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One presentation in the area of learning disabilities by Emily Sheldon considers the structure of an educational program with teachers and parents in rural areas. A plan for thorough diagnosis and suggested classroom modifications and treatment is described. Conclusions, offering specific educational implications, are presented. A second report by David Sabatino presents the conclusions from a study utilizing 23 commonly used psychological tests and subtests administered as variables to investigate the correlations between behaviors responsible for learning. This unit of reports is available in microfiche. (WW)

SELECTED CONVENTION PAPERS

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LEARNING DISABILITIES: WORKING WITH TEACHERS AND PARENTS IN RURAL AREAS

by

Emily B. Sheldon

Vermont's program on learning disabilities was started by a social worker because of the amazing array of unusual social problems extending far beyond schools into homes, among relatives, in play, in neighborhoods, and even at offices of doctors and dentists such as:

1. Making these children the butt of jokes and dares because of their known impulsivity, slow processing, or their tremendous desire to be included in play

2. Bizarre enough responses on the part of the children to cause an able sibling to say, "How'd you like to have a kook for a brother?", or feel deep resentment over punishments for acts tolerated by the handicapped one

3. Years of interrupted sleep due to the unusual startle response to night time sounds such as the bark of a dog, a distant fire truck, or the banging of a car door

4. Neighbors confusion (e.g., returning after dark from taking a child for a drive and being asked, "How can you find your house? I can't find mine unless it's blue")

5. The child's catastrophic response to medical procedure, dental care from prophylaxis to fillings to extractions

6. Deep conflicts over behavior management of these children between parents and among relatives

7. Often deep guilt by one parent who had weathered a like learning disability in a less hurried, less distraction packed, less competitive, and more accepting milieu.

Structure of the Vermont Association for the Crippled

In order to understand the approaches of the Vermont Association for the Crippled, it is necessary to describe the make up of the Association. Its services are state wide, and centered in Rutland where it conducts the State's only Children's Rehabilitation Center. The staff consists of an array of medical consultants on call rather than in residence, occupational, physical, and speech therapists, teachers, a bus driver, four aides, and social workers. Two psychologists come on an appointment basis--one to do the bulk of testing, and the other to test severely handicapped children whose performance and verbal skills might both be involved. The program includes diagnosis, out-patient training, and an intensive school therapy program for 50 children between five and 12 years of age who have the capacity to learn, and whose disabilities preclude regular school success. The diagnostic groups include cerebral palsy, congenital anomalies, speech and hearing problems, and

learning disabilities in isolation or as an added part of the obvious, visible, audible handicap. Housing, because of its flexible adjustment for the different cultures of the children, to ease the strain at the day's end, but, most of all, to offer true home life as a substitute to institutional living, is in carefully selected and supervised foster homes. Foster parents truly become a part of the staff. The backgrounds of the children vary from poverty to riches and from parents with a sixth grade education to parents who are doctors and other professionals. In order to have meaning to all, all written materials for general distribution is presented with a seventh grade vocabulary; letters, often accompanying this material, can be geared to the parents' educational level.

Basic to this Association's work philosophy are that:

1. Diagnosis should end in a plan to reduce a handicap, or offer constructive guidance in its management.

2. A practicing therapist or teacher, put in the role of diagnostician, is more likely to meet our goals of diagnosis than one concentrating solely on diagnosis. Likewise, the constant exposure to problems in diagnosis sharpens the practitioners' observation in the classroom or in therapy. Also, exposed directly to the roles of parents in diagnosis, the practitioner better appreciates the need to include parents in all planning.

3. Contribution is what matters from staff; human foibles can be better tolerated if the focus is on contribution.

4. Staff is given the freedom to think, plan, and innovate, and thus, they contribute more than those whose creativity is curbed by an over abundance of supervision.

Diagnosis of Children with Learning Disabilities

Our plan to put theory into action in this hard to understand area of learning disabilities starts with the preparation for diagnosis. We put families, teachers, doctors, and hospitals to work supplying information which helps us plan the diagnostic study of each individual child. We use mimeographed forms (they permit inexpensive flexibility), and structure questions to focus thinking on the many areas of trouble these children often show. There are many check items to compensate for the long forms sent to parents, and much shorter ones were sent to schools. Direct questions, coupled with an explanation of their reasons, are sent to doctors, hospitals, and agencies, always enclosing a signed parent release form.

More often than not, diagnosis involves an array of tests and observations, and, for many, housing for a three day period. The diagnostic plan is mimeographed for all who are involved, and forms the feedback of information gathered from all sources to the parents. (We believe that written material has a different emotional impact on parents than verbal, and also allows an opportunity for as much accurate review as necessary.) The "diagnostic plan" includes a description of the child's history and handicaps, the reason for the visit, the housing plan, and the hour to hour schedule for each day. Since the referral is usually made by mail, and information is gathered this way, the whole plan has to be made without seeing child or family. Therefore every minute of the visit has to be adult supervised, and each adult takes the child to the next appointment. The diagnostic study is made by an array of testers and, in contrast to those we did in the past with testing only on a one to

one basis, includes observations in living, on our bus, in free play, in the lunch room, in a classroom, and in play alone. Each involved person writes a report and makes recommendations for troubles noted in that area. The foster mother writes reports about eating, sleeping, behavior, and play. The Coordinator, who collected data and planned the diagnostic study, also collects written reports, and combines them into a written report for parents. Before doing this, however, usually the child is accompanied by the Coordinator to the Pediatrician's office (a good chance for observation), and the Coordinator has a conference with parents to learn about their feelings, fears, questions, approaches, and information or misinformation. A written Evaluation Summary Form is used (two mimeographed pages) covering 14 items considered, and is sent with an accompanying explanatory Key with numbers corresponding to the form. A letter is sent to parents giving conclusions and recommendations. Similar report material is routinely sent to the family doctor, the Superintendent of Schools, to the child's teacher, and to an involved agency. (Parents are told this, and they are pleased.) Sometimes actual copies of tests are sent, or the Pediatrician's report to the family doctor. All staff returns the diagnostic plan material in case this, too, needs to be sent to complete the picture. Thus the whole program from start to finish is largely handled through writing, but not without human contacts before the reports are sent. The efficacy can be tested only by the response to recommended action, and this is great. Refusal of parents to consider sending their child to stay with strangers is rare; the lack of response to recommendations happens seldom. Part of this is now due to our reputation, and part, we think, is due to the parents' sensing that we truly care. This can be shown in writing quite as well as in speech if done carefully, and in language parents understand. Even relatives (often nonunderstanding, disturbing ones) can share the parents' report; one parent, absent from an interview, can thus get the same facts as the one who came. The result of the sharing of this information with schools, physicians, and agencies shows clearly in referrals, and best of all, in the referrals of young children. It has led to schools seeking our advice in establishing Government Title projects they were considering for children with learning disabilities.

Treatment

In general, treatment seems to center on:

1. A plan of structure in the home, play, and school (disorganized children function best in a setting of organization)
2. Consistency in management to reduce confusions
3. Dilution of excitement for times when structure is absent
4. Medication for some to better stabilize behavior, attempted only in situations where valid observations can be fairly certain
5. An abundance of praise for children with failure packed lives, but always earned praise
6. Learning by doing to facilitate the foundation of all future learning
7. Enjoyable therapeutic activities, given at home or in school.

For the home, we have prepared mimeographed material on sequence, recall, listening, eye games, physical readiness activities--concentrating on

the more common occurrences of deficits. A recent addition is on the use of the typewriter for children whose concept of letter size, letter order, spacing between words, etc. is distorted. The authorship of the material borrows from many people and many sources--those who write and develop programs in this field, and our own staff. Again all is written in a seventh grade vocabulary. We may offer occupational therapy for such problems as drooling (Margaret Rood's neuromuscular facilitation can be very effective in reducing and eliminating this socially difficult problem), bow tying, dressing, pencil grasp, or work on visual perception confusions. Many a household chore can be as therapeutic as any planned program:

1. Setting the table meal after meal and day after day, starting with a pattern and with supervision, can help to establish the concept of sequence and left to right progression.

2. Completing any work can help curb the distractible child's tendency to wander from the activity at hand--physically or mentally.

3. Self monitoring in a full length mirror--for cleanliness, general neatness, and correct closures--can start the monitoring process everyone must develop if school work and later employment is to be managed well.

4. Story telling about the interesting aspects of each family member's day at the evening meal can curb the tendency to interrupt (a turn is lost for those who interrupt!), improve oral expression slowly, improve listening, and give the slow processor a chance to be heard.

5. "A place for everything and everything in its place" is a wonderful motto to follow with the disorganized child.

6. Preparing for sleep with bathing and tooth brushing preceding bed by over an hour, and then the time until sleep filled with quiet, nonstimulating activities can often break the devastating pattern of delays in actually getting to sleep.

7. Often making simple suggestions will help warring siblings better accept their atypical brother or sister.

Our Parent's Auxiliary is helpful because it groups people who face like problems. Also having parents visit and report to members on training approaches, rather than having staff do it, increases the parents' slow understanding of a problem which has puzzled educators for centuries. Planned day long parent visits by class groups has been extremely helpful. Parents are given a list of all of the handicaps (not their child's) to be observed in a classroom, visible and invisible, and in writing before the visit. The parents meet with the teacher during a recess period, with the social worker while they eat their lunches. They learn from each other as well as by observation in the classroom. In order to check on these observations, again we use the written feedback system by asking the parents to write what they learned that was new, to make suggestions, and send questions.

Suggested Classroom Modifications

Suggested modifications for the classroom are made by one of our teachers, with the belief that it will irritate rather than help if there are too many, or if the modifications take more than a reasonable amount of teacher time. There is indirect learning for the teacher from both the reports sent

to parents, and from copies of mimeographed materials sent to parents but shared with the teacher so he or she will see the total picture. Classroom modifications might include:

1. Special seating for the distractible child

2. Extra time given to a child who processes information slowly

3. Concrete aids if needed

4. Markers for children whose eye movement patterns are poorly stabilized

5. Reduction in visible distractions by folding a page, or covering part of it so the distractible child is not overwhelmed by a distraction loaded page of illustrations, writing, or figures

6. Suggestions on management (We often suggest the right of a child to go to a "quiet room" when his life starts to "fall apart" not for punishment, but for a chance to get reorganized)

7. Suggestions for the child who has real problems in hand skills, or real limitations in physical education activities

8. The offer of a teacher visit to our Center (these are frequent, and in Vermont come on a day allowed by many school systems for visiting another school. Our teachers are wonderful to these visiting teachers for they well remember their own early struggles in this field--and others which persist even to the present.)

9. Literature on this subject which often helps remove guilt from the teacher when she realizes the problem stems from nervous system dysfunction rather than from her teaching and management

10. School visits by one of our teachers (infrequent but reassuring), if the parents and the teacher wish them which can be very helpful as our teacher observes the child in the school setting, and then discusses problems seen with the teacher, as well as others which baffle the teacher.

Conclusions

After struggling with this problem since 1953, the Vermont Association for the Crippled has reached many conclusions:

1. Too many reports are written by professional people for professional people with confusing verbiage. Professional gobbledygook actually slows up progress in this field.

2. Reports to parents are often strewn with such terms as "perception" which confuse rather than help parents.

3. It may be possible to streamline diagnosis as we have learned that some tests tell more about a child's disability than an array of others.

4. The diagnostic plan should include group participation with structured and unstructured as well as one to one testing.

5. Teachers, once freed of their guilt about the inadequacies of children

with learning disabilities, make excellent observations, and spot most of the problems which any testing reveals.

6. Bright children are able to work out their own compensations in many instances if the child has help on the social aspects.

7. Children with learning disabilities can be as easily spotted in kindergarten as in upper grades, and the remedial work they need can be given more quickly, and the efficacy of special training improved more than when given early than at a later age.

8. Preventive work can be effective for most children if given in regular school by a regular teacher (while this Association has never found any "canned" program which meets the needs of different children, we have found two programs--Getman's Physiology of Readiness and the Peabody Language Development Kits--which in combination offer excellent prevention possibilities, are complete, have clear directions, and are very effective if presented exactly as described. The cost of these materials is negligible compared to the cost of a single repeater!).

9. Medication, while potentially very helpful to some, can be very upsetting if handled loosely, for it takes the help of time, and good observations for any doctor to arrive at the ideal medication and dosage for a particular child.

10. Preparation for medical care has to be matter of fact, very brief, and given immediately before treatment.

11. The "big brother" system of dental care works well where the new to dentistry child observes his big brother having dental care before it is his turn.

12. Teachers, parents, doctors, and agencies must work together in order to avoid situations which further confuse or actually handicap an already handicapped child.

13. The majority of problems in learning could be handled effectively in regular school, and doubtless will be, with the increased awareness of and knowledge about dealing with this problem.

14. The focus on learning disabilities in schools will improve all education as it becomes geared to the individual rather than for the masses.

15. With this change in educational concepts, the classroom teacher will become a happier, less frustrated individual.

16. The main reduction in the problem will come if underachievers in kindergarten, or children not ready for first grade are given the special help they need before formal learning starts.

17. Learning disabilities are common coupled with poor hearing, cerebral palsy, visual deficits, congenital anomalies, and, most of all, speech problems.

18. The failure complex of these failure prone children is as disabling as the learning disability itself, and a factor to be considered in training quite as much as deficits in areas of learning.

19. Auditory skills and remedial work in this area need much further emphasis.

20. Irregular eye movements can be a very damaging factor in learning.

21. Speech therapists, with their training concentration on language development, articulation, motor patterns, rhythm, and listening, have a wealth of contributions to make in the field of learning disabilities.

22. Physical therapists, understanding pathology in relation to movement patterns, can restructure physical education work so it can be therapeutic and avoid the chronic failure pattern.

23. Occupational therapists, in their concentration on drooling, hand skills, and visual and tactile perception training, can help a great deal (tactile perception deficits can be as handicapping as visual or auditory!).

"When you reach the point of no return you must forge ahead or fail completely", is a good motto for this field of learning disabilities. To really get in it you get "hooked" without awareness; to stay in it you have to find the way to forge ahead. No state, no teacher, no training center yet has all the answers in this vast, perplexing, challenging area of learning. Many an innovation works; many more will work as well or better! Vermont encourages innovation.

THE RELATIONSHIP BETWEEN TWENTY-THREE LEARNING DISABILITY BEHAVIORAL VARIABLES

by

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Assisted by R.L. Jones, Curtiss Brown, W.M. Gibson

Introduction

Learning disability among school age children has become a national health and educational problem of considerable magnitude. It is estimated that 20 percent of all elementary children fail to adjust either to the social order of the classroom or to the academic standards established at a specific grade level. Gilbert (1957) reports that academic difficulties are the reason 75 percent of the children between the ages of seven and 13 are referred to school psychologists and child guidance clinics. Only three to five percent of these children have any obvious mental retardation or physical disabilities.

The medical, educational, and behavioral science disciplines have advanced a variety of theoretical explanations as to the causes of learning disability. It is probably safe to say that there has been more written about learning disability than any other topic in child development. Yet, the term is used in many different ways and not even a satisfactory definition has been substantiated. The fact that there is no single cause for all learning problems is the evident reason. Extensive but scattered research has shed some light on this multidimensional causality. However, most of the research has not been focused on either those human behaviors which are responsible for learning or those which restrict the processing of information.

In the general medical out patient clinic of Columbus Children's Hospital, in Columbus, Ohio, about 45 percent of the children are referred by school authorities for learning or behavioral disorders. Only a very few of

these children have any real disease or health problems which could interfere in their classroom performance. The majority of these children upon closer examination present no apparent physical or intellectual reason for learning failure. This study was undertaken to obtain systematic behavioral data on the way children with learning disabilities process environmental information. The initial contention was that specific behaviors resulting in learning disabilities can be found bearing relationship to the reason for academic failure. It was not our purpose to devise a new theory of learning disability, but rather to extract from multiple etiologies the correlational indices that may explain how individual information processing behaviors are related to academic disturbances.

Problem

A review of the literature relative to learning disability quickly reveals many possible causes for such a problem. Studies have been reported correlating learning problems to visual disturbances (Betts, 1946), hearing and speech difficulties (Eames, 1938), physical and health, and emotional adjustment (Prentice and Bessie, 1965; and Mitchell, 1956). More recently, a new category has appeared called the "minimal" brain damaged syndrome (Clements, 1966; and Cohn, 1964). The cultural problems associated with social economic status, broken homes, and parental pressure have taken their place in offering equality inconsistent findings (Buxbaum, 1964). The problems of poor school readiness, inadequate development at the critical point of school entrance, a lack of early school success, and the quality of teaching have also been reported (Grunebaum, Hurwitz, Prentice, and Sperry, 1962).

It is probably true that each of these problems may exist in isolation or in some combination for any selected group of children with learning disabilities. A multidimensional diagnosis of all the possible etiologies seem important if we are to determine the specific reasons for a learning disability. Said another way, a visual motor perceptual problem may result in reading failure. A problem in visual motor perception is not a proper diagnosis, or even a specific diagnosis. It is merely a description of one aspect of human behavior. It may well have other antecedents and many generalized accompanying responses that also impair some aspect of the youngster's social adjustment, self image, reaction to school, and academic skills other than reading. The antecedent problems could be cerebral insult, developmental disturbances in growth, or emotional disturbances. In other words, the specific learning disability must be determined before it can be treated, or indeed the child may be programed to fail in school.

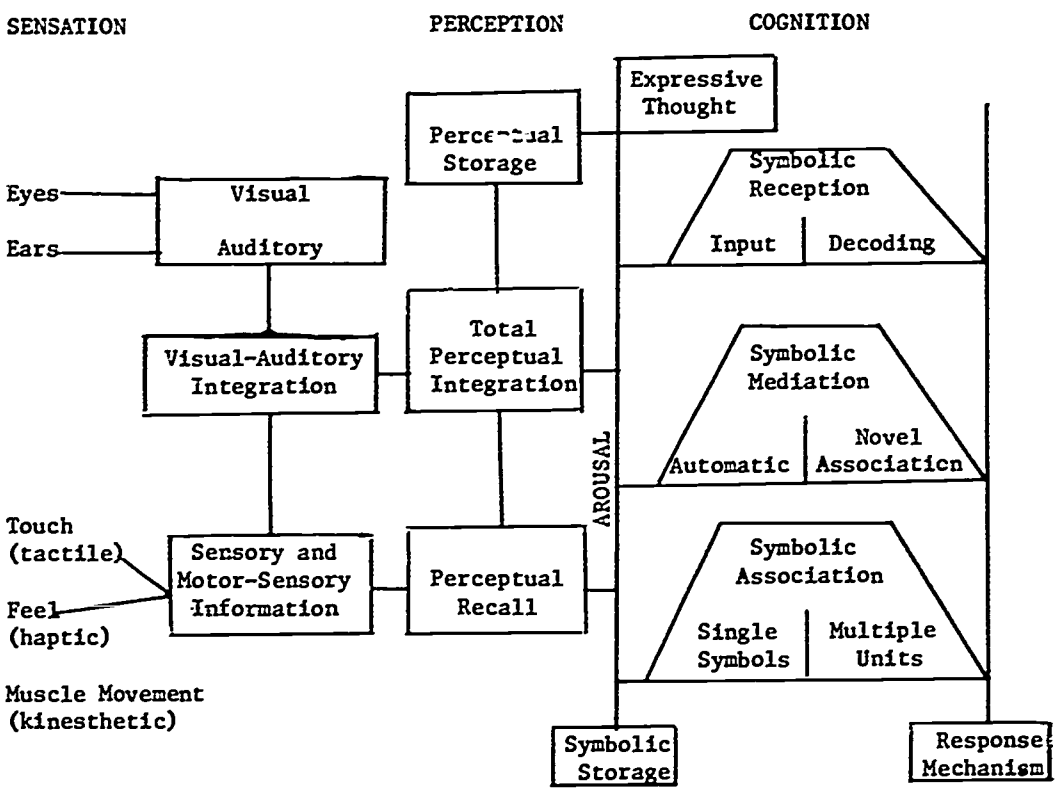
This st. ittempts to clarify the behavior patterns associated with learning or the means by which children with learning disabilities process environmental information. It raises the question about which specific behaviors amalgamate to produce learning as the means of processing environmental information. The two tenets underlying the collection of data were (a) the use of standard psychological tests, and (b) a parisimonious learning model that offers an explanation for information processing behaviors. This model simply explains that environmental stimulation begins in the sensory receptors as input (environmental information) which is coded neurally and transmitted to the perceptual centers. Perception is the accurate and rapid interpretation of information into correct categories for further relay to the centers of higher learning. In these high cortical centers language is formed into symbolic conceptual units. Once language concepts are formed they provide the formation of additional language symbols within the frame-work of the original conceptual categories. This is called conceptual

association. If the language concepts create different or additional language categories, we have language conceptual mediation. Mediation is the association of conceptual symbols between categories. The higher centers must be able to receive, associated, and mediate symbolic units in a systematical manner. Language output is important in the classroom. However, we do feel that responses, especially oral ones, are overly stressed.

The model implies two other important dimensions: (a) the integration of perceptual information from more than one perceptual source (auditory and visual) and its storage (memory), (b) an arousal, which is the interconnection between a meaningful perceptual experience and the transmission of that perceptual information appropriate to the conceptual units within the cortex. A lack of arousal is why many well received perceptual experiences never become learned information.

Figure 1

The Model Used to Describe the Information Processing Behaviors



Procedures

Subjects: Forty-five boys served as subjects for the study. The chronological age range was from six years and four months to 12 years and two months. The study was kept as bias free on selection procedures as possible by using all the male subjects who met the selection requirements over a nine month period of clinic intake.

Selection Requirements: It was mentioned earlier that most of the children referred to Learning Disability Center have no apparent health or physical problems. Children selected for this study were carefully screened within the outpatient clinic for the following disabilities at the established criteria:

1. Hearing loss--no greater than 15 Db in the better ear
2. Visual impairment--no difficulty greater than a corrected refractory error which produced 20/20 vision
3. Chronic illness--no history of any prolonged disease or accident
4. Seizures--no history of seizures (transient starring spells or febrile seizures were not included)
5. Family pathology--no pending divorce activity, overt marital stress, or foster home placement
6. Gross motor--no overt patterns of neuromuscular incoordination
7. Speech and language--no articulation or other motor speech problems which might interfere with communication
8. Sociological--no pattern of previous home stress, bilingualism, frequent neighborhood or school mobility
9. Emotional--no history of existing anxiety, or bizarre behavior related to the situational aspect of school or the classroom
10. No other apparent abnormalities that would draw attention to the child.

Prescreening: Two different types of prescreening were included in the subject selection. The initial screening was that associated with the school referral. The selection requirements were mailed to the public school personnel responsible for getting them into the hands of the principals and teachers. The referral was initiated by teachers possessing knowledge of the selection requirements in addition to knowing that the child must be underachieving by the simple definition of doing failing work in either reading or arithmetic.

Teacher referrals were signed by building principals and given to school psychologists who determined the global level of verbal function by administering Stanford-Binet Tests of Intelligence. They also administered tests of academic achievement. If the child was normal in verbal intelligence and evidenced academic underachievement in one or both of the tool subjects mentioned, he was then referred to the outpatient clinic at the hospital. The social worker and medical student visited with the parents and child upon the initial clinic visit. At that point, the initial medical examination was undertaken. If all the selection requirements were met, the child was then referred for a clinic visit to the Learning Disability Center for systematic medical, social work, and psychological examinations.

Behavioral Methodology

The initial visit to the Learning Disability Center was made a very pleasant experience. Two rules were always observed: (a) children were never overcome with any medical procedures or white coats, (b) parents were always

given interpreted information. The child usually began his visits with enjoyable nonschool structured activities. The parents were seen for social work and developmental interviews. The number of clinic visits seldom ranged less than two or more than five. The length of time in behavioral study was always offset by free play. The test periods never became either a dull ritualistic question and answer period, or hear this and do that response set.

The psychological instruments selected to obtain the behavioral sample were purposefully chosen to represent popular clinical tools, instruments that every clinic has on hand. A list of 23 tests and subtests were developed to obtain measures for the information processing behaviors discussed earlier, and shown in the model. A list of the 23 tests and subtests variables are shown in Figure 2. The test and subtest variables will retain the abbreviations and numbers indicated in Figure 2 throughout this study.

Figure 2

A List of the Twenty-Three Tests and Subtests Variables
Used to Assess the Information Processing Behaviors

Wechsler Intelligence Scale for Children (WISC)

1. Information
2. Comprehension
3. Arithmetic
4. Similarities
5. Vocabulary
6. Digit Span
7. Picture Completion
8. Picture Arrangement
9. Block Design
10. Object Assembly
11. Coding

Test of Auditory Perception (TAP)

12. Discrimination
13. Recognition
14. Memory
15. Comprehension

Wide Range Achievement Test

16. Word Recognition
17. Spelling
18. Arithmetic

Bender Visual Motor Gestalt Test (BVMGT)

19. Immediate Memory
20. Delayed Memory

Birch's Auditory Visual Integration Test (AVI)

21. Auditory visual Integration

Southern California Test of Motor Accuracy

22. Preferred Hand
23. Nonpreferred Hand

Tests that were administered but not included in this study because

because of insufficient data or scoring problems were the:

24. Money Road Map Test of Directionality
25. Draw-a-Family
26. Draw-a-Man
27. Make-a-Picture Story
28. Gate's Reading Comprehension

The Wechsler Intelligence Scale for Children (WISC)

29. Mazes

The 23 tests and subtests variables are reiterated in Figure 3. The purpose of this figure is to show the specific information processing behavior a given test is assumed to assess. The model shown in Figure 1 theoretically explains why certain behaviors were considered more important to assess than others. Thus, the limit as to the number of psychological instruments that could be administered within the realm of practical considerations was reduced to 29. Only 23 of the 29 tests administered were treated as variables in this study. The six tests or subtests not used were disregarded because of scoring difficulties or the fact that they produced insufficient data.

Figure 3

The Tests and Subtests Used to Measure
the Various Behaviors Identified in the Model

Visual Perception
- BVMGT--immediate memory

Visual Perceptual Memory
- BVMGT--delayed memory

Auditory Perception
- discrimination
- recognition
- memory
- comprehension

Visual Auditory Integration
- Birch's Visual Auditory Integration Test

Symbolic Reception
- WISC--Digit Span (aural input/oral response)
- WISC--Coding (visual input/motor response)

Symbolic Mediation (vocabulary language)
- WISC--information (aural input/oral response)
- WISC--comprehension (aural input/oral response)
- WISC--arithmetic (visual/aural input/oral response)
- WISC--similarities (aural input/oral response)
- WISC--vocabulary (aural input/oral response)

Symbolic Association (visual motor)
- WISC--picture completion (visual input/oral motor response)
- WISC--picture arrangement (visual sequencing/motor response)
- WISC--block design (visual input/motor response)
- WISC--object assembly (visual input/motor response)

Laterality and Directionality
- SCTMA--preferred hand

SCTMA--nonpreferred hand

Academic Achievement
word recognition
spelling
arithmetic

Results and Discussion

The purpose of this study was to determine the specific behaviors or clusters of behaviors utilized in the processing of information associated with learning disabilities in 45 male subjects. The data from the 23 tests and subtests used to assess these information processing behaviors were treated for relationship by multiple correlations and related principle components using a Kaiser's Varimax on an IBM 7094.

The means and standard deviations (SD) for the 23 test variables are shown in Table 1. The mean values for the WISC subtests are scale scores. The scores for the TAP are the number of correct responses and the scores for the BVMGT and AVI are the number of incorrect responses. The WRA test scores are given in grade placement units, i.e., 2.52 indicates a word recognition level of second grade, fifth month.

Table 1

The Means and Standard Deviations (SD)
for the Twenty-Three Subtest Variables

Subtest Variables	Mean	SD
1. WISC--Information	8.96	2.00
2. WISC--Comprehension	10.36	2.26
3. WISC--Arithmetic	8.09	2.31
4. WISC--Similarities	11.09	3.29
5. WISC--Vocabulary	10.49	3.33
6. WISC--Digit Span	9.13	2.44
7. WISC--Picture Completion	10.64	2.23
8. WISC--Picture Arrangement	9.53	2.26
9. WISC--Block Design	9.93	2.90
10. WISC--Object Assembly	10.11	3.25
11. WISC--Coding	8.22	2.99
12. TAP--Discrimination	21.93	7.13
13. TAP--Recognition	16.73	6.73
14. TAP--Memory	17.64	6.82
15. TAP--Comprehension	26.02	7.77
16. WRA--Reading	2.52	14.09
17. WRA--Spelling	2.25	10.95
18. WRA--Arithmetic	2.75	9.38
19. BVMGT--Immediate Memory	6.13	3.59
20. BVMGT--Delayed Memory	7.49	3.82
21. AVI	3.64	2.63
22. SCTMA--Preferred	451.42	44.12
23. SCTMA--Nonpreferred	443.11	24.79

N=45

The test data from the SCTMA is given in scale scores. The hand with the greatest accuracy in completing the manual motor task within a time period was called the preferred hand, the other hand becoming the nonpreferred hand. The TAP, BVMGT, and AVI subtests were compared on the basis of correct or incorrect responses.

A detailed or extensive discussion of the relationships between the variables will not be reported as the reader may determine those aspects of particular interest by examining Table 2. This discussion will be limited to those relationships which were obviously clinical. The relationship between WISC vocabulary and WISC similarities subtests were extremely low. Clinically, we began to sense a difference in what these two subtests measure. DeHirsch, Jansley, and Langford (1967) have shown that children referred to language clinics frequently have academic learning problems. The results in Table 1 indicate that the children with learning disabilities have scores similar to the mean values on both the similarities and vocabulary subtests. In the clinic, we felt that vocabulary was a rote assessment of an aural oral association type of behavior that really requires very little mediation of symbolic concepts. It was frequently suggestive of the ability to receive and express language symbols. The WISC similarities subtest was found to be highly predictive of children with subtle language impairments, the kind of impairment where the child was unable to mediate between various categories of symbolic concepts. Thus, a child with a high vocabulary subtest score and a low similarity subtest score, became highly suspected of a central language problem.

In examining the population as a whole, there were low negative correlations between WISC similarities and WRA test results of word recognition, spelling, and arithmetic. The WISC vocabulary subtest correlated at an equally low level with the WRA subtests. This is somewhat contrary to the popular finding that vocabulary is the best predictor of school success. It is probably true that vocabulary is the best predictor of reading comprehension among children in the normal academic range. It seems equally true that vocabulary tests with children having learning disabilities are not predictive of any specific information processing behavior related to learning disability except rather gross language impairments (which are most frequently obvious).

If the standard type of language tests do not predict learning disability, then what does? The answer to this question again resides on what we consistently saw in the clinical assessment of these boys. There were only low positive correlations between the two aural oral language measures and the various tests of perception. The only place where this relationship was predictive was in the BVMGT test of Immediate Memory, a correlation of .44. The correlational relationships between the perceptual behaviors and the WRA test emerged as generally positive and moderate to moderately high. The relationship between the WRA and TAP were in the high forties and low fifties. The AVI subtest correlated at .49, .48, and .57 with word recognition, spelling, and arithmetic, respectively.

Even more surprising is the fact that the correlation between the various perceptual variables was not proportionately high. The correlation between the TAP subtest of auditory perceptual discrimination, and the two forms of the BVMGT, and AVI, were .25, .11, and .25, respectively. The correlations between the other measures of perception were higher, running in the forties and fifties. The correlation between the two forms of the BVMGT was significantly high. Since the same nine BVMGT design cards were used in both administrations, the difference became that of the behavior being assessed. The one is a measure of the visual perceptual immediate copying response to

Table 2

MULTIPLE CORRELATIONAL VALUES BETWEEN EACH OF THE TWENTY-THREE TEST AND SUBTEST VARIABLES

Test and Subtest Variables

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	.431	.394	.415	.259	.379	.098	.109	.133	.263	.074	.095	.275	.391	.325	.349	.303	.194	-.126	-.166	-.163	-.083	-.043
		.181	.243	.511	.326	.084	.352	-.017	.069	-.056	-.044	.166	.054	.164	.060	.062	.045	-.082	-.250	-.070	-.157	.026
			.419	.162	.445	.174	.112	.279	.319	.158	.069	.688	.198	.088	.031	-.011	.019	-.127	-.185	-.050	-.125	-.159
				.211	.143	.051	.145	.363	.239	.150	.018	.077	.190	.225	-.120	-.089	-.087	-.105	-.238	-.140	.104	-.062
					.090	-.016	.475	.234	.186	.239	.163	.203	.123	.096	.046	.097	.010	-.190	-.442	-.156	-.069	.198
						.026	.128	.037	-.016	.111	-.010	.350	.349	.113	.075	-.021	.120	-.093	-.073	-.085	-.033	.003
							.181	.229	.134	.080	.006	.302	.250	.208	.137	.109	.246	-.136	-.142	-.146	.169	.101
								.395	.038	.080	.051	.290	.104	.179	-.030	.002	.034	-.046	-.283	-.134	-.091	.248
									.460	.259	.109	.130	.294	.078	-.030	.076	.118	-.303	-.288	-.185	.330	.188
										.210	.060	.182	.357	.245	.045	.011	.028	-.479	-.459	-.157	.185	.255
											.433	.338	.416	.229	.153	.173	.222	-.305	-.186	-.336	.214	.098
												.394	.358	.380	.376	.425	.488	-.253	-.114	-.250	.120	.196
													.740	.731	.539	.493	.568	-.423	-.485	-.556	.284	.346
														.757	.447	.446	.515	-.420	-.406	-.484	.363	.361
															.506	.467	.501	-.418	-.528	-.638	.353	.438
																.915	.744	-.270	-.216	-.496	.211	.212
																	.841	-.382	-.288	-.488	.227	.214
																		-.502	-.317	-.575	.248	.411
																			.775	.624	-.527	-.358
																				.669	-.428	-.357
																					-.487	-.368
																						.273

designs, and in the other, it is a matter of copying the designs from memory. The correlational difference between these two variables was highly positive (r=.77). High correlations were also found between the auditory perceptual memory variable and the other TAP subtest variables of recognition and comprehension. The memory component does predict other related areas of perceptual involvement fairly well. The BVMGT measures of immediate memory correlated well with the achievement WRA test results, at the high forties and low fifties.

Table 3

Correlational Indices Between Twenty-Three Variables Identifying Four Principle Components

Test and Subtest Variables	Principle Components I	II	III	IV
1. WISC--Information	.267	.648	.024	.219
2. WISC--Comprehension	.063	.317	.117	.636
3. WISC--Arithmetic	-.051	.680	.147	.062
4. WISC--Similarities	-.126	.501	.289	.156
5. WISC--Vocabulary	.034	.122	.147	.748
6. WISC--Digit Span	.135	.610	-.052	.115
7. WISC--Picture Completion	.168	.202	.175	.024
8. WISC--Picture Arrangement	.010	.083	.127	.653
9. WISC--Block Design	-.067	.239	.589	.126
10. WISC--Object Assembly	-.039	.276	.632	.051
11. WISC--Coding	.237	.178	.352	-.015
12. TAP--Discrimination	.488	.045	.127	-.006
13. TAP--Recognition	.688	.221	.292	.201
14. TAP--Memory	.599	.397	.438	-.028
15. TAP--Comprehension	.662	.170	.381	.137
16. WRA--Reading	.895	.065	-.072	-.024
17. WRA--Spelling	.897	-.018	-.010	.021
18. WRA--Arithmetic	.873	-.020	.134	-.003
19. BVMGT--Immediate Memory	-.381	.028	-.711	-.111
20. BVMGT--Delayed Memory	-.289	-.001	-.689	-.439
21. AVI	-.593	.044	-.503	-.146
22. SCTMA--Preferred	.258	-.154	.611	-.181
23. SCTMA--Nonpreferred	.337	-.235	.378	.245

N=45.

Table 3 indicates the correlations between rotated principle components using Kaiser's Varimax. The correlational values for each of the factors which appears to be moderately high to outstandingly high are underlined. Principle Component I seems to represent an academic achievement oriented factor indicating the high relationship between the four TAP subtests variables and the AVI integration variable. Principle Component II seems to be concerned with the ability to associate and mediate language concepts as previously learned information. In other words, it represents previously learned factual information, number facts, and memory for digital units. This is definitely not a perceptual factor and has a very low relationship to academic achievement in children with learning disability. Clinically, the case seems to be that most of the children referred for learning disability had good use of language and an excellent ability to discuss educational facts in clear and concise terms.

Principle Component III would be a visual motor perceptual factor if we exclude auditory perceptual memory. It is certainly difficult to logically recognize the relationship between the auditory perceptual memory (TAP) and the ability to visualize designs and reproduce them manually. The perplexing aspect is that the auditory visual integration test variable (AVI) is also related to this factor. Therefore, if we wish to become theoretical, we may probably assume that BVMGT delayed memory, AVI, and TAP memory subtests are related to visual perceptual and motor manual accuracy in some dimension that may have far reaching teaching importance. It is quite possible to think that memory could be trained to overcome some very resistant problems associated with visual motor perceptual development. In fact, this may be a compensatory behavior displayed by many children eight years and older, who seem able to reduce the character of perceptual difficulties via other behaviors. These other compensatory behaviors may include perceptual memory, language association and mediation, and language association and storage.

Principle Component IV has a direct relationship with the ability to sequence central language association that generally concerns one level or area of verbal association (one word meaning, one concept meaning, one story meaning) and produce a syntaxical verbal language pattern (expressive speech). Principle Component IV lacks the perceptual component of Principle Component I, the central language and aural receptive (WISC, picture arrangement is a visual input task) of Principle Component II, and the visual motor memory perceptual component of Principle Component III.

These four Principle Components representing these highly positive relationships between variables seem to suggest that specific information processing behaviors can be identified in male subjects with learning disabilities.

Summary and Conclusion

Children with learning disabilities offer researchers in many disciplines the opportunity to explore the vast numbers of behavioral complexities which comprise human learning. This study attempted to describe some of the behaviors which may be responsible for learning. These were referred to as information processing behaviors. It was suggested that learning begins with the sensory intake of environmental information, including the perceptual interpretation of information which results in the association or mediation of that information into symbolic concepts. The behaviors responsible for the processing of environmental information were constructed into a learning disability model.

Twenty-three commonly used psychological tests and subtests were administered as variables in keeping with the information processing behaviors detailed in the model. The subjects were 45 males, with an age range of six years and four months to 12 years and two months. The subjects were preselected and prescreened for possible physical, health or emotional problems.

The correlational analysis between the variables indicated the level and degree to which these behaviors were related. The various correlations indicated that perceptual problems may occur as single disabilities or as auditory visual integrative perceptual errors. Clinically, it became possible to indicate prognosis and plan certain aspects of prescriptive teaching based upon the singularity or combination of perceptual problems. It was also noted that perception is not in itself a single entity, but in fact, a combination of several fundamental information processing behaviors; two of which are exceedingly important, memory and integration.

When the variables were rotated for major components, four factors emerged. These factors seem to represent the patterns of information processing behaviors which are related. Therefore, each of these factors might be described as a major area of learning disability, with each of the related variables representing specific learning disabilities. This may imply that there is nothing homogeneous about classes for children with learning disabilities. It might further disclose that the various major categories, if we must use categories, might be:

1. A perceptual category containing various possible perceptual behaviors

2. A symbolic mediation category

3. A perceptual memory, spatial relations category

4. A language association category.

In conclusion, one might extract that it is important for teachers of learning disability classes to have reports of specific information processing behaviors and not global measures, such as IQ. This would be advantageous for the teacher in two ways: (a) in knowing those information processing behaviors to strengthen or avoid using, and (b) in what way the classroom environment could be modified in working with these children.

This study would certainly support the facts that children with learning disabilities have multidimensional etiologies, and that the academic difficulty must be regarded as a symptom, not a cause.

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