SPECIFIC PROBLEMS IN ARITHMETIC
IN THE BRAIN-INJURED CHILD
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This paper is based on my experience in teaching "exceptional children" in my schools for children with learning difficulties. The majority of these children have been diagnosed as brain-injured, with varying degrees of educational retardation. The age range is from 7 to 17 years.

One may ask, "Why present a paper on Arithmetic Problems to THE ORTON SOCIETY, whose interests are directed toward the child with language disabilities?" Or, again, "Why arithmetic problems as encountered in the Brain-Injured Child?" The answer is: because the problems arising in teaching and in comprehending number concepts and processes are closely related to language, and success depends largely on the child's ability to make adequate use of receptive and expressive language. And the discussion of the brain-injured child before this group may be justified because so many of the characteristic learning difficulties of the organically damaged child are found to a milder degree in children with specific language disabilities. It is our hope that the methods of training which have proved helpful to the brain-injured child may also prove of value to others with similar problems in arithmetic.

To quote Dr. Archie Silver (1): "Approximately 70% of children with reading disabilities do not have 'organic' signs in the sense of structural damage, but they do have neurological and perceptual problems." Moreover, 22% of the reading cases in Dr. Silver's study did show evidence of more specific organic defects. These findings confirm the contention that

Common Factors

What are some of the factors interfering with the learning capacity of the brain-injured child? The following symptoms can be found singly, or in varying combinations and degrees, in brain-injured children in a classroom situation:

1. Fluctuating attention
2. Perceptual disturbances — visual and/or auditory or kinesthetic, related to
3. Figure-background confusion, i.e., difficulty or inability in differentiating the foreground from the background, as in
   a. Picture identification and discrimination, especially of outline pictures
   b. Identification and discrimination of patterns of sounds in proper sequence
   c. Identification and discrimination or reproduction of a sequential pattern by touch
4. Distortion of body image (the awareness of the parts of the body in relation to one's self, to others, and to space)
5. Visual and motor incoordination
6. Disturbed spatial, size, sequence, temporal, relationships
7. Motor disinhibition—"drivenness"
8. Left-right confusion. Mixed lateral dominance
9. Perseveration (need to respond alike to different stimuli)
10. Language disabilities
11. Deficient conceptualization — difficulty in abstract thinking, and therefore

This list of components contributing to the dysfunctioning of the brain-injured child could be supplemented and extended but I feel that the above data are sufficiently significant for this discussion.

It is interesting to note that Dr. Silver (1) found a number of the above-listed characteristics of brain-injured children in his group of reading disability cases: specifically, right-left confusion, visual-motor difficulty (Bender Gestalt), auditory imperception (matching sounds and particularly, blending), and body image distortion (Goodenough).

**Relation to Arithmetic**

What effect do these characteristics have on the learning needs of the brain-injured child, especially in regard to arithmetic? Although no scientific study has been undertaken, the majority of the parents whose children have struggled through the regular grades without the benefit of specialized training methods, report that “his achievement in arithmetic is absolutely zero” or that “he has no number concepts.” In contrast, some learning has been accomplished by the child in the language arts. It would be very helpful if the correlation between language and arithmetic disability in brain-injured children could be determined and diagnostic tools discovered to explain and predict failures in arithmetic. It seems to me that the predominance of certain of the above-listed characteristics over others may pre-determine the specific difficulty in learning number concepts and processes.

We will not attempt to relate arithmetic difficulties to all of the symptoms mentioned above. However, if we consider certain ones, beginning with spatial relationships, we can see the tremendous obstacles which arise. Basic concepts usually acquired at the pre-school level can be implanted only through specialized training. “Up,” “down,” “over,” “under,” “top,” “bottom,” “high,” “low,” “near,” “far,” “front,” “back,” “beginning,” “end,” etc., either can not be discriminated or are as confused as left-right orientation. These difficulties are distorting, in the language area, by producing the inversion-reversal tendencies in reading and writing. They show many similar effects in the numerical area, such as in acquiring the concept of quantities, perceiving configurations of number patterns, seeing relationships between numbers, and also in reading and writing number symbols. As Strauss and Lethinen (2) point out: “Disturbed spatial perception leads to the inability to perceive the relative distances between numbers, e.g., is 3 closer to 4 or to 6?” Such difficulties interfere with the visualization of the entire number system.

**Size relationships, such as** “big,” “small,” “long,” “short,” (“concrete”—geometric), “more,” “less,” (“abstract”—numerical), are not well established in the child’s mind and basic concepts cannot be acquired, even if concrete material is used for teaching. If the child cannot differentiate and grade sizes, quantities, and measurements, we cannot expect him to get abstract number concepts. **Perception of sequences** (first—next—last) is essential for awareness, retention, and recall of the succession of numbers. **Temporal relationships**, which are related to spatial relationships, (after, before, between, next, etc.) are fundamental links toward the acquisition of the basic processes of addition and subtraction, and, again, the structure of the number system with its relative position of numbers (units, tens, hundreds, etc.)

**Motor disinhibition—“drivenness”—** interferes with the brain-injured child’s ability to coordinate and integrate his visual, auditory, and motor activity. Such a child will not be able to count objects properly by pointing at the respective objects in the order in which they are arranged and, at the same time, say the respective number to be associated with the particular item. For example, if buttons are arranged in a row, it cannot be taken for granted that the child can determine the “beginning” of the row (spatial-temporal disorientation) and if he does point to one item at a time, he is apt to rush through the number