship between ocular functions and reading achievement. *J Pediatr Ophthalmol Strabismus* 1991;28(1):17-19.
2. Anastasi A. *Psychological testing*, 5th Edition. New York: Macmillan 1982:159.
3. Rourke BP and Strang JD. Sub-types of reading and arithmetical disabilities: a neuropsychological analysis. In Rutter M (ed): *Developmental neuropsychiatry*. New York: Guilford Press 1983:473-488.



Harold A. Solan, O.D., M.A.