

# Treatment of Learning Disabilities

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Learning disabilities constitute the most prevalent and urgent medical problem afflicting children not only in the United States but in most countries of the world. The number of children involved is staggering when one considers that 5 percent of the nonretarded children population is affected. Physicians must be made aware that a child suffering from learning disabilities will not "outgrow it," that his condition is not "a phase he is passing through." If adequate intervention is not made into these disabilities, the child's potential will never be realized and the effects on his life will be more devastating than those of most other childhood disorders with which he might be afflicted. The earlier the diagnosis is made, the more rewarding will be the response to Orthomolecular therapy or to pharmacotherapy and hence the more successful the results of remedial effort. Delayed diagnosis or treatment exposes the child to improper assessment by school personnel, his peers, and his parents, increasing the probability of permanent psychological damage.

Recent research suggests that learning disabilities are associated with minimal brain dysfunction. This term refers to children of near- or above-average intelligence, with certain learning or behavioral disabilities, ranging from mild to severe, which are associated with

deviations of function of the central nervous system. There is growing recognition that the hyperactive "problem child," the child with a learning disability, may indeed be suffering from a biochemical disorder. The characteristic sign most often observed is hyperactivity - the one symptom common to all emotional disorders of childhood. Other symptoms may include perceptual - motor impairments, impulsive behavior, general coordination defects, inability to concentrate, short attention span, and disorders of speech. Many children diagnosed minimal brain dysfunction seem normal or near-normal until they enter a classroom. Then, despite being endowed with average or above-average intelligence, they will have difficulty in one or more areas of learning. Reading disabilities (dyslexia) are most common. The resulting academic and emotional difficulties easily lead to misdiagnoses of retardation or of primary psychiatric problems.

Dr. William Wendie (1971), Director of Research of The New York University Institute of Rehabilitation Medicine, states that the cause seems to be malfunctioning of one area or another of the brain. In many cases the malfunction is caused by physical damage to the brain although such damage is difficult or impossible to prove. Because the damage is subtle, states Dr. Wendie, no EEC abnormalities are found in about 50 percent of the cases. In experiments with Rhesus monkeys in 1968, in which

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asphyxia was deliberately induced in 130 subjects during or after birth, development of this group was then compared with that of uninjured controls. In the early years, the differences were obvious. The asphyxiated monkeys had extreme difficulty in carrying out simple motor tasks and noticeable sensory problems. By the fourth year of life the monkeys seemed to have made a normal adjustment although a lack of manual dexterity and a low level of spontaneous activity were visible signs of neurological deficit. In most cases, the EEG's were normal, but autopsies showed that brain injury induced by the asphyxia had not been repaired. There was widespread nerve cell damage in several parts of the brain.

In humans, brain damage due to trauma before, during, or after birth is now believed to be responsible for many cases. The state of the mother's health and general nutrition prior to conception and during pregnancy are of the utmost importance, for subtle or gross disasters occurring during these periods or during labor and delivery can compromise the child in learning and behavior (Pasaman- ick et al., 1956).

Learning disabilities associated with minimal brain dysfunction in children of normal or superior intelligence can readily be distinguished from cases of mental retardation or of severe emotional disturbance. For this group of children, the diagnosis of specific learning disabilities has been suggested. The term general learning disabilities should be reserved for the mentally retarded child, or the child suffering from severe disorders of behavior and communication (childhood schizophrenia, autism).

Evidence is accumulating that learning disabilities are frequently of genetic origin and may be related to genetic vitamin dependency. Because of the world-wide scope of the problem, the World Federation of Neurology Meeting in Dallas, Texas, considered terminology related to reading problems of genetic origin (Learning Disorders in Children, Little, Brown, Pub.). In obtaining

detailed case histories of adolescent or adult schizophrenic patients, the author found a high incidence of hyperactivity and learning disabilities early in life. Many were characterized as "slow learners" who had difficulties with concentration and comprehension and a short attention span. It is suggested that hyperactivity and learning disabilities may, in the genetically predisposed child, be early symptoms of schizophrenia. Case studies further reveal that more than one learning disabled child frequently occurs in a family. This examiner has seen several families in which all the children had learning disabilities or were classified "slow learners" and many families in which there were several members who were schizophrenic, diabetic, or alcoholic.

The average I.Q. of children with learning disabilities is about the same as the average I.Q. of the total population. It has long been known by teachers in special education that severe learning disabilities may be found in children of very superior intelligence and I.Q.'s of 160+ are frequent. While in most learning disabled children the problem becomes manifest when they enter school and can be detected by a kindergarten teacher, it is generally not diagnosed until the child enters first grade. Many children progress fairly well through the early grades, but the problem becomes overt when subjects are introduced in which abstract thinking is required. Even if intervention is made early, many of the effects of learning disabilities cannot be overcome with the best help now available. There is no single etiological factor for learning disabilities nor is it likely that one will be found. Much emphasis has been placed and attention directed to the neurogenic learning disorders, while other important variables in the learning process have been overlooked or ignored (Cott, 1972). The author presents for consideration a most important variable in the learning process - the biochemical disorders which interfere with learning and a new

adjunct to treatment which involves the use of massive doses of vitamins and the maintenance of proper nutrition to create the optimum molecular environment for the brain. Drugs are being used widely as the primary intervention for the treatment of learning disabilities and are of importance in helping many children.

On January 11 - 12, 1971, the Office of Child Development and the Office of the Assistant Secretary for Health and Scientific Affairs, Department of HEW, called a conference to discuss the use of stimulant medications in the treatment of elementary school-age children with certain behavioral disturbances. In convening the conference, the Office of Child Development was aware of public concern about the increasing use of stimulant medications in treating so-called hyperkinetic behavior disorders. Questions were raised by concerned parents whether these drugs, which were being widely abused by adolescents and adults, were truly safe for children? Were they properly prescribed or were they used for children who in fact need other types of treatment? Is emphasis on medications for behavior disorders misleading?

In order to clarify the conditions in which these medications are beneficial or harmful to children, a panel of 15 specialists were invited to meet in Washington, D.C. The panelists were drawn from the fields of education, psychology, special education, pediatrics, adult and child psychiatry, psychoanalysis, basic and clinical pharmacology, internal medicine, drug abuse, and social work.

The panel's task was to review the evidence of research and experience and to prepare an advisory report for professionals and the public. Their report dealt with the wide range of conditions and disabilities which can interfere with a child's learning and highlighted such etiologic factors as social deprivations, stress at home or at school, mental retardation, childhood psychosis, and autism. Other factors included were medical conditions such as blindness, deafness, or

obvious brain dysfunction. Some cases were described as associated with specific reading or perceptual defects and others with severe personality or emotional disturbance.

The panel commented that the dysfunctions under consideration were known to require careful evaluation, thoughtfully planned treatment employing a variety of methods on the child's behalf, and conscientious monitoring of remedial treatments. The focus of the panel's report was upon the issues related to the current use of these drugs. They clearly defined hyperactivity as physical activity which appears driven - as if there were an "inner tornado" - so that the activity is beyond the child's control, as compared to other children. The child is distracted, racing from one idea and interest to another, unable to focus attention.

The panel agreed that little was known about definitive causes. Among their conclusions they stated that the neurological and psychological control of attention is an important but incompletely researched topic, as are the nutritional, prenatal, and developmental factors. They continued that the fact that these dysfunctions range from mild to severe and have ill-understood causes and outcomes should **not** obscure the necessity for skilled and special interventions. Attention was drawn to the similarity in the majority of better known diseases - from cancer and diabetes to hypertension - which have multiple or unknown causes and consequences. Their early manifestations are often not readily recognizable, yet useful treatment programs have been developed to alleviate these conditions. Uncertainty as to cause has not prevented tests of the effectiveness of available treatments while the search for clearer definitions and more effective kinds of therapy continues. The panel suggested that the same principles should clearly apply to the hyperkinetic behavior disorders.

They concluded that stimulant medications are beneficial in only about one-half to two-thirds of the cases in which use of the drugs is warranted. They considered the stimulant drugs to be the first and least complicated of the medicines to be tried, while other medications - the so-called tranquilizers and antidepressants - should be generally reserved for a smaller group of patients. They agreed that the medications did not "cure" the condition, but the child may become more accessible to educational and counseling efforts. Over the short term and at a critical age, this can provide the help needed for the child's development.

The panel emphasized the rights of the parents and took the position that under no circumstances should any attempt be made to coerce parents to accept any particular treatment and that the consent of the patient and his parents or guardian must be obtained for treatment. They further added that it is proper for school personnel to inform parents of a child's behavioral problems, but members of the school staff should not directly diagnose the hyperkinetic disturbance or prescribe treatment. The school should initiate contact with a physician only with the parent's consent. The report was concluded with the summary that there is a place for stimulant medications in the treatment of the hyperkinetic behavioral disturbance, but these medications are **not** the only form of effective treatment.

The author agrees in essence with the conference report. Early intervention is of the utmost importance if the hyperkinetic learning disabled child is to have an opportunity to learn and achieve. It is true that in most instances the hyperactivity will subside spontaneously by age 12 or 13, and those parents who accepted the advice that their child would "outgrow" the condition find that it is too late for him. His academic career is gone, and opportunities for work later in life are indeed limited since there are very few jobs left which do not require a degree of literacy.

It is unfortunate that the panel quoted above, while they did point out that drugs were not the only effective treatment, was not convened to report on effective alternatives to drug treatment or effective treatments for that one-third to one-half of five million children who are not helped by drugs. In the author's experience with the use of the Orthomolecular intervention into the hyperkinetic learning disabled child, better than 50 percent are helped. These statistics achieve greater significance because the children treated have failed to improve with the use of methylphenidate or amphetamines. Many parents were searching for an alternative to drug therapy because their children were experiencing the side effects of insomnia, loss of appetite with concomitant weight loss, or a reaction of fatigue and sedation when the drug was given in doses large enough to control the hyperactivity. Many children had been tried on a regime of various psychotropic (tranquilizer) medications which failed because they produced the paradoxical effect of overstimulation and increased the hyperactivity and disturbed behavior. Many parents had read of the Orthomolecular approach or had spoken to other parents whose children were achieving notable improvement on the regime and sought this as the primary treatment. Since the Orthomolecular approach is compatible with all other substances used in the drug intervention and since the megavitamins potentiate the action of most drugs, the treatments can be combined. This is frequently done early in treatment while the vitamin doses are gradually being raised to the optimal maintenance level and more rapid control of the hyperactivity is required. At times, tranquilizer medication is added at the request or insistence of the school authorities to bring the hyperactive, disruptive behavior under more rapid control.

The large majority of children treated by the Orthomolecular approach improve without the use of drugs. Fortunately

very few parents accept the clichés with which their concerns about their child's development are met by so many of their pediatricians and family physicians. They are not satisfied with "boys are slower than girls," "you're an anxious mother, your baby is fine," "lots of healthy children do not speak until they are four years old," or "there's nothing to worry about if your baby creeps backward or sideways." It has been the author's experience that the mothers most often were first in noticing their child's problems, while in a very low percentage of cases was their pediatrician first to make the diagnosis. Many parents, after reading about the Orthomolecular approach, instituted the recommended dietary changes and found these changes alone brought about a dramatic reduction in hyperactivity. Other parents purchased vitamins and reported improvement when their child was given several of the vitamins used in the treatment.

During the treatment of several hundred psychotic children, the author noted and reported that in most cases in which parents persisted in the proper administration of the vitamins and the diet, significant improvement in many areas of functioning was achieved. The most significant and earliest sign of improvement reported by the parents was a decrease in hyperactivity which led to improved concentration and attention span with a resultant improved capacity for learning. Trials were then begun with the Orthomolecular treatment in children exhibiting specific learning disabilities, the child diagnosed hyperkinetic or minimal brain dysfunction, the child described earlier as being of near-or above-average intelligence with certain learning or behavioral disabilities ranging from mild to severe which are associated with deviations of function of the central nervous system. Until these studies were begun, most remedial specialists stressed the more peripheral aspects of a handicapped child's performance and ignored the biochemical basis of his disturbed behavior and impaired ability to learn. Improvement under the Orthomolecular treatment is directing the attention of the scientific

community to the central processes and closer scrutiny of the biochemical processes of the learning disabled child. In this means of intervention, remedial efforts are directed toward both brain function and body chemistry. In addition to the employment of perceptual-motor techniques and pharmacotherapy, attempts should be made to improve the child's biochemical balance through the use of Orthomolecular techniques (Cott, 1971).

Orthomolecular treatment has been described in a previous chapter, but its definition at this point bears repetition. Dr. Linus Pauling, in his classical paper on Orthomolecular Psychiatry (1968), defined this approach as the treatment of illness by the provision of the optimum molecular composition of the brain, especially the optimum concentration of substances normally present in the human body. The implications for much needed research in the more universal application of Orthomolecular treatment are clear. There is rapidly accumulating evidence that a child's ability to learn can be improved by the use of large doses of certain vitamins, of mineral supplements, and by improvement of his general nutritional status through removal of "junk foods" from his daily diet.

With Orthomolecular treatment, results are frequently quick in starting and the reduction in hyperactivity often dramatic, but in most instances several months elapse before significant changes are seen. The child exhibits a willingness to cooperate with his parents and teachers. These changes are seen in the majority of children who failed to improve with the use of the stimulant drugs or tranquilizer medications. The majority of the children I see have been exposed to every form of treatment and every known tranquilizer and sedative with little or no success even in controlling the hyperactivity. Concentration and attention span increases, and the child is able to work productively for increasingly larger periods of time. He

ceases to be an irritant to his teacher and classmates. Early intervention is of the utmost importance, not only for the child, but for the entire family since the child suffering from minimal brain dysfunction is such a devastating influence on the family constellation. He is the matrix of emotional storms which envelop every member of the household and disrupt both their relationship to him and to each other.

Based on empirical data, the application of Orthomolecular principles can be successful in helping many learning disabled children. Positive results have been obtained when the treatment regimen consisted of the following vitamins - niacinamide or niacin, 1-2 grams daily depending upon body weight; ascorbic acid, 1-2 grams daily; Pyridoxine, 200-400 mg daily; calcium pantothenate, 200-600 mgs daily. The vitamins are generally administered twice daily. Magnesium oxide powder is frequently used for its calming effect on the hyperactivity. Half teaspoon of the powder is added to the vitamin intake twice daily along with 1 tablet of calcium gluconate or calcium lactate twice daily.

These are starting doses of the vitamins for children weighing 35 pounds or more. If a child weighs less than 35 pounds, 1 gram daily of niacinamide and ascorbic acid are used in 1/2 gram doses administered twice daily. If the child shows no signs of intolerance after two weeks, the dose is increased to 1 gram twice daily. In the smaller child the Pyridoxine and calcium pantothenate are started, at 100 mgs twice daily and gradually increased to twice the amount. In a child weighing 45 pounds or more, an optimum daily maintenance level of approximately 3 grams of niacinamide and 3 grams of ascorbic acid is reached. Frequently, vitamin B12, vitamin E, riboflavin (B2), thiamine (B1), folic acid and L-glutamine can be valuable additions to the treatment. No serious side effects have resulted in any of the hundreds of children treated with these substances. The side effects which occur infrequently (nausea, vomiting, increased frequency of urination or bowel movements) are

dose related and subside with reduction of the dose.

It has been shown that proper brain function requires adequate tissue respiration, and Dr. O. Warburg (1966), Nobel laureate in biochemistry, described the importance of vitamins B3 and C in the respiration of all body tissues in the maintenance of health and proper function.

It has been the author's belief that those children and adults in all diagnostic categories who benefit from the massive doses of vitamins are not always suffering from vitamin deficiencies but rather from a genetic vitamin dependency. In August, 1970, Dr. L. E. Rosenberg of the Department of Genetic Research of Yale University reported that of the dozen known disorders involving genetic vitamin dependency, Pyridoxine (vitamin B6) is involved in five. Genetic dependency is described as a condition in which normal levels of vitamins are insufficient for the body and can be treated successfully only by massive doses of vitamins. Rosenberg found that in many instances up to 1,000 times the usual vitamin requirements are needed to prevent the disease from expressing itself. Laboratory findings with animals have shown a direct relationship between vitamin intake and learning enhancement. It has been found by some researchers that injections of vitamin B12 markedly enhanced learning in rats.

Control of the child's diet is an integral part of the total treatment, and failure to improve the child's nutritional status can be responsible for achieving minimal results. Greater concern must be shown for the quality of the child's internal environment in which his cells and tissues function if we are to help him attain optimal performance. The removal of offending foods from the diet of disturbed or learning disabled children can result in dramatic improvement in behavior, attention span, and concentration. Since many disturbed and learning disabled children are found to have either hypoglycemia, hyperinsulinism, or

dysinsulinism, cane sugar and rapidly absorbed carbohydrate foods should be eliminated from their diets. It has been the universal observation of those investigators who assess the child's nutritional status that they eat a diet which is richest in sugar, candy, sweets, and in foods made with sugar. The removal of these foods results in a dramatic decrease in hyperactivity. Most children do not drink milk unless it is sweetened with chocolate syrup or some other syrupy additive. All the beverages which they consume every day are spiked with sugar - soda, caffeinated cola drinks, highly sweetened "fruit juices," and other concoctions which are sold to them on TV commercials. The child who drinks any water at all is indeed rare.

The appalling fact about the constant consumption of these "junk foods" is the parents' belief that these foods are good for their children. Parents must realize that they litter their children's bodies by making these unnatural junk foods available to them and incorporating them in their daily diet. The children will not voluntarily exclude these foods from their diet, they must be helped to accomplish this. These foods should not be brought into the house. The child must learn the principles of proper nutrition and proper eating from his parents. The dissemination of this knowledge is far too important to entrust it to the writers of TV commercials whose aim is to sell rather than educate.

Dr. Jean Mayer (1970), Professor of Nutrition at Harvard University, speaking at a symposium on hunger and malnutrition, stated that "studies at Harvard among resident physicians suggest that the average physician knows little more about nutrition than the average secretary, unless the secretary has a weight problem and then she probably knows more than the average physician." "We did find that there is a difference between older physicians and younger in relation to this problem. The older doctors do not know more about nutrition than their younger colleagues,

but they are conscious of this lack. All in all, it seems that most physicians tend to be happy about this state of affairs." Dr. Mayer complained that "only a half dozen or so medical schools in the U.S. include a nutrition course in the curriculum. Nutrition education should be centered on foods - their size, shape, color, caloric value, etc. — we must relate such vital information to the everyday uses of all people."

The author has taken many dietary histories which revealed that the usual "nutritious" breakfast for some children consists of a glass of soda or "coke" and a portion of chocolate layer cake! For the child with hypoglycemia, such food assures a drop in blood glucose level for several hours, during which time that child's brain function is impaired so that he cannot learn well even if he does not suffer from learning disabilities. At best, the breakfast menu of the majority of learning disabled children is poorly balanced and varies from the above extreme by the substitution of sugar-frosted cereals. The glucose in the bloodstream is one of the most important nutrients for the proper functioning of the brain, and the maintenance of a proper glucose level is essential in the creation of an optimum molecular environment for the mind.

Orthomolecular treatment has many advantages which make it especially suitable for large numbers of children. Treatment can be directed by parents and paraprofessionals, reducing to a minimum the occasions upon which the child must be brought to a specialist for therapy. It is inexpensive, as it does not depend upon complex machinery or equipment or upon the long-term use of psychotropic drugs. Of great importance is the role it could serve as a **preventive** as well as a therapeutic measure, because it could easily be included in prenatal and infant care programs everywhere. These are important considerations in view of the evidence that neurologically-based and biochemically-based learning disabilities are especially

frequent among children from low-income areas. U. Bronfenbrenner (1969) points out that a low-income mother's "exposure to nutritional deficiency, illness, fatigue or emotional stress can be far more damaging to her child than was previously thought. The neurological disturbances thus produced persist through early childhood into the school years, where they are reflected in impaired learning capacity."

The relationship of severe malnutrition to infant mortality, disease, and retardation in physical development are all well documented. In recent years evidence has accumulated that malnutrition has adverse effects on mental development and learning as well. Mild malnutrition can result in the child who is a "picky eater," who chronically gags when he swallows some foods, or swallows it readily and then vomits. Recent studies utilized such reported differences within young twin pairs to show that subtle variations in eating habits in the first year can be related to differences in mental abilities later in life.

While the chronic ingestion of lead has yet to be clearly associated with hyperactivity in children, two recently reported studies of mice and rats show that lead poisoning causes definite changes in brain biochemistry, that such changes may lead to behavioral disorders including hyperactivity (Michaelson, 1973).

At the University of Cincinnati Medical Center, Drs. I. Arthur Michaelson and Mitchell U. Sauerhoff administered varying concentrations of lead solution to nursing mother rats and then measured the neurochemical changes in 90 babies. They found 15 percent - 20 percent decreases in brain dopamine. At Johns Hopkins University, Drs. Ellen K. Silbergeld and Alan M. Goldberg (1973) tested the effects of lead ingestion on mouse behavior. After administering lead solutions to nursing mothers the investigators found that the offspring were retarded in development and suffered behavior disorders - hyperactivity and aggression.

The environmental pollutants are often heavy metals such as lead, mercury, or cadmium. The pollution of our environment, and particularly the cities, with lead has already reached a disturbingly high level. In 1967 in Manchester, England, a group of children were found to have lead levels of 30+ micrograms per 100 ml of blood. Professor D. Bryce Smith of the University of Reading wrote recently in the journal, **Chemistry in Britain**, that no other toxic chemical pollutant has accumulated in man to average levels so close to the threshold for overt clinical poisoning. Whenever lead poisoning has been diagnosed, it has always been possible to trace it to some definite source. In children, it may be chewing on old paint work or toys containing lead. There has been no known case of lead poisoning from the widespread general pollution to which everyone is exposed. This is why the apparently alarming situation to which Professor D. Bryce Smith draws attention has caused little concern. Lead pollution does not seem to be doing any serious damage, the complacent argument runs, so why worry about it? However, this position begins to look more and more vulnerable in the face of mounting evidence that lead could have harmful effects at levels well below those which cause overt poisoning.

In 1964, Sir Alan Moncrieff and others at the Institute of Child Health in London found that a group of mentally retarded children had distinctly more lead in their blood than a group of normal children. In fact, nearly half the retarded children had higher blood levels than the maximum level in the other group. It does not, of course, follow that lead was responsible for the children's mental retardation. It could well have been their retardation which made them more prone to chew on substances with a lead content. Nevertheless, the possibility that lead at levels too low to cause obvious poisoning could result in mental retardation could not be ignored and acted as a spur to the search for some



measurable effect of low levels of lead in the human body.

In 1970, Dr. Sven Hernberg and his associates found that lead affected the functioning of an enzyme, ALA Dehydratase, which is\* involved in haem synthesis. Furthermore, he showed that in the test tube any level of lead affected the activity of ALA Dehydratase to some degree. In October, 1970, a research group led by J. A. Millar fed lead to baby rats and found that the activity of ALA Dehydratase was affected not only in their blood, but in their brains as well. They wrote in their report in *The Lancet*, "The finding of decreased ALA Dehydratase activity in the blood of children with lead levels falling within the normal range and the possibility that similar biochemical changes are present in the brain also, emphasizes the danger of exposure to even very small amounts of lead during childhood and suggests that a downward revision of acceptable levels of blood lead in children is desirable." In addition to the lead discharged into the atmosphere in vehicle exhaust, one absorbs lead from foods and water.

It is now a well-known clinical fact that susceptibility to the harmful effects of lead is highly variable. Lead in heavy concentrations in the tissues (and some of the hundreds of children I have examined have concentrations as high as 85 ppm) can interfere with metabolic reactions which activate other metals such as copper, iron, manganese, and potassium.

In the author's studies of the trace metals in children's hair, it was found that they show a higher concentration of lead than do adults. In the adult groups it has been reported that pregnant women show a greater susceptibility than other adult members of the population. Now that attention has been focused on the level of lead in the tissues of many middle-class Americans who may be exposed to lead by-products in gasoline exhaust fumes, many new cases of borderline lead toxicity are appearing without the usual explanation of lead ingestion. While there is a close

correlation between the level of atmospheric lead and the levels of lead accumulated and stored in the body, there is a wide diversity in the susceptibility, not only to symptoms, but also to the accumulation of this toxic trace metal. Recent experiments again give evidence that nutritional factors, particularly dietary calcium, may be important determinants in the capacity of the body to absorb and retain lead. Animals receiving lead in their drinking water showed a greater absorption of lead when their diet was deficient in calcium. This group of animals absorbed four times as much lead as compared to the group which received a normal dietary calcium intake.

### PRENATAL INFLUENCES

Ashley Montagu, in his book **Life Before Birth**, states that life begins at conception and that the happenings in the interval between conception and birth are far more important for our subsequent growth and development than has until recently been realized. The thinking about this period of the child's life had for so many years for the majority of people been rather simplistic. It was stated with confidence that the child was safe, warm, and snug in the mother's uterus, shielded and protected from all external influences while he floated in his fluid-filled sac which by its hydraulic effect made him safe even from physical pressures. It was believed that the placenta acted as a "barrier" against the transmission of toxic substances from the mother's blood stream.

Not until the past decade of research has it been learned that during the prenatal period - the nine months between conception and birth - a human being is more susceptible to his environment than he will ever be again in his life. What happens to him in the prenatal period can help sustain normal development or hinder him from ever achieving his full genetic potential. The events which take place before his birth can exert a lifelong influence, for part of

the child's environment consists of his mother's immediate state of health, her general physical condition, her age at the time of conception, and how fatigued she becomes each day. A pregnant woman's nutrition must be more than merely adequate, it must be the best that her circumstances allow.

Montagu emphasizes that "a mother's nutrition is the most important single environmental influence in the life of her unborn child and it is by means of the food she eats that a mother can have the most profound and lasting effect on her child's development - by the simple act of improving her diet where improvement is necessary she can greatly influence the development of her child toward normal healthy growth." A study of malnutrition and pregnancy is cited from which a surprising finding emerged - that none of the mothers in either group, the well fed or the poorly fed, showed any signs themselves of malnutrition or deficiency diseases, yet the diet of the pregnant woman can be so seriously inadequate that her child is endangered and yet not produce any recognizable symptoms that might give warning to her or her doctors.

This finding corroborates Roger J. Williams' (1971) report that greater concern must be shown for the quality of the internal environments in which our cells and tissues function, because these environments can vary through the full spectrum from those which barely keep cells alive up through hundreds of gradations to levels supporting something like optimal performance. It is an obvious undeniable conclusion that an unborn child should be given the advantage of growing to term in an optimum molecular environment. Proper diet based on wholesome foods, vitamin and mineral supplements, and the elimination of "junk foods" helps to create such an environment for prenatal development and growth - cigarette smoking, stimulant drugs, diuretic drugs, tranquilizers, dieting with or without the use of amphetamine-containing appetite suppressors do not.

In the author's clinical practice, detailed

prenatal histories and the histories of labor and delivery reveal that some complications of pregnancy and delivery occurred in a majority of the children who show evidence of brain injury, behavior disorder, or learning disabilities. Clinical impressions are always open to all the possibilities of error found in such retrospective evaluations (Pasamanick et al., 1956).

Dr. Benjamin Pasamanick (1956) and his coworkers, in a series of papers describing their research in these areas, postulated "a continuum of reproductive casualties extending from fetal deaths through a descending gradient of brain damage manifested in cerebral palsy, epilepsy, mental deficiency and behavior disorders in childhood." In a 1958 report, Dr. Pasamanick extended the continuum of reproductive casualties to include reading disorders in childhood. In this study, reported in the **Journal of the American Medical Association** (March 22, 1958), they compared the prenatal and birth records of 372 white male children with reading disorders born in Baltimore between 1935 and 1945 with the records of a similar number of matched controls. The results of the study "appear to indicate that there exists a relationship between certain abnormal conditions associated with birth and the subsequent development of reading disorders in the child."

Those children with reading disorders had a significantly larger proportion of premature births and abnormalities of the prenatal and delivery periods than their control subjects. They found that the toxemias of pregnancy and bleeding during pregnancy constituted those complications largely responsible for the differences between the two groups. The investigation suggested that some of the learning disabilities in children constitute a component in the continuum of reproductive casualties, which Pasamanick had previously hypothesized to be composed of a lethal component consisting of stillbirths and neonatal deaths and a sublethal component

consisting of cerebral palsy, epilepsy, mental deficiency, and behavior disorders in children.

Impressions leading to similar conclusions formed from the author's clinical experiences based on detailed histories of hundreds of learning disabled children. The interview with the parents generally begins with the request that they describe the pregnancy. With very few exceptions in the hundreds of pairs of parents interviewed, the opening response is "The pregnancy was perfectly normal." It is appalling to contemplate the disasters which can await the child in what women have been led to believe are quite the usual and therefore normal experiences of pregnancy. Many mothers report with a feeling of pride their accomplishment of having carried a pregnancy to full term and delivered a baby of normal weight without having gained a single pound in the nine months of the pregnancy! Nausea and vomiting occurs in the great majority of mothers and is accepted as a normal occurrence. Many mothers attempt to minimize the importance of "morning sickness" by adding (usually accompanied by a smile or a chuckle), "but I was sick every day with all my pregnancies."

Many mothers reported dieting severely throughout the pregnancy at the demand of their doctor, because he preferred that his patients have small babies. Amphetamines were frequently prescribed to suppress the appetite or to combat fatigue. Tranquilizer and sedative medications were used freely throughout the pregnancies, but the most frequently prescribed medication seemed to be the diuretic drugs which mothers took throughout the pregnancies and which were in very few cases taken along with an increase in potassium - rich foods. Anemia during pregnancy is frequently reported.

The frequency of the occurrence of complications during the perinatal period (delivery) is higher in children with learning disabilities. The most commonly encountered history is that of a prolonged period of labor and a difficult delivery. In a study reported by Dr. Mary Hoffman in **Academic Therapy**

(Vol. VII, No. 1 - Fall 1971), 25 percent of a group of children who were failing students were products of difficult deliveries, while this occurred in only 1.5 percent of the histories of the able students. Cyanosis occurred in 11 percent of the learning disabled and in only 0.5 percent of the able students. Prolonged labor, blood incompatibility, premature births, postmature births, breech deliveries, and induced labor were also found to be highly significant factors in the historical background of children with learning disabilities, since these casualties occurred far more frequently than in able children.

The examination of a child who suffers from a disorder of speech, communication, or learning cannot be considered complete without a visual examination, for the investigation of sight and vision is as important as any other part of the total examination and more important and revealing than many other routines. A major number of the children treated by the author have all had examinations which included electroencephalograms, but very few have been examined for vision by a vision specialist. If an examination has been done, it was performed for sight, and if the child demonstrated 20/20 vision on the Snellen Chart, the parents were informed that there was nothing wrong with the child's eyes. This may be true for distance eyesight, but overlooks all the near-point visual activity so important to the dynamic visual process of reading (Wunderlich, 1970). The child who has a school or learning problem must have an examination performed by a specialist who investigates the function of the eyes as well as their structure. Such a specialist could be an ophthalmologist (an M.D. specializing in diseases of the eye) or an optometrist specializing in developmental vision. At the present time few ophthalmologists perform these examinations, so one is more apt to find a developmental vision specialist among optometrists. Sight is the ability of the

eye to see clearly. It refers only to the ability to resolve detail. Vision is the ability to gain meaning from what is seen (Wunderlich, 1970).

Too often parents are lulled into a false sense of security when they are told that their child's eyes are "fine" for here, also, early detection and treatment will produce a more rewarding response and the more successful will be the results of the remedial efforts. There can be significant deviations from normal vision even if a child has 20/20 on the Snellen Chart. Farsightedness can be overlooked in a distance vision screening examination and can cause difficulties when a child does near work. Trouble can be caused if one eye is different from the other in refractive power. Convergence of the eyes noseward for looking at things up close is of vital importance in centering with two eyes on a near-point task. Convergence bears an important relationship to focusing, and the two processes are combined. If this link is not proper, a child can be out of focus and be completely unaware that he is, just as a child who sees a separate image with each eye has no way of telling us about this since he believes that everyone sees in this way. The out-of-focus child cannot tell us about his blurred vision until he can be helped to see in sharp focus with the aid of lenses. The author has seen many children who had not seen near things in sharp focus or looked at the world through binocular vision until the eyes had been treated successfully by a developmental optometrist or by an ophthalmologist interested in developmental vision. Yet these children are daily trying to learn to read when the printed page presents nothing but a blur. Hyperactivity is frequently reduced when the visual systems work

efficiently.

Lack of smooth eye muscle control makes a difficult task of trying to follow successive words in a line of print as the eyes sweep across a page. Often the eyes will not make the repeated necessary convergences if the focusing is not proper, and the child will skip words in the line, lose his place, or not be able to find the first word on the next line and as a result will not comprehend what he reads.

Developmental visual training is another vital link in the creation of an optimum molecular environment for the mind. Neither improved nutrition, vitamin and mineral supplements, enriched educational opportunities, or visual and perceptual motor training alone can be successful in fully helping the child with learning disabilities. All must be used in a coordinated program to develop each child's potential. Because research cannot at this time give an unequivocal or full answer to the question of what effect malnutrition or malnourishment has on intellectual development is not a valid reason to delay programs for improving the nutritional status and eating practices of mothers and infants. Information demonstrating the benefits of good nutrition in improved health, physical growth, and improved learning already justifies such efforts.

We cannot afford the luxury of waiting until causes can be unquestionably established by techniques yet to be developed. We cannot postpone managing as effectively and honestly as possible the 5 million or more children who desperately need help now.

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