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## FOREWORD

by Richard L. Masland

More than sixty years have passed since Samuel Torrey Orton published the first edition of his pioneering study, *Reading, Writing, and Speech Problems in Children*. Over 30 years ago, a collection of his papers, written from 1925–1946, was published posthumously by his widow, June Lyday Orton. These works are reprinted as Parts I and II in this volume.

The intervening years since Orton wrote about language learning problems have seen great advances in our understanding of the structure and function of the human brain. Nevertheless, Orton's remarkable observations and conclusions continue to provide valuable insights into the characteristics, nature, and remediation of developmental alexias, agraphias, apraxias, aphasias, word deafness, and stuttering.

Throughout his work Orton emphasizes the diversity of the symptomatology that these conditions exhibit and the need for individualization of analysis and treatment. He notes that "each case of developmental delay forms an individual problem" and that "we are all prone to search for a simplified and universally applicable formula, but no such general 'method' can be defined" (p. 86 in this volume).

Orton observed a disorder, or rather a peculiarity, of cerebral dominance leading to interference in right-left discrimination in many dyslexic children. Furthermore, family histories often revealed unusually large numbers of relatives with mixed cerebral dominance, left-handedness, or various forms of language disability. Because of the frequency of poorly established cerebral dominance associated with disturbances of right-left discrimination and sequencing problems, developmental variations in hemisphere preponderance were thought to be an underlying cause in many cases.

Orton rejected Hinschelwood's thesis that "word-blindness" results from congenital malformation of the left angular gyrus—the seat of word storage in the brain. Evidence at that time suggested that the two hemispheres were identical at birth and equally capable of supporting normal language function. Subsequent studies have shown, in fact, that asymmetries in the language areas are significant, and that, indeed, in most people, the left hemisphere can support stronger language functions than the right.

Furthermore, recent anatomical studies of brains of dyslexic subjects have demonstrated areas of malformation or underdevelopment in crucial areas of the dominant hemisphere. These same studies also suggest that underdevelopment of one area may be associated with overgrowth of others. Viewed in this light, Orton's thesis of a structural imbalance between the two hemispheres, which he presented in *Reading, Writing, and Speech Problems in Children*, is once again timely.

Orton's papers, published in 1966 as the Orton Society's Monograph #2 under the title *'Word-Blindness' in School Children and other Papers on Strophosymbolia (Specific Language Disability—Dyslexia) 1925–1946*, provide a deeper examination of Orton's thinking about dyslexia and other disorders of written and spoken language. In these papers he develops the theory that dyslexia may be accounted for by a physiological process dependent upon delayed maturation of one or another of the brain functions required for reading.

His emphasis on the physiological nature of the disorder and his demonstration that it was remediable by appropriate diagnostic and education approaches had a profound and continuing impact, especially when he used dramatic case studies to demonstrate the devastating secondary damage caused by misunderstanding and inappropriate management.

The theoretical basis for Orton's explanation of the nature of dyslexia has been a source of continued controversy. He was impressed by the frequency with which dyslexia, individuals made two related types of errors—the reversals of symbols, such as b and d, p and q, and words, such as was and saw, and the tendency to read words or part of words from right to left. Orton also noted the tendency of some to use mirror writing. He concluded that most of the other difficulties of dyslexic children were secondary to these basic problems of reversals and sequencing difficulties.

Orton developed a neurophysiological explanation for these phenomena. He noted that the two hemispheres of the brain are symmetrical and postulated that the sensory information (engrams) would be represented in each hemisphere in equivalent but mirror-image (antitropic) patterns. However, language functions depend upon only one "dominant" hemisphere. Thus, the comprehension of the written symbol can occur only when the engram, or sensory trace, of that symbol in one or the other hemisphere becomes associated with the language centers on the left.

Confusion, Orton believed, would occur when clear-cut hemispheric dominance failed to be established. Without this, "the immediately successive linkage between the sensory stimular (printed word) and its meaning (concept) which constitutes reading" could not take place ("Methods for Diagnosis and Treatment of Cases of Reading Disabil-

ity," 1928). Reading disability, he theorized is "probably dependent on failure of constant selection of either the right or the left sensory record in the brain" ("The Relation of the Special Education Disabilities to Feeble-mindedness," 1929).

Orton noted that in many of his cases disorders of spoken language development were very significant. While denying that these atypical forms of maturation had a "pathological" basis, he did not deny the existence of a strong hereditary factor that must have a structural basis.

Orton's papers on "Special Disability in Spelling" and "Special Disability in Writing" (written with Anna Gillingham, provide models for thorough case studies. They outline approaches to intervention that should be understood by every student of dyslexia.

Since Orton's time, three discoveries have both strengthened his concepts and required that they be modified. The first is the discovery that whereas the left cerebral hemisphere is "dominant" for handedness, language, and similar sequential activities, the right hemisphere is superior in pattern recognition, orientation, and other functions requiring parallel processing. These findings tend to strengthen Orton's concepts, since the establishment of an association between the visual stimulus, most effectively analyzed in the right hemisphere, and the linguistic counterpart, stored in the left hemisphere, could easily be seen to predispose to uncertainty of cerebral dominance, especially if the language function were poorly established in the left or if the spatial skills in the right hemisphere were strongly developed.

The second important discovery is the finding of Geschwind and Levitsky of significant structural asymmetries of the human brain. Specifically, the planum temporale—that area most directly involved in the analysis of auditory input—is ordinarily much more highly developed on the left than on the right. This finding establishes a structural basis for the physiological asymmetry noted by Orton.

Finally, and most important, has been the demonstration by Galaburda and Kemper that anatomically observable irregularities occur in the development of the brains of dyslexic individuals. In a sense, these findings support the view of Henschelwood that dyslexia is attributable to a developmental anomaly. On the other hand, they also support the view of Orton that "other areas would be competent to assume the function." The most striking finding of Galaburda and Kemper is not the presence of minor irregularities of development on the left side, but rather the evidence of compensatory overgrowth on the right. As a result, instead of the usual asymmetry, the planum temporale on the two sides is more likely to be equal in the brains of dyslexic individuals.

EEG, CAT, and fMRI are now enhancing our knowledge of the structure and function of the brain. Most striking is the demonstration that

information arriving in the brain is analyzed within various networks or "Modules." These operate in parallel in both the right and the left hemisphere. Within some areas, possibly in the frontal lobe, they are brought together to form a concept. Thus, the same information may be analyzed in both the right and the left hemispheres simultaneously. D. Bakker has studied his patients on the basis of which hemisphere appears to be playing a predominant role in the reading process. Orton was ahead of his time in emphasizing the important role that is being played by the right hemisphere: "its connections with the sensory receiving stations are intact and abundant and it seems evident that sensory data such as those furnished to the dominant side are constantly irradiating the nondominant side as well" (p. 323). These facts also account for the success of the multisensory training approach, which has been so successful a part of the Orton Gillingham method of remediation. In spite of the present preoccupation with the problems of lack of phonemic awareness and impaired rapid naming, there is still a need to explain the frequent finding of right-left confusion, which was the focus of Orton's imaginative studies of his patients.

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