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Auditory Processing and Learning Disabilities

Donald L. Rampp

AUDITORY PROCESSING AND LEARNING DISABILITIES

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CLIFFS NOTES, INC. · LINCOLN, NEBRASKA

This book is dedicated to Robin and Randy, who have made it all worthwhile.

The author wishes to express appreciation to Mrs. Patricia Dagenhart and Mrs. Rose Townsend for the hours spent in the typing of the text. A special appreciation is extended to Ms. Darlene Cottier for the numerous hours spent in preparing the manuscript.

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Auditory Processing and Learning Disabilities

"The majority of children identified as being learning disabled are so diagnosed because of difficulties in mastering the process of reading. The relationship between the components of auditory processing and reading ability is a very intimate one. It is apparent that reading requires a number of intact auditory processing skills."

"It is important that the person working with an APLD child should have some general knowledge of the rationale of learning problems."

"The concepts discussed apply to assisting the child with auditory processing problems in the school, home, or clinic situation."

CLIFFS SPEECH AND HEARING SERIES

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Introduction

In terms of frequency, learning disabilities are among the most handicapping of all childhood disorders. It is estimated that eight million individuals in the United States are learning disabled. However, a much larger number function ineffectually throughout their lives due to learning disabilities. The Department of Health, Education, and Welfare's National Advisory Committee on Dyslexia and Related Reading Disorders (Templeton 1969) estimated that 15 percent of children in public schools experience difficulty in learning to read. The majority of children identified as being learning disabled are so diagnosed because of difficulties in mastering the process of reading.

The relationship between the components of auditory processing and reading ability is a very intimate one. Kaluger and Kolson (1969) reviewed some of the auditory skills necessary to master the process of reading, including auditory comprehension, auditory discrimination, auditory memory, auditory temporal discrimination, auditory lateralization and localization, auditory awareness, sound-symbol relationship, and adequate auditory sensitivity. The previously cited report of the Department of Health, Education, and Welfare, which listed the requisites for reading, similarly acknowledged the importance of these auditory skills. It is apparent that reading requires a number of intact auditory processing skills.

All levels of auditory processing also require an intact sensorimotor system. In language acquisition, the child must be able to receive acoustical messages which make up the individual language system being acquired. In addition to requiring an adequate auditory mechanism, auditory processing involves a complex series of behaviors: the ability to focus attention on the content and the source of the message; the ability to detect and identify the selected message; the ability to transmit and conduct the message to the brain for analysis;

the ability to store and retain the message by sorting out the appropriate perceptual or cognitive level; and the ability to retrieve and restore the message (Wood 1975).

In 1977, in section 5(b) of "Procedures for Evalulating Specific Learning Disabilities," the United States Congress defined learning disabilities as follows:

> Specific learning disability means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain disfunction, dyslexia, and developmental aphasia. The term does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, of mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage.

Basic to all definitions of learning disability is *language;* the disability is in one or more of the processes in language functioning.

When the auditory end-organ is impaired, a language system will be acquired with difficulty. Even with an intact auditory end-organ, which allows the ear to transmit and conduct acoustical patterns of varying intensity and frequency, the central processor may be inefficient and unable to handle incoming messages effectively. Interference may occur because of limited experience with the message content or because of perceptual or cognitive disabilities rather than problems of sensitivity. Perceptual deficiency results in faulty organization of auditory patterns. These faulty auditory patterns may be responsible for difficulty in discrimination, reduced recognition of signals, limited development of language systems, restricted ability to benefit from repeated auditory experiences, and fluctuations in the ability to attend to signals for identification and storage.

Auditory processing was defined by Wepman (1972) as "the capacity to collect, transmit, decode and integrate signals received along the auditory pathway." In 1969, Berry defined auditory processing as "the act of meaningfully interpreting or discriminating sounds and sound sequences employed in oral communication." Considering that approximately 158 minutes of the day of a child of elementary-school age is spent in listening, coupled with Toman's observation (1969) that 70 percent of all instructions given by the primary class-

room teacher are oral, it is crucial for a child to be able to process auditory information efficiently. Efficient auditory processing involves a composite of skills, as evidenced by the ability of the listener to attend, discriminate, focus, recognize, retain, and sequence the communication of the speaker at the instant the message is being given.

Auditory processing dysfunction is a term applied to children with learning disabilities which are reflected in poor performance on auditory tasks involving attention, discrimination, figure-ground, memory, closure, temporal sequencing, and generalizing (Rampp and Plummer 1977; Witkin 1971). These difficulties are often manifested in poorer than normal reading and writing ability (Rampp and Covington 1972) and in slower than normal language development (Stark 1975).

Interest in auditory processing as a component of the understanding and treatment of communication disorders has increased in tandem with the development of the concept of learning disabilities. Evidence that implicates auditory processing dysfunction as a major etiological factor in impaired learning has been documented from clinical experience and research studies.

Friedlander's research (1970) indicated that approximately 25 percent of kindergarten children have auditory processing deficits. Males with this disorder outnumber females by about 8 to 1. Johnson and Myklebust (1967) provided a general description of a child with auditory processing deficits: "The child with a generalized deficit in auditory learning hears, but he does not interpret what he hears. He is unable to structure his auditory world, to sort out and associate sounds with particular objects or experiences."

A child's learning environment is constantly bombarded with stimuli involving the kinesthetic, tactile, visual, and olfactory, as well as auditory senses. Both in school settings and in other environments, the child must be aware of incoming messages, must discriminate the relevant information dimensions from the irrelevant distracting dimensions, and must sort, store, and associate information with past experiences. Only when each of these systems is functioning properly, with integration occurring between the systems, and when all of the processes have been completed, can the child respond appropriately to auditory tasks.

Problems of Definition

Current definitions of learning disabilities include such areas as hyperactivity, brain injury, retardation, social-emotional adjustment, language disturbances, auditory and visual perceptual disorders, motor incoordination, and, always, reading disorders. These obviously cover the entire fields of special education, speech pathology, and audiology, as well as portions of many other professions. The terminology has become so confused that Fry (1968) put some humor into the problem by developing a "Do-It-Yourself Terminology Generator" (see Table 1).

TABLE 1
DO-IT-YOURSELF TERMINOLOGY GENERATOR

Directions: Select any word from Column 1. Add any word from Column 2, then add any word from Column 3. If you don't like the result, try again. It will mean about the same thing.

1 QUALIFIER	2 AREA OF INVOLVEMENT	3 PROBLEM
Minimal	Brain	Disfunction
Mild	Cerebral	Damage
Minor	Neurological	Disorder
Chronic	Neurologic	Dis Synchronization
Diffuse	C.N.S.	Handicap
Specific	Language	Disability
Primary	Reading	Retardation
Disorganized	Perceptual	Impairment
Organic	Impulse	Pathology
Clumsy	Behavior	Syndrome

The above system will yield 1,000 terms, but if that is not enough, you could use specific dyslexia, aphasoid, neurophrenia, or developmental lag.

"Do-It Yourself Terminology Generator," Edward Fry. March 1968, *Journal of Reading*, p. 428. Reprinted with permission of Edward Fry and the International Reading Association

Following are several definitions to give the reader some idea of the problems in defining learning disabilities.

CATEGORY LABEL	DEFINITION
Learning Disability	". . . we refer to children who have particular or specific difficulty in learning and/or those whose behavior is such that they cannot con-

	centrate or attend when we try to teach them" (Richardson, Brutten, and Mangel 1973).
Psychoneurological Learning Disability	". . . in those having a psychoneurological learning disability it is the fact of adequate motor ability, average to high intelligence, adequate hearing and vision, and adequate emotional adjustment together with a deficiency in learning that constitutes the basis for homogeneity"(Myklebust 1967).
Learning Disorder	"Learning disorder might best designate a known impairment in the nervous system" (Bateman 1964).
Brain-Injured Child	". . . those children, physically handicapped or physically sound, who show intellectual and personality aberrations as a result of injury to the brain substance" (Strauss and Lehtinen 1947).
Specific Dyslexia	". . . children with a disability in learning to read as a result of neurological involvement" (Orton 1937).

Etiologies

Much research concerns the etiologies of learning disabilities. Since the primary reason for the diagnosis is reading deficiency, the cause of the reading problem must be determined. There is much debate as to why so many children have reading problems: in terms of the definition, they must be related to language. Auditory and visual processing disturbances do not constitute the major cause of reading retardation but are the major etiologies of learning disabilities. The list of possible etiologies of reading problems also includes emotional disturbance, lack of motivation, low socioeconomic level, low intelligence, and so forth.

With respect to the etiologies of auditory processing learning disabilities (hereafter referred to as APLD), no definitive information is available as yet, but rather, possible contributing factors are suggested in many areas. Recent research has begun to identify certain

possibilities, including frequent and recurrent episodes of otitis media (see Chap. 5), inability to process rapid auditory sequences (see Chap. 4), and poor short-term memory skills (see Chaps. 2 and 5). It has also been speculated that the auditory system may have a limited information capacity and may have difficulty in the management of acoustic information (noisy channel theory), that there may be a limitation imposed on the auditory system following channel combining of both ears (defective central processor), or that a lag-time disorder may result in poor acoustic memory with rapid decay and a subsequent decrease in usefulness of verbal information.

Although medical problems such as otitis media may result in sound deprivation which may cause auditory system dysfunctions, contributing to deficits in lag time, pattern processes, or channel combining, there may also be existing auditory system dysfunctions in the absence of chronic otitis media which result in the same characteristic disorders. Specific causes have not been identified. Often a positive family history of APLD may be identified in children with auditory processing disorders. There may be a sibling with school problems, parents who report having had similar difficulties in school, or parents with inappropriate employment.

The primary reason that children are labeled as learning disabled is because they cannot master the process of reading. The relationship of reading to language has been demonstrated (Stark 1975); the first requisite for reading is that the child know the language he expects to read (Templeton 1969). Disorder in auditory processing is one etiological factor identified as causative with children exhibiting learning disabilities (Myklebust 1954; Rampp 1972; Wepman 1972). Learning-disabled children diagnosed as having auditory processing disorders share many of the behavioral symptoms described by Clements (1966) and Rampp (1972).

During the past fifteen years, there have been great advances in our knowledge concerning learning disabilities. Clements (1966) reviewed the pertinent literature for the ten most frequently reported symptoms of learning disability.

1. Hyperactivity
2. Perceptual-motor impairments
3. Emotional lability
4. General orientation defects

5. Disorders of attention
6. Impulsivity
7. Disorders of memory and thinking
8. Specific learning disabilities in reading, writing, arithmetic, and spelling
9. Disorders of speech and hearing
10. Equivocal neurological (soft) signs and EEG irregularities

Later, specifically reporting the characteristics of auditory perceptual disturbances, Rampp (1972) listed the following:

1. Difficulty with auditory foreground-background stimuli
2. Difficulty with listening: thresholds of responsiveness vary
3. Difficulty with auditory discrimination
4. Difficulty in auditory synthesis
5. Difficulty in serial memory
6. Distractible, disinhibited, and hyperactive
7. Difficulty with impulse control
8. Limitation of abstraction: concretism
9. Soft neurologic signs
10. Inconsistency
11. Difficulty with spatial and temporal relationships
12. Mild articulatory deviations
13. Difficulty in reading

Since the above two reports, much needed research has been and is being completed. More specific information is available narrowing and limiting the scope of APLD.

APLD children are of school age (5 to 18 years), primarily males with average or near-average intelligence and adequate peripheral hearing acuity (they all have right-ear preferences). They will probably have some visual perceptual disturbances and may not have overt expressive language problems. Their specific difficulties in auditory processing create academic failure in the elementary grades primarily attributable to failure to learn the reading process. These academic deficiencies are thought to be related to specific auditory processing, linguistic, and/or cognitive failures in language learning.

From the basic abilities standpoint, certain assumptions are made when dealing with the learning-disabled child: (1) he has certain or-

ganismic learning disabilities that are interfering or limiting his potential for learning and (2) if he is provided with appropriate training, either remediating his disabilities by working in so-called deficit areas or helping him compensate for his disabilities by teaching to his strong ability areas, he can be helped to overcome his learning problem. It is assumed, then, that if such teaching is successful, he will become a more effective achiever in academics and other areas.

Critical Period Concept

The basic premise of a theory of critical periods is that there are certain times during the developmental process when the organism is programed to receive and utilize certain types of stimuli and that subsequently the stimuli will have gradually diminishing potency in affecting the organism's development in the function represented. This theory suggests that at certain developmental ages auditory signals will be optimally received and utilized by the central nervous system. However, once that age has passed, the effective use of auditory messages will gradually lessen. In the case of auditory language, it is well documented that total sensory deprivation during the first five years of life results in an irreversible language retardation (Downs 1956; Templin 1966). Also, linguists suggest that the critical language-acquisition period occurs by six or seven years of age.

By definition, learning disorders in children constitute a developmental problem, with the crucial period being from birth until approximately six years. McNeil (1970) suggests that age and function are crucially related. Postponement or wait-and-see carries the child beyond the crucial language age. Except in catastrophic deviations, children with developmental learning problems may not even be brought to evaluation until time has run out (Irwin, Moore, and Rampp 1972). As Edwards (1968) indicated, if the critical-periods-in-learning hypothesis is correct, then the right experience must come at the right time or the child's potential will remain forever unrealized.

Chapter 2 presents basic information about perception, learning, and listening. Chapter 3 is devoted to the components that are involved with children diagnosed as having auditory processing learn-