



# CrossRoads INSTITUTE™

DEDICATED TO THE ART AND SCIENCE OF HUMAN POTENTIAL

## **The Attention Deficit Dilemma**

Disorder, Deficiency, or Denature?

Has the human brain suddenly become so dysfunctional that nearly 10% of the children in the West are suspected of having mental disorders that manifest as attention-deficits and hyperactivity? Or, could it be that our modern environment has something to do with it? Alternative approaches to ADD/ADHD really begin with an alternative view of this over-diagnosed and under-treated phenomenon. For example, ADD expert and author Thom Hartmann believes that some behavior diagnosed as ADD is not a disorder. Instead, it represents natural adaptive traits of personality and metabolism that in an evolutionary sense represent important survival skills. "This state of mind evolved naturally. It's not a malfunction — to the contrary, it's a coherent, functioning response to a different kind of world and society than that in which many of us live."

Nothing is wrong with the so-called ADD child, he explains. They are simply "hunters in a farming society." We need to stop labeling these children as disordered. Instead, refer to them as "hunters" or "lookouts."

### A Different Perspective

Writing in his landmark 1993 book, *Attention Deficit Disorder: A Different Perception*, Hartmann contends that behavior considered disorderly in the context of ADD has an equally valid and positive interpretation. For example:

- \* "Distractible" translates into constantly monitoring the environment.
- \* "Impatient" means results-oriented, acutely aware of whether the goal is getting closer, now.
- \* "Impulsive" really means flexible, ready to quickly change strategy.
- \* "Short attention span" suggests being able to throw oneself into the chase on a moment's notice.
- \* One who "acts without considering the consequences" is willing to take risks and face danger.
- \* "Daydreamers" are bored by mundane tasks; they like new ideas and enjoy the excitement of the hunt.

Seeing ADD in this new light can remove the stigma of deficit and illness. Hartmann hopes this new perception will lead to positive ways of accommodating these hunters in contemporary society, allowing them "to again become the powers behind cultural, political, and scientific change which they have so often historically represented." After all, today Benjamin Franklin and Thomas Edison would probably be diagnosed with ADD.

#### What's Stress Got to Do with It?

Being a hunter in a farming society is obviously a stressful situation, as is much of modern life itself. As the hunter-sex, boys are diagnosed with ADHD seven-times more often than girls. Also, boys account for 70% of kids with learning disabilities, 80% of juvenile cases, and 83% of suicides among 15-19 year olds.

The current scientific consensus on ADHD points to an imbalance in the brain chemical dopamine. Dopamine is related to the stress hormone adrenalin. Both are excitatory neurotransmitters known as catecholamines, which are involved with mediating the bodies' response to stress.

One of the most vulnerable key neurotransmitters, dopamine levels are depleted by poor sleep or stress. Alcohol, caffeine, and sugar all seem to diminish dopamine activity in the brain. It's also easily oxidized, therefore adequate intakes of vitamins C and E are necessary to protect dopamine-using neurons from destruction by free radicals. A 1998 study at the University of Massachusetts Medical School measured levels of the stress hormone cortisol in subjects with ADHD. It concluded that "an impaired response to stress may be a marker for the more developmentally persistent form of the disorder."

Stress also stimulates the breakdown of serotonin, a calming neurotransmitter that balances dopamine. What's more, serotonin plays a role in mediating allergic reactions. Since brain allergies are implicated in ADD, this reinforces the connection between ADD and stress.

#### Drugs and Children

In a November 1999 health watch segment, a major television network reported that ADHD may be caused by allergies to a wide range of possible substances — from chemical additives and colorings to foods such as dairy, chocolate, and wheat. Rather reluctantly, the medical correspondent suggested that perhaps parents could find out which foods were the problem. She made it sound like a lot of trouble, however, to monitor what your child eats in order to identify the allergens. The underlying message was that it is simpler to just give

them a drug. This came as no surprise — a pharmaceutical company sponsored that health watch segment. Even on their web page, drug ads predominated, although the ADHD report was absent.

Stimulants have been used to treat ADHD since the 1930s. Most recently, these medications include methylphenidate (Ritalin) and dextroamphetamine (Denedrine). Another drug, Cylert (pemoline), was withdrawn in Canada in September 1999 due to the possibility of serious liver complications. These medications increase nervous system alertness by prompting an increased production of the neurotransmitters dopamine and norepinephrine, enhancing attention while reducing excess restlessness.

Prescriptions of Ritalin have multiplied, especially for very young children. In 1995 it was estimated that more than 1.5 million American children aged 5 to 18 were taking Ritalin. One recent study found that 18-20% of the fifth-grade white boys in two cities had been diagnosed with ADHD and were being treated with stimulant drugs.

A strongly-worded report titled "Diet, ADHD, and Behavior" was released in November 1999 by the nonprofit Center for Science in the Public Interest (CSPI). Among its findings:

"The U.S. Drug Enforcement Administration (DEA) of the U.S. Department of Justice, which treats methylphenidate as a controlled substance, reports that manufacturers' sales increased nearly five-fold between 1990 and 1998 and that the U.S. now consumes 90 percent of the methylphenidate produced throughout the world. While prescriptions for methylphenidate began leveling off between 1995 and 1997, prescriptions for amphetamines, which are also used to treat ADHD, tripled, so overall use of stimulant drugs has continued to rise. One reason for the increase is that more elementary-school children are remaining on those drugs into their teens."

Evidence suggests that the problem is growing. At a November 1999 medical conference devoted to the disorder, it was estimated that attention deficit hyperactivity disorder affects from 10-15% (1.8 to 2.7 million) of all U.S. school children — and is doubling every 3 to 4 years! Children with ADHD often continue the symptoms into adulthood. In 1997, somewhere between 6.5 million and 9 million adults in the U.S. were estimated to have ADHD, which makes it as large a problem as clinical depression or drug abuse.

#### Ritalin Needs More Testing

A 1995 study conducted by the federal government's National Toxicology Program (NTP) found that Ritalin caused liver tumors in mice. "The NTP study sends a strong warning that Ritalin may cause cancer — in the liver or other organs — in humans," says Samuel

Epstein, professor of occupational and environmental health at the School of Public Health, University of Illinois Medical Center. "Millions of young children take Ritalin for long periods of time, and children may be especially vulnerable. It would be prudent for HHS [U.S. Department of Health and Human Services] to discourage doctors from prescribing Ritalin, especially in the absence of an explicit warning about the cancer risk."

Epstein and several other cancer specialists — including Emmanuel Farber at the University of South Carolina School of Medicine, Marvin Legator at the University of Texas Medical Branch at San Antonio, and Richard Clapp of Boston University — have urged HHS to sponsor new animal and human studies on Ritalin and other stimulant drugs. "It makes a lot more sense to try modifying a child's diet before treating him or her with a stimulant drug," said Dr. Marvin Boris, a pediatrician in Woodbury, New York, whose 1994 study found that diet affected the behavior of two-thirds of his subjects. "Health organizations and professionals should recognize that avoiding certain foods and additives can greatly benefit some troubled children."

#### What's Diet Got to Do with It?

That food allergies are associated with ADHD is nothing new. In the preface to his book, Thom Hartmann mentions the pioneering work done more than twenty years ago by the pediatric allergist Dr. Ben Feingold. He discovered that children with skin disorders were allergic to certain foods or additives, particularly aspirin-like compounds called salicylates. When these were removed from the children's diet their skin problems cleared up, but also their behavior changed. Many of these kids had been diagnosed with hyperactivity. Without the allergens in their diets, the hyperactivity was dramatically reduced or quite often disappeared.

After reviewing 23 scientific studies, the CSPI report contends that food dyes and certain foods can adversely affect children's behavior. It cites 16 controlled studies over the past 25 years which found that food additives exacerbate the symptoms of ADHD in some children. A 1976 study of U.S. children aged 6 to 11 found they ingested an average of 76 milligrams of food dyes per day, and ten percent ingested twice that amount. (Since then, the quantity of food dyes manufactured per person in the U.S. has increased 50%.)

#### Government Urged to Advise Caution and Conduct More Studies

The CSPI and several experts on diet and behavior have asked the Department of Health and Human Services to undertake new research into the link between diet and behavior and to "consider banning

synthetic dyes in foods and other products (such as cupcakes, candies, sugary breakfast cereals, vitamin pills, drugs, and toothpaste) widely consumed by children."

"The Department of Health and Human Services should withdraw its printed and Internet documents that largely dismiss the effect of food ingredients on behavior," said Michael F. Jacobson, executive director of CSPI and lead author of the report. "The FDA should halt distribution of a pamphlet on food additives that it co-published with an industry group."

The pamphlet titled "Food Color Facts" was actually written by the International Food Information Council. This trade association represents makers of food additives including General Mills, Kraft, Procter and Gamble, Pepsi-Cola, Coca Cola, Monsanto (maker of aspartame), and Ajinomoto (maker of monosodium glutamate). It states that "there is no evidence that food color additives cause hyperactivity or learning disabilities in children." It ignored the 16 double-blind studies cited by CSPI which showed that food dyes do worsen the symptoms of ADHD in some children.

The CSPI report also concluded that poor diet undoubtedly contributes to ADHD. Large numbers of U.S. children are considered malnourished, because they receive less than 60% of the recommended daily allowances (RDA) for a particular nutrient — an amount needed to avoid disease, not to function optimally.

### Chemicals and Behavior

In a Rachel's Environment & Health Weekly report on "ADHD and Children's Environment," Peter Montague points to the role of prenatal exposures to lead, cigarette byproducts, alcohol, and pesticides as well as exposure to low levels of industrial chemicals that may interfere with hormones, especially thyroid hormones. Previous studies have shown that combinations of chemicals can increase the toxicity of a single poison by a factor of 160 to 1600. (Science, June 7, 1996) Montague concludes: "At a time when Americans are searching for causes of aggression and violence among children, it would make sense to consider malnutrition, food additives, tobacco additives, toxic metals, pesticides and other endocrine-disrupting industrial toxicants — all of which many U.S. children are exposed to from the moment of conception onward."

### Why Has Nutrition Become Alternative Medicine?

During the second half of the twentieth century, commercial interests have succeeded in changing the popular meaning of "primary" healthcare. Common sense nutritional approaches to health are now labeled "alternative" or "complementary." Drugs have become primary.

Throughout history, healers have said that food is the best medicine. A child's mental health and behavior are intimately related to what he eats — both the good and the bad. Is he getting enough essential macro and micronutrients? Is he consuming too many non-foods and toxins?

How can there not be mental disorder when potato chips and French fries make up more than one-quarter of the vegetable servings eaten by children, and nearly one-third of the veggies eaten by teenagers? How can a child function at his best when he drinks more soda pop than water? This is common sense, but the commercial media does not remind us of this. Because vitamins, minerals, and other nutrients are not patentable, there is little commercial incentive to promote them. Dr. Joseph M. Mercola, D.O., the medical director of the Optimal Wellness Center in Schaumburg, Illinois, treats complex chronic illness by integrating lifestyle changes with innovative tools in nutrition and energy medicine. Writing in his December 1999 column in the Townsend Letter for Doctors & Patients, he says that "restricting sugar, grains and all fluids but water will improve nearly all children with ADHD. Nothing works all the time, but this is close to it."

#### Dopamine and Attention

Charles Gant, M.D., Ph.D., a New York physician believes ADD/ADHD is likely caused by an imbalance in dopamine. This vital neurotransmitter helps integrate thoughts, feelings, and sensory information in the frontal lobes, as well as update feedback about current motor activity. He elaborates:

"In evolutionary terms, this is the last part of the human brain to develop and is one of the first parts to lose its function when there is a generalized stress or injury to the central nervous system. Because this recent brain structure has not had the benefit of millions of extra years of 'road testing,' that the older, more rugged parts of the brain have had, it is more vulnerable to modern-era stress, neurotoxins, and nutritional deficiencies."

When dopamine activity is compromised, Gant says people become unfocused and distractible because they have difficulty coordinating all this information and choosing the next task to attain.

This fits in with a growing body of evidence that implicates one region of the brain as causing ADHD. A study presented at the May 1999 meeting of the American Academy of Neurology found that ADHD children possessed less gray matter in both frontal lobes, with the right frontal lobe averaging about 5% less fewer cells. ADHD children cannot stop themselves from responding to every stimulus. Damaged or underdeveloped cellular circuits in the frontal lobes may be a

structural reason why these children have difficulty staying on task. Dopamine is made from two essential amino acids, tyrosine or phenylalanine, in the presence of adequate amounts of folic acid, iron, vitamins C, B3 and B6. Therefore it could be a dietary deficiency of these necessary nutrients that is causing the dopamine deficiency, says Dr. Gant. He has found that ADD can be treated with nutrients and amino acids, the raw materials the brain uses naturally to synthesize this neurotransmitter. "Nutritional supplementation will virtually erase symptoms of garden variety, uncomplicated ADD." Sources of tyrosine include almonds, avocados, bananas, dairy products, lima beans, pumpkin seeds, and sesame seeds.

## MAGNESIUM

Deficiency in another essential nutrient, magnesium, may be the basis of ADD — as well as numerous other disorders of the brain and body. This should not be too surprising. Vitamins themselves were originally discovered during the search for the cause of beriberi, a life-threatening degeneration of the nerves. Thiamine was identified as the nutrient missing from polished rice. It became the first vitamin, B1, and was called the "nerve vitamin." We now know that thiamine is necessary for proper functioning of the nervous system and good mental health. Among other things, it is needed to create myelin, the protective sheath that insulates nerve fibers. Even a mild B1 deficiency can cause nerves to become hypersensitive and an individual to become irritable, apathetic, and forgetful.

### The Mineral that Matters

Although magnesium is fundamental to brain health and fitness, this essential mineral has not been given the respect it deserves. The vast majority of people do not get even the minimum recommended daily amount of magnesium, and most are unaware of magnesium's vital role in the human body. (Again, there is no financial incentive to promote magnesium.)

In the cerebrospinal fluid that bathes the brain and spinal cord, magnesium is present in higher concentrations than in the blood plasma. More than 300 different enzymes in the human body require magnesium to function, and many are crucial to cerebral metabolism and cognitive function.

For example, magnesium is needed by the enzymes that participate in the conversion of dietary sugars and fats into energy. Magnesium is essential to the production, storage, and utilization of ATP, the body's primary molecular form of energy. Proper brain function depends on a constant supply of this biochemical energy. When magnesium is depleted or chronically deficient, then brain metabolism and brain

power suffer. The ability to pay attention and maintain focus is compromised.

### Magnesium and Attention-Deficits

Biochemist James South, M.A., a leading expert on brain nutrition, has noted a remarkable similarity between the symptoms of ADD and the symptoms of chronic magnesium deficiency. These include difficulty concentrating and remembering, confusion and disorientation, irritability and apathy, and muscular restlessness. He points out magnesium's many roles in mental function.

Because magnesium controls the rate of synaptic activity between neurons, low levels of magnesium may cause nerves to fire too easily — even from minor stimuli. South says this can result in noises sounding excessively loud, lights seeming too bright, and emotional reactions becoming exaggerated. The brain may even be too stimulated to sleep.

At neuromuscular junctions, calcium allows muscles to contract, however to relax they need magnesium. Chronic magnesium deficiency can therefore lead to excessive muscle tension, including spasms, twitches, and restlessness. South notes that this can be especially true of the hands, feet, and facial muscles — and that one of the main criterion for diagnosing hyperactivity listed in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders IV is: "often fidgeting with hands or feet, or squirming in a seat." This is often the only way a child can prevent magnesium-deficient muscles from cramping or spasming.

Magnesium is needed by the enzyme that allows cells to dispose of ammonia, an extremely toxic byproduct of normal protein metabolism. The ability to focus and pay attention can be compromised by even small increases in brain ammonia.

Magnesium is crucial to the synthesis of the DNA, RNA, and the brain proteins required to form and store memories. A chronic magnesium deficiency could limit the ability of brain cells to network, especially in the most formative years of childhood.

### Magnesium and Essential Fatty Acids

Magnesium activates D6D, the enzyme that converts dietary essential fatty acids (EFAs) into DHA and other long-chain fatty acids that are vital structural components of brain cell membranes and essential for proper mental function. Prostaglandins are also synthesized in this pathway. These hormone-like substances regulate metabolic functions

within cells, including inflammatory processes.

Several recent research projects have highlighted the connection between EFAs and learning disorders. Dr. Laura Stevens and her colleagues at Purdue University found that many hyperactive children are deficient in EFAs. Although they consumed plenty of EFAs in their diet, the hyperactive boys in their study were less able to convert the dietary EFAs into the long chain derivatives, DHA and AA, which require the active enzyme D6D.

Research conducted by John R. Burgess, Ph.D., of Purdue University's Department of Foods and Nutrition, indicates that deficient levels of DHA are also correlated with behavioral problems in children. Burgess studied a population of children in Indiana and found that subjects with ADHD had significantly lower levels of DHA when compared to controls.

### Stress Depletes Magnesium

In preparation for "fight or flight," one of the actions of stress hormones is to take magnesium out of muscle cells and replace it with calcium. This gives muscles the needed rigidity to defend against a foe, however, it can also lead to cramps or spasms — even a heart attack. And, the magnesium that leaves does not necessarily reenter the muscle cells once the stress is over.

A 1994 review of more than 250 references found that magnesium deficiency enhances stress reactions. In the authors' words:

"Stress intensifies release of catecholamines and corticosteroids. . . . When magnesium (Mg) deficiency exists, stress paradoxically increases risk of cardiovascular damage including hypertension, cerebrovascular and coronary constriction. . . . Dietary imbalances such as high intakes of fat and/or calcium (Ca) can intensify Mg inadequacy, especially under conditions of stress. . . . A low Mg/Ca ratio increases release of catecholamines, which lowers tissue (i.e. myocardial) Mg levels. . . . Thus, stress, whether physical (i.e. exertion, heat, cold, trauma, burns), or emotional (i.e. pain, anxiety, excitement or depression) and dyspnea as in asthma increases need for Mg. Genetic differences in Mg utilization may account for differences in vulnerability to Mg deficiency and differences in body responses to stress." (J Am Coll Nut, Oct. 1994)

### What's Heart-Smart is Also Brain-Gain

The heart muscles of cardiac arrest victims typically have a 20% lower magnesium level than those who died from causes unrelated to the heart. According to the U.S. National Academy of Sciences, more than 50 studies, in nine countries, have indicated an inverse relationship

between water hardness and mortality from cardiovascular disease. People who drink water that's deficient in magnesium and calcium generally appear more susceptible to this disease.

A 1977 report by the Academy's Safe Drinking Water Committee estimated that a nationwide initiative to add calcium and magnesium to soft water might reduce the annual cardiovascular death rate in the United States by 150,000.

We now know that what's good for the heart is even better for the brain, therefore the importance of magnesium to mental health, from ADD to AD, becomes paramount.

Low magnesium levels in the brain make cerebral vessels more prone to constriction, and even to spasm — a cause of stroke. What's more, research has shown an association between low magnesium levels in the brain and increased uptake of aluminum, a toxic metal implicated in dementia. (Fluoride has also been shown to increase the uptake of aluminum. Both of these chemicals are added to most water supplies.)

#### Why the Deficiency in Magnesium?

Several factors contribute to the lack of magnesium in our diet. First of all, our soils are often depleted of magnesium. Then, food processing and cooking destroy the magnesium that's in the food. Fats, meats, and dairy products — a big part of the American diet — are low in magnesium.

Furthermore, the magnesium that is consumed may not be digested. Intestinal absorption of magnesium is easily compromised, especially by high dietary and supplementary intakes of calcium. Both minerals compete for the same intestinal absorption sites, with calcium given priority. Excessive vitamin D (from milk and multivitamins) can also impair magnesium status. James South notes that "the typical American high-dairy diet contains 2.5 to 4 times as much calcium as magnesium! Many physicians ill-advisedly recommend that children (because of their growing bones) and adults (because of osteoporosis fears) take 500 to 2000 mg of calcium supplements daily!"

Many factors, particularly stress (including physical stress from overexercising), increase magnesium loss from the body. Of all the drugs known to deplete magnesium, alcohol is the most notorious.

#### Soft Drinks are Hard on the Brain

The high levels of phosphoric acid in soft drinks can combine with magnesium and calcium in the gut to form mineral phosphates that are lost in the feces. Sugar is a powerful urinary magnesium "spiller." Acidic sodas in aluminum cans can leach the toxic metal into the liquid, which is amplified if the soda was made from water that contained silicofluorides, the chemicals most commonly used to fluoridate

drinking water. At a fundamental level, drinking soda pop decreases the amount of pure water a child gets, which can lead to dehydration which depletes the brain and other organs of fluids. (The brain is more than 75% water.)

#### ADHD Children Found Deficient in Magnesium

In a 1997 study, Polish researchers found that 95% of the ADHD children they examined were deficient in magnesium. About half of these children were assigned to a six-month trial of magnesium supplementation (200 mg/day). "At the end of the trial, the children whose treatment included magnesium supplements showed significant reductions in parent and teacher ratings of ADHD symptoms compared to the children who had not received the supplements." (Magnesium Research 10, 1997)

#### What to Do? Supplement.

South concludes: "Given this overlap of magnesium deficiency and ADD symptoms, and given the woefully inadequate magnesium status of the American diet and way of life, I suspect the vast majority of ADD sufferers are magnesium deficient. I also believe this deficiency is a major contributing cause, if not the primary cause, of most ADD cases."

Many nutritionists believe the optimum intake of magnesium — especially when stress is a factor — should be two to three times higher than what Americans are typically getting from their diet. Supplements are the easiest way to increase magnesium intake. Good forms of magnesium that are well-absorbed and well-utilized include magnesium ascorbate, aspartate, chloride, citrate, glycinate, succinate, and taurinate. Forms that are not so well absorbed are magnesium oxide and carbonate.

Although the main side effect of excess magnesium is diarrhea, it's wise to check with a health professional who is knowledgeable about nutrition before supplementing. (Because magnesium chloride can irritate sensitive stomachs, it should never be taken on an empty stomach.)

#### Zinc About It

Magnesium is not the only mineral associated with attention deficits. Insufficient levels of zinc have been found in children with lowered learning ability, apathy, lethargy, and mental retardation. Hyperactive children may be deficient in zinc and vitamin B-6 and have an excess of lead and copper. (Biol Psychiatry, April 1982)

The highest levels of zinc are found in synapses and in the hippocampus, the area of the brain vital to memory formation and

sensory integration. Zinc is stored with histamine in hippocampus, where it prevents excessive histamine release, which severe allergy-suffers experience as a spacey, foggy feeling that makes it difficult for them to focus their attention.

Like magnesium, zinc is also needed to synthesize DHA and the other long-chain fatty acids and prostaglandins that the brain requires for optimal functioning.

## TELEVISION

An obvious modern "environmental" factor that affects behavior and influences the mind is television. A 1999 study by the Kaiser Family Foundation found that typical American children aged 2 to 18 "consume" media (mainly TV, but also computers and music) for more than five hours a day — usually alone in their room. Kids older than seven are putting in seven-hour days in front of the tube!

### TV Contributes to Stress and Loneliness

Children who watch a lot of TV alone are less able to cope with stressful situations. They don't develop relationships with other children and do not learn to deal with stress, according to Michele Cooley-Quille, a professor of mental hygiene at Johns Hopkins School of Public Health. TV offers a "false sense of interpersonal relations," she says. Children feel they have relationships with TV characters, but this illusion robs them of the emotional and intellectual benefits of real social interaction and contributes to a pervasive sense of loneliness. Because the influence of mass media is becoming a major public health concern, the American Academy of Pediatrics now recommends that children should not have television sets in their bedrooms, and that children less than two years old not watch any television at all. Furthermore, the Academy says parents should fill out a "media history" along with a medical history of their child when consulting their pediatrician.

The content of television is obviously a huge factor that influences behavior — and the subject of much debate — but it is the medium itself that aggravates attention problems, as Jerry Mander thoroughly explains in his classic 1978 book, *Four Arguments for the Elimination of Television*. With images that quickly change every few seconds or less, TV entrains brains to constantly change focus. No wonder people are have trouble paying attention to single thing for any length of time.

### Television Teases the Senses

In his 1991 follow-up book, *In the Absence of the Sacred*, Mander describes television as a kind of sensory tease that has become a major cause of hyperactivity. He refers to the research of Australian

psychologists Merrelyn and Fred Emery who have investigated the correlation between increases in TV viewing and hyperactivity in children. Mander explains how the unused physical energy created by television images eventually bursts out in aimless, random, speedy activity.

"While sitting quietly in front of the TV, the child sees people punching each other on the screen. There is the impulse to react — the fight-or-flight instinct is activated — but since it would be absurd to react to a television fight, the child suppresses the emotion. As the fighting continues, so does the cycle of impulse and suppression. Throughout the television-viewing experience, the child is drawn back and forth on the see-saw of action and suppression, all the while appearing zapped and inactive. When the set goes off, this stored-up energy bursts forth in the disorganized, frantic behavior that we associate with hyperactivity. Often, the only calming act is to again put the set on, which starts the cycle anew."

Two years after television was introduced to a native village in the Northwest Territories of Canada, teachers found that the children were restless and hyper, their attention span was much shorter than before television, and they had just about given up reading.

#### Television Accelerates the Pace of Life

Mander says that television, combined with video games and computer fixation, is producing generations of people moving so quickly that they cannot attune themselves to slower, natural, primordial rhythms.

"The natural world is really slow. Save for the waving of trees in the wind, or the occasional animal movement, things barely happen at all. To experience nature, to feel its subtleties, requires human perceptual ability that is capable of slowness. It requires that human beings approach the experience with patience and calm. Life in the modern world does not encourage that; it encourages the opposite. . . . We live in a world of constant catharsis, constant change, constant unrest. While out in the real world, in nature, we become anxious and uncomfortable. We desire to get back indoors, to get that TV set back on, to get 'up to speed.'

"For children, this change is very serious, and has been well noted by educators. Countless teachers have told me how young people are utterly unable to maintain focus. They become bored after only a few minutes of the same subject. They need constant change."

#### TV's Distorted Reality is Dangerous

A 1998 study by Spanish researchers at the University of Granada

found that the more time children spent watching TV, the greater their risk of injury — even more so than children who played potentially dangerous sports. TV makes children believe that harmful actions are without consequences. Lead researcher Dr. Jose Uberos said that children who watch TV excessively "receive a greater number of distorted messages about reality that become converted into false real-life experiences and distort the child's adaptation to his or her surrounding environment."

#### Nature Nurtures the Human Brain

In *Sibling Society*, author and poet Robert Bly describes the vital role of the natural environment to the proper development of the neocortex (or cortex), that part of our brain that makes us human. Instead of relying on instinctual reactions, the neocortex must learn to behave. That's why we're so uniquely curious. In the words of Konrad Lorenz: "Human exploratory inquisitive behavior — restricted in animals to a brief developmental phase — is extended until the onset of senility." But in order to learn, children must interact with the nature. And that's the problem today, says Bly:

"The frightening thing, for us in the industrial world, is that the neocortex may not reach its maturity — and the human being with it — unless it wraps itself intricately, intensely, in the sense world, and draws the sense world in around it, seeing, smelling, hearing, touching, weighing, tasting. . . . The hours and hours that children, until the last few years, spent playing outdoors are hours in which the brain receives the food it wants."

#### Television Denatures Children

Television steals this observation time and gives little in return, Bly insists. We do not immerse ourselves in the details of nature. The thousands of hours of playtime children lose to television is a serious and irrevocable loss to the neocortex. When the neocortex no longer interacts with plants and animals but only plays with its own inventions, a truly new element has entered human life. "The neocortex becomes analytical about analysis, or inquisitive about inquisitiveness."

We no longer receive or learn to give the years of nourishment and protection needed for growth and learning. Immediacy replaces the "hard work of figuring out how to give delight and entertainment to ourselves and others."

Bly concludes that if the "brain cannot do its work, which is to study animals, wind, thunder, stones, and feathers in detail, it cannot feel safe. Not feeling safe, the boy or girl feels utterly unable to confront

the 'ills that flesh is heir to,' and finds a way to numb the fearful mind and the emotions."

### Illuminating the Problem

The human brain is a product of its environment. To decipher attention-deficit problems, one must consider all sources of information received by the brain, especially the most fundamental ones — for example, light. Light has an enormous effect on health, something that scientists are only beginning to recognize. Recently, night-time light in infants' bedrooms has been linked to nearsightedness later in life.

This century, we have significantly altered the quality of light under which we work and study. Most of us know how tiring fluorescent lights can be, but this "malillumination" is more than annoying; it is a very real problem.

Your eyes are actually extensions of your brain and are the portal of entry for approximately 90% of the information you receive in a lifetime. Cool-white fluorescent lights produce a rather distorted spectrum of light that is deficient in the red and the blue-violet areas of the spectrum — precisely where the sun's emissions are the strongest. Research presented by Jacob Liberman, O.D., Ph.D., in his eye-opening 1991 book, *Light: Medicine of the Future*, clearly shows that the cool-white fluorescent lighting used in most classrooms creates bodily stress and thus interferes with learning ability.

### Lights Affect Students' Learning Ability and Behavior

In Dr. John Ott's 1973 study involving four first-grade classrooms in Sarasota, Florida, full-spectrum fluorescent lights that more closely simulated sunlight were installed in two of the four windowless rooms. Cool-whites were in the other two. The results were significant:

"Under the cool-white fluorescent lighting, some students demonstrated hyperactivity, fatigue, irritability, and attentional deficits. In the classrooms with full-spectrum lighting, however, behavior and classroom performance as well as overall academic achievement improved markedly within one month after the new lights were installed. Furthermore, several learning-disabled children with extreme hyperactivity problems miraculously calmed down and seemed to overcome some of their learning and reading problems while in classrooms with full-spectrum lighting."

### Creatures of Habitat

As the adapted offspring of Earth, we are inseparable from our environment. Our brain chemicals and cerebral circuitry reflect what

we eat and how we learn. A lifetime of nutritional and sensory input influences our thought processes and behavior — leading to the habits that shape our personality and form our character. It is in the details of daily life that we are likely to discover the way out of the attention-deficit dilemma.