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THE THEORY OF NEUROLOGICAL ORGANIZATION IN HISTORICAL PERSPECTIVE

Nancy C. Hartman and Robert K. Hartman*

Abstract

The treatment program for speech and reading disorders employed by the Institutes for the Achievement of Human Potential is discussed and relevant research and opinion cited. Questions related to the viability of the theoretical formulations and efficacy of the treatment procedures are raised. The authors conclude that the theory of neurological organization and the remedial principles based on that theory are scientifically unsubstantiated.

In 1959 C. H. Delacato wrote the *Treatment and Prevention of Reading Problems*. This book, along with a book which appeared four years later, *The Diagnosis and Treatment of Speech and Reading Problems* (Delacato, 1963), outlined an approach to the diagnosis and treatment of brain-injured children which has generated considerable controversy and is generally known as the theory of "neurological organization." This approach was developed at the Institutes for the Achievement of Human Potential by Delacato and physical therapist, G. J. Doman, and was based largely on the work of the Philadelphia neurologist, Temple Fay (1955).

The earlier historical roots of Delacato's approach lie with the work of Samuel T. Orton (1937) and his theory of hemispheric dominance and laterality as related to reading and language disorders. According to Orton's view it is necessary for the left hemisphere to be sufficiently dominant in language functioning to suppress interference from the right hemisphere in order to prevent confusion in oral language and reading. When dominance is incomplete the confusion is most evident in letter and word reversals which he called strephosymbolia (twisted symbols). However, while Orton's theory did encourage motor activities of the right side (contralateral to the language hemisphere) in order to enhance left hemisphere dominance, his approach to remediation of reading and language disorders was quite unlike Delacato's. Working in collaboration with Orton, Anna Gillingham developed a remedial program (Gillingham & Stillman, 1968) that employed a synthetic phonic approach in direct academic instruction. The heavy motoric emphasis in remediation seen in Delacato's approach was not employed by Orton.

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Theory of Neurological Organization

The theory of neurological organization is based on the postulate that "ontogeny recapitulates phylogeny." Delacato accepts the notion that individual development on the part of a human being repeats the pattern of the evolutionary development of man as a species. Delacato further postulates that if man does not adequately develop at each stage of the evolutionary continuum he will exhibit problems of language, mobility, and reading (among assorted other deficiencies).

Delacato traces the development of the brain from the lowest level of vertebrates, to amphibians, and to the primates. The lowest levels of vertebrates (such as fish) have the central nervous system control primarily centered in the spinal cord and medulla. Amphibians have the control centered in the pons region and have a more dominant midbrain while the primates have a dominant cortex. Finally, only man shows hemispheric separation of the cortex relative to functioning and control. Thus, the basic diagnostic procedure used by Delacato et al. is to assess a child's functioning level in relation to the postulated level of development phylogenetically. For this diagnosis they use the *Doman-Delacato Neurological Development Scale* (Doman, Delacato & Doman, 1964) which charts a child's development at the medulla, pons, midbrain, or cortex level (in order of ascending development) in six areas: mobility, language, manual competence, visual competence, auditory competence, and tactile competence. In the normal child it is assumed that complete neurological organization has taken place by age eight.

If damage to the central nervous system occurs during the developmental years, the child will show evidence of neurological dysfunction or disorganization. However, according to the theory of neurological organization, not all cells would be damaged and those remaining can be trained to take over the functions of the damaged or destroyed cells. Thus, the assumption that the central nervous system can be directly affected by remedial procedures is another cornerstone in the Delacato method.

After diagnosing a child's functioning ability by using the developmental profile, treatment is begun at the level of neurological development at which the child has not been able to demonstrate sufficient neurological organization through mastery of the tasks appropriate for that level. From that point on Delacato and his associates have the child master the requisite behaviors at each level before proceeding to those above that level in the hierarchy. For example, if a child is found to be unable to crawl in the prone position in a cross-pattern manner, he would not demonstrate the mobility necessary to be considered neurologically organized at the pons level. Thus, for this child a program of cross-pattern crawling would be employed in order to develop the mobility skills which presumably reflect

neurological organization at that level. Only after he has demonstrated his ability to cross-pattern crawl would he be moved to the midbrain level of mobility requiring creeping on hands and knees, culminating in cross-pattern creeping. The final stage of neurological organization in their scheme refers to cortical hemispheric dominance. Among other things, training at this stage emphasizes the consistent use of one side of the body for throwing, kicking, and sighting. In the latter case occlusion of the eye as well as a device to encourage suppression of vision in one eye (called the Stereo-Reader) are used to change eyedness.

From the foregoing discussion of treatment procedures, it can be seen that there is a corollary of the second assumption in the Delacato system, namely, that the behavior traits assumed to reflect development of the neurological system at various stages are more than correlates of maturation. The assumption is that teaching the child the behavioral trait which is assumed to reflect neurological organization does, in fact, neurologically organize the child.

Challenges to the Delacato System

From the first appearance of his book in 1959, Delacato's approach has been a focus of controversy. With the appearance of his second book in 1963 and several popularized accounts in magazines and newspapers (Bird, 1967; Brossard, 1962; Delay, 1963; Ernst, 1962; and Maisil, 1964) opposition began to mount. In a book review Brown (1964) wrote that "Neurologists will be unlikely to find this book scientifically informative. It is of some passing interest if viewed as an excursion into the realm of science fiction [p. 600]." Wepman (1964) refers to the mass media claims of the Delacato method as "the Madison Avenue treatment" and points out that they have been ". . . little different from statements which appear within the book itself and, in fact, are often outdone by the unsupported evidence presented in the book [p. 353]."

Edwin Cole of the Massachusetts General Hospital also wrote a negative review of the second book in the *Harvard Educational Review* (1964). He says, ". . . this is a dangerous book, because of the large amount of truth it contains, skillfully strung together in such a way as to mask a multitude of post hoc ergo propter hoc propositions, which are quite unjustified in the light of modern knowledge of neurophysiology [p. 354]." He also referred to statements of opinion by Delacato which he regarded as unsubstantiated to clinical studies which were scientifically uncontrolled.

After some initial objections such as Cole's, Delacato and his associates were almost continuously challenged by many individuals and organizations to produce research evidence to back their approach. In 1966 Delacato defended the efficacy of his system by referring to the studies of Alcuin,

Edwin, Glaeser, Kabot, McGrath, Miracle, and Nonan (Delacato, 1966). These investigations were offered by Delacato as proof of his methods additional to his own studies and the Piper study (Delacato, 1959). However, that same year an article by Robbins (1966) appeared in *Exceptional Children* in which a well designed experimental study failed to support the validity and practicality of Delacato's theory. Based on this study Robbins, along with G. V. Glass (1967) of the Laboratory of Educational Research at the University of Colorado, began an intensive investigation of the Delacato method. In August, 1967, they published a monograph providing an in-depth critical analysis of the theory, diagnosis, and treatment procedures of this controversial approach. While a complete review of the Robbins and Glass monograph would be too extensive for this paper, a few highlights from their analysis will be cited.

In reviewing the "ontogeny recapitulates phylogeny" assumption, Robbins and Glass (1967) refer to Haeckel's Biogenetic Law upon which it is based. They refer to this as being a discredited neurological theory and cite Kraus (1964) and Moody (1962) for the reasons. Originally Haeckel's Law was applied to only fetal development and was never intended to refer to children after birth (Cohen, Birch & Taft, 1970).

Other sources were cited such as Perkins (1964): "Not only does evidence from comparative neurology fail to support this theory in any detailed way but it has long been discredited in the educational and psychological fields from evidence in the development of behavior [p. 120]." Hudspeth (1964) is also quoted: "This neuro-anatomical development supposedly follows the structural changes found in ascending the phylogenetic scale. However, this comparison is based only upon gross structural similarities. In addition, there appears to be no one-to-one functional-structural correspondence as one follows the phylogenetic scale [p. 127]."

The importance of the sequential development of motor skills was also challenged by Robbins and Glass (1967). They refer to the studies of Shirley (1933) as well as Dearborn and Rothney (1941) as providing evidence to clearly challenge the assumption that early motor performance is predictive of later intellectual development. They also cite the fact that the Harvard Growth Studies found a near zero correlation between motor development and intellectual development. In another study by Robbins (1965) he found that many children who did well on Delacato's test of laterality had difficulties with some of the tasks at the earlier developmental levels. This evidence was seen as contradictory to the theory that deficiency at one level prohibits mastery of levels above.

Another important assumption challenged by Robbins and Glass (1967) is the notion of the importance of mixed laterality as a correlate or

cause of language and reading disabilities. Studies failing to support this supposed relationship with speech and language disorders have been reported by Osgood and Miron (1963) and Penfield and Roberts (1959). Considerable research has accumulated which disputes the presumed relationship between mixed laterality and reading failure. Witty and Kopel (1936), Gates and Bond (1936), Hildreth (1945) and Smith (1950) found no significant differences between good and poor readers on this variable. More recent studies by Belmont and Birch (1963; 1965) also failed to find a greater incidence of mixed laterality among poor readers.

After analyzing and providing evidence to question or refute many other areas of the theoretical formulations of Delacato, Robbins and Glass move on to evaluate the research put forth by Delacato in support of his program. To do this they used Campbell and Stanley's (1963) outline of research designs and threats to the validity of research and found that not one of the studies offered by Delacato was scientifically sound with adequate controls for the major threats to validity (see Figure 1). Each of those studies is analyzed in depth in the Robbins and Glass monograph.

At the end of their extensive review, three conclusions are cited.

1. The fundamental tenets of the theory are overwhelmingly refuted by internal inconsistencies, a lack of supporting evidence, and direct contradiction by established knowledge.
2. Studies which purportedly support the relationship between neurological organization and reading lack of sophistication and proper controls consistent with current scientific procedures.
3. There is no empirical evidence to substantiate the value of either the theory or practice of neurological organization [p. 37].

Professional Organizations Criticize Delacato Approach

The scientific attack on Delacato's approach mounted by Robbins and Glass was assisted by arguments in an article by Freeman (1967). Together these papers generated enough opinion and evidence that an "official statement" was prepared which was critical of the Institutes' approach (Cruikshank, 1968). That official statement was approved by the American Medical Association, the American Psychological Association, the American Academy of Cerebral Palsy, the American Academy of Physical Medicine and Rehabilitation, the American Association of Mental Deficiency, the American Congress of Rehabilitative Medicine, the Canadian Association for Children with Learning Disabilities, the Canadian Association for Retarded Children, the Canadian Rehabilitation Council for the Disabled, and the National Association for Retarded Children (Drake, 1968; Myers & Hammill, 1969). Since that official statement, the Delacato procedure appears to have lost popularity as a treatment for brain-injured children. To date there is published evidence of a large well-controlled evaluation program by the Institutes themselves.

Source of Invalidity	Delacato (1959)	Piper	Delacato (1963)	Sister Edwin	Master-man	McGrath	Noonan	Kabot	Glaeser	Alcuin	Miracle
History				X	X				X		
Maturation	X	X	X			X	X				
Testing	X	X	X			X					
Instrumentation								X			
Regression	X	X	X		X	X	X				
Selection				X					X	X	X
Experimental mortality		X			X			X	X		
Inappropriate or inadequate statistical analysis	X	X	X	X							

Figure 1. Probable Sources of Invalidity for the Eleven Experiments Being Reviewed*

* Robbins & Glass (1967), p. 22.

Along with the decline of the Delacato approach has been a general decline of all motor approaches to learning and language disabilities. Recent articles by Benton (1970), Mann and Phillips (1967) and Mann (1970; 1971) have suggested a general disenchantment with these approaches. The pendulum now seems to be swinging away from such perceptual-motor systems which are presumed to affect the child and toward a more task-oriented model which emphasizes the specific reading and language skills to be taught and the sequence in which they should be taught (Bateman, 1971; Cohen, 1971; Otto & Askov, 1970).

Summary

This paper has attempted to follow the development of the Delacato approach from a chronological view. The specific theories and methods are too extensive to report in a short paper, but an attempt has been made to capture the flavor of the theoretical formulations, the diagnostic and remedial techniques and supporting research. The literature reviewed for this paper would lead these writers to conclude that the fundamental theory is based upon questionable conceptions of neurology, and the evidence supplied to support the method has been heavily laden with methodologically unsubstantial studies.

Certainly the dilemma in dealing with brain-injured children is such that any new approach warrants consideration. However, new approaches must be subjected to the same critical scientific analysis as other approaches in order to justify their continued existence beyond the exploratory experimental stages. Until more convincing research evidence is provided, it would seem that the theory of neurological organization must be considered as scientifically unsubstantiated.

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