Educating Children from the Inside Out

Food for Thought
Sue Marcus

Feeding the Brain for Academic Success: How Nutrition and Hydration Boost Learning
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Physical Activity, Fitness, and Cognitive Processes in School-aged Children
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Exercise and the Brain: How Movement Enhances Thinking
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Sandra Kramer Henderson

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Issue Editors:
Sandra L. Noel
Joyce M. Lieberman
Aim and Scope: The Thresholds in Education Journal is dedicated to the exploration of new education inquiries, theories, viewpoints, and program innovation. Our intent is to explore fresh ideas and viewpoints that may become the pathways to the future. We intend for Thresholds in Education to provide a forum for new ideas and practices.

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About Thresholds

In the summer of 1973, several professors from the former Department of Secondary Education at Northern Illinois University discussed the possibility for an education journal that united secondary school practitioners and university professors in dialog. They talked about problems, experiments, research, and new developments. This group, under the leadership of Dr. Leonard Pourchot, proceeded to elect a board of directors, establish a non-profit foundation, solicit charter members, elect a managerial staff, and set the wheels in motion for a long range goal of publishing the first issue of *Thresholds in Secondary Education* in February, 1975.

The word “thresholds” best represented the intention to explore ideas and share viewpoints that could lead to new educational advances while respecting achieved values and knowledge bases. The *Thresholds in Secondary Education* journal would stimulate thinking, influence education practices, inform, and inspire.

Over the years, *Thresholds* has broadened its focus beyond secondary education to include dialogue between educational theorists and practitioners from diverse locations. In 1977, the journal was retitled *Thresholds in Education*. Today it remains dedicated to the examination and exploration of new educational inquiries, theories, viewpoints, and program innovations. The title of the journal was well chosen and more than ever is relevant to the needed forum among educators in these complex times. The threshold is a structure familiar to all cultures from ancient times. Taken literally, it is the traverse beam of a doorframe. But it also stands as a metaphor for moving through time, place, and process. Thresholds are crossing-over places where we venture from the securely known to the uncharted spaces.

The publication of the *Thresholds in Education* Journal is a cooperative effort between the Thresholds in Education Foundation, the Department of Leadership, Educational Psychology and Foundations, and the College of Education.

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ISSUE EDITORS  
SANDRA NOEL & JOYCE LIEBERMAN

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What if teachers had a way to increase alertness; improve concentration, focus and test scores; enhance creativity and self-esteem; lower hyper-activity, anxiety and depression; promote ability to handle complex tasks and problem-solve; create a more positive attitude toward school; and improve brain efficiency for learning and memory—all without investing in new academic programs and teacher training? What if teachers had classrooms filled with healthy students each with a better brain potential? What if health education was meaningful and experiential, something that we all lived not merely learned for a grade and then forgot?

Former Surgeon General, David Satcher, believes that schools have a vested interest in improving the health of children.¹ He contends that active, healthy, well-nourished students do better on tests. Of significance to administrators, teachers and parents is the fact that improper nutrition and inactivity not only causes heart disease and obesity, but also the early onset of type II diabetes in children. Complications of this disease include dulled mental functioning and memory problems. In addition, overall performance is enhanced with an adequate amount of sleep and inadequate sleep causes cravings for brain draining junk food upon awakening.

This issue of “Thresholds” brings together current trends and research in health education. The articles together describe an intricate web of interconnections between our brain-body and basic needs: Nutrition, Exercise, Water, Sleep. The articles reveal the overall impact of meeting and not meeting these needs for learning, memory, performance and emotional well being.

Dr. Susan Marcus, *Food for Thought*, and Dr. Phillipa Norman, *Feeding the Brain for Academic Success: How Nutrition and Hydration Boost Learning*, propose that in order to leave no child behind, one must study the physiology of the brain and understand the brain-body connection. Dr. Marcus provides research which establishes that the foods we eat affect both physical and emotional states. Dr. Norman offers research and suggestions to enhance physical and emotional health through proper nutrition and hydration resulting in a “better brain-body,” sitting in the classroom, ready to learn.

University of Illinois researcher Dr. Darla Castelli, *Physical Activity, Fitness, and Cognitive Processes in School–Aged Children* examines numerous studies that demonstrate a correlation between physical fitness and higher academic achievement. She states that the studies’ findings indicate that physical activity and fitness can be increased by key school personnel in order to improve health and student performance. She calls for reform of the physical education curriculum and recommends that schools establish physical activity committees (PACS) with representation from all elements of the school community to plan events and promote healthy choices.

Leslie Whitaker, *Exercising the Brain*, employs lessons from research on brain functioning and neurotransmitters that enhance learning to assert the importance of recess and physical activity during the school day. She details an Illinois pilot program that brings “classroom energizers” to public schools in Chicago with limited outdoor play opportunities and spotlights teachers who use recess as a teaching tool to improve academic performance, social skills and

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¹ Former Surgeon General, David Satcher, believes that schools have a vested interest in improving the health of children.
classroom behavior. As a means of closing the achievement gap, Whitaker describes current exercise/reading research at a Naperville, Illinois school.

Dr. James Maas, Power Sleep and Peak Performance for the Rest of Your Life, writes of the importance of adequate sleep to the performance of both adults and children on memory and attention tasks. He asserts that there is a nearly linear relationship between sleep deprivation and daytime alertness. Dr. Maas cites studies that tie sleep deprivation to obesity and increased blood sugar levels and, thus, to heart disease and type II diabetes. He offers the “Golden Rules for Power Sleep” and encourages readers to lead a Power Life.

Sandra Kramer Henderson, Targeting Childhood Obesity–One Bite at a Time, looks at schools that are making a difference in health education and following the Center for Disease Control (CDC) model by bringing all the stakeholders to the table. The Coordinated School Health Program proposes that health be taught, not only in the schools, but also to and with the community, so that students are learning everywhere they go—in the classroom, in the cafeteria, at home, in the community, and through the media. Noting the significance of the obesity epidemic, she clarifies why the federal government passed a law requiring schools to create a Wellness Policy. Kramer highlights three schools: one secondary, one charter, and one elementary who are leaders in wellness, linking nutrition education and physical activity to praxis. These schools exemplify collaboration with both local and national organizations and are changing not only lunches, but also fundraisers and treats, creating a culture of health.

The authors of this issue of Thresholds challenge educators to apply their research and recommendations for the benefit of all students. If the entire learning community, at every level of education, followed the models of trailblazing schools described herein, perhaps children would cross the achievement gap and none would be left behind.

Endnote
¹ David Satcher convened the Healthy Schools Summit in 2002 to address the health of youth in America. From this summit, Action for Healthy Kids was formed in collaboration with educators, health professionals, and 40 national organizations. Action for Healthy Kids aims to educate administrators, educators, students, and parents about the research and role of sound nutrition and physical activity in academic achievement.

Sandra Noel is a doctoral student in Curriculum Leadership at Northern Illinois University and a Physical Education Teacher with over 30 years experience. During her tenure in Oak Park School District #97, Sandra has received local, state and national awards including: Those Who Excel in Illinois, The Golden Apple Award, 2006, and The All USA Teacher Team Award, 2006. She is a member of the Illinois Association for Health, Physical Education, Recreation and Dance (IAHPERD). She serves on the Action for Healthy Kids Illinois State Team.

Joyce M. Lieberman is a member of the Thresholds editorial board. She recently left her position as assistant professor in Curriculum Leadership in the Department of Teaching and Learning at Northern Illinois University to pursue other opportunities in Chicago. Her research interests include education policy and politics, school reform and professional development. During her tenure at NIU, Dr. Lieberman worked closely with doctoral students as they moved through their coursework and the dissertation process. This issue of Thresholds is the result of one of her doctoral student’s passion, energy, and commitment to improving education the lens of wellness.
Health is Something That We DO!

Sandra L. Noel
Northern Illinois University

‘Cause I’m in school, I know sleep is cool
For A’s and B’s, I catch my Z’s
To do my best, I get my rest
When I catch 9, I feel so fine
Alpha brain waves throughout the day
Will help me focus on my work and play
I am not an owl, I am a lark
I get my sleep when it turns dark.

I break my fast so I can last
Throughout the day to work and play
I eat my food and elevate my mood
From the pyramid I choose, so I can’t loose
I feed my brain protein, fats and grains
With the fruits and veggies, I don’t restrain
I eat them with sauce and I eat them plain.

With aerobic exercise my heart pumps harder,
With each and every beat, I get even smarter
When I play sports, I really hustle
Oxygen to my brain, each organ and muscle
I work with intensity and build muscle density
To keep myself fit, I just won’t sit
Sixty minutes a day, that’s the exercise way
Yeh—that’s the exercise way.

When it comes to water the UK rules
Cause the kids have water at all their schools
With water at each desk, they feel their best
And when I drink, it helps me think
I know hydration is the explanation
8 ounces of water, that’s H2O
Will give me the get up so I can go
I gotta go, I gotta go.

Listen up, the message to you
HEALTH IS SOMETHING THAT WE DO!

Author’s Note: How this rap came to be: Upon observing that my students knew the lyrics to countless rap songs, I set out to “rap” up health messages for them. I wrote the lyrics and then asked two former students who are now part of a hip-hop group to set my lyrics to music. They readily agreed. The rap became a CD, and “Staley”, the Chicago Bears Mascot has handed out over one hundred and fifty copies to Illinois students.
Imagine a regular kid, someone who seems perfectly normal. A kid who blends in so well, people think she is a healthy, happy child. Yet this child feels uncontrollable depression, a feeling so mystifying, so perplexing, that the human intellect seems unable to comprehend or respond. I was that child, and that was the first half of my life—consumed with feelings of pain. My depression lasted 22 years. Then I met a physician who diagnosed my condition as a biochemical depression. He began to balance my brain chemistry with nutrients. I stopped eating sugary foods, which exacerbated my already delicate brain chemistry. I took various vitamins and minerals to support my brain chemistry and focused on a low sugar diet. Within two weeks I felt different. In fact, I remember the moment I no longer felt depressed. I had just arrived home from my teaching job. It was a Friday. I felt the normal exhaustion of a workweek, but I did not feel sad. I thought to myself, “I think I feel happy. I think this is what happy feels like.” Because of my experience I have been studying nutrition and its effects on mood, mind, memory, and behavior for more than 20 years.

The brain is the busiest organ in the body, a chemical factory that never rests. Although only 3% of total body weight, the brain uses about 30% of the body’s blood sugar supply as fuel. In the developing fetus, the brain uses 70% of the energy provided by the mother. And during the first year of life, the brain continues to use 60% of the energy generated by the baby’s body (Schmidt, 1997). Because the brain does not store food, it needs a constant flow of vitamins, minerals, amino acids, essential fatty acids, and blood sugar in just the right amounts to function properly.

Often this wondrous organ is referred to as a separate part of the body, functioning in isolation from the rest of the anatomy. Indeed the brain is separate, but not separated from the body. Educators historically look to strategies to enhance brain function, which are indeed important, but the chemistry of the brain—which scientists are still uncovering—is also important. One thing scientists know for certain is that this organ has a voracious appetite.

Feeding the Hungry Brain
As important as the lessons we teach is getting the busy brain ready to learn. This can be illustrated by a study reported by Connors in his book, Feeding the Brain (1989), in which he discussed a study of children with attention deficit disorder (ADD) and a control group of children. They were divided into three treatment groups, with one group receiving a carbohydrate breakfast (two slices of buttered toast), one a protein breakfast (two scrambled eggs in butter), and the third no breakfast. Both hyperactive and control children were randomly assigned to all three groups. The children’s performances were then measured.

The results were quite striking. Performance for the children with ADD who had the carbohydrate breakfast was significantly worse than the performance of children who had the protein breakfast or even fasting conditions. Reaction time was slower in these children, and they made more errors overall. For some, the effects became more substantial as the morning
wore on (Conners, 1989).

These results do not mean that eggs are good and toast is bad. Rather, they imply that carbohydrates such as bread, cereal, bagels, potatoes, and pasta that are eaten alone may be slightly detrimental to performance, especially for children with attention problems. Our alertness neurotransmitters dopamine and norepinephrine are manufactured by protein. The brain synthesizes them from amino acids that are nitrogen-containing chemicals from which proteins are built. Thus, eating protein is a great way to start the day.

**Feeding the Brain Breakfast**

Breakfast ideas that consist of high protein sources may appear to be foods usually eaten for lunch. That’s fine. After children get used to the idea they enjoy having a sandwich for breakfast, and they feel the difference, because they don’t get hungry as quickly as they did before. Some “kid-friendly” breakfast ideas include scrambled or poached eggs; yogurt and fruit; breakfast burrito; chicken, tuna, egg salad, or turkey sandwich; apples and natural peanut butter; oatmeal with yogurt or peanut butter; bread stick wrapped in deli turkey; or whole grain bagel with raisins and almond butter.

**What You See in the Classroom**

Mrs. Hernandez tells about a fourth-grader named Grant. He is an energetic learner when he enters the classroom, but around 10 a.m. he gets a little ornery. One time he hit a friend on the playground just before lunch. This hitting behavior was “out of character” for Grant. What was happening to Grant happens to about 16% of the population or 5 out of 30 children. It is called hypoglycemia or low blood sugar and occurs when the brain is not properly fueled with glucose. This condition can cause dizziness, lack of concentration, change of personality, headaches, temper tantrums, panic attacks, and even blackouts.

The brain is a hungry, rapidly metabolizing organ, and fuel shortages may create problems with concentration, memory, and mood. Remember, the brain does not store fuel. It needs nutrients to keep its main fuel, glucose, flowing continuously, especially during times of mental concentration.

**Adrenaline to the Rescue**

Without glucose in the brain, people become unconscious or even lapse into a coma. However, there is a backup system for situations in which there is too little glucose in the bloodstream. The body releases a chemical that signals for more sugar in the bloodstream and the brain, preventing a coma. This chemical is adrenaline, which has its own effect on the body. Adrenaline also called epinephrine, is a critical chemical and works on both the nervous system and the immune system. It affects the heart, lungs, stomach, and brain. Adrenaline, referred to as the “fight-or-flight” hormone, is released when one is scared or feels in some sort of danger. It diverts energy from lower priority activities, such as digestion, and funnels it to the higher priority activity, such as running, fighting, or doing whatever to escape danger. When adrenaline is dumped into the bloodstream to counteract low blood sugar, the child feels the fight-or-flight energy surge and reacts in unpredictable ways. Even if sitting comfortably in the classroom, trying to pay attention, the student can feel a profound effect from the adrenaline release. The pupils of the eyes dilate and the heart rate increases. A child in this state may not be able to sit still or pay attention. Anything might trigger agitation and acting out. It is the adrenaline release that causes the irritability, agitation, and shakiness when one is hungry.

**The Sugar Paradox**

Low blood sugar can happen in two ways. One is when not enough food is eaten, as previously described. The second way is when foods high in sugar are eaten. This seems paradoxical; it would seem that if we consumed sugar, more sugar would get into the bloodstream, not less. How does this low blood sugar happen? When sugar and refined carbohydrates (e.g., white bread, pasta, crackers, and cereal) are eaten without protein or fiber, they are converted to glucose in the bloodstream within minutes. The high glucose levels then signal the body to produce insulin in large amounts. The flood of insulin processes the glucose to reduce the blood sugar levels, which causes blood sugar to bottom out, leaving little for the brain. Thus, the brain is deprived of its fuel.

**Kids and Sugar**

Kids love sugary foods. It is part of the U.S. culture. Unfortunately, children seem to be more sensitive than adults to an onslaught of sugar. A study conducted at Yale University (Jones, 1995) investigated the effects of sugar on children and adults. Each group
was fed sugar. Blood glucose levels and blood adrenaline levels were measured every half-hour for five hours. The blood sugar levels remained normal in both adults and children, indicating that the adrenaline was controlling the glucose. However, as long as five hours after ingesting sugar, the adrenaline levels in the children were 10 times higher than normal. All the children had symptoms of increased adrenaline, whereas only one adult did.

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**Overeating too many calories in general makes the brain age faster.**

Another study implicates sugary foods for deleterious effects on behavior and learning. In the spring of 1979, the New York Board of Education reduced the acceptable level of sugar in foods served in the school lunch and breakfast program and banned two artificial food colorings (Schoenthaler, Doraz, & Wakefield, 1986). This study involved 803 schools and took three years. At the beginning of the study, New York ranked in the 39th percentile on the California Achievement Test (CAT). In 1980, CAT test scores soared to the 47th percentile; by the spring of 1983, scores rose to the 50th percentile rank nationwide (Schoenthaler, Doraz, & Wakefield, 1986).

**The Role of Food in Brain Functioning**

Since the foods we eat are critical for proper brain function throughout our lives, what are the fuels that are needed by the brain? The brain needs oxygen, blood sugar, fatty acids, amino acids, water, and the right combination of vitamins and minerals. Fruits provide many of the vitamins; vegetables, fresh or frozen, and whole grains, unprocessed, are sources for the needed minerals. Protein foods supply the amino acids and some of the fatty acids that the brain needs. Water is essential along with exercise to bring more oxygen to the brain cells.

In contrast with the good foods that feed the brain, there are the junk foods, or foodless foods, that can actually harm the brain. Too much sugar can destroy B1 or thiamine. Partially hydrogenated fats can clog arteries to the brain, slowing down certain processes (Schmidt, 1997). Overeating too many calories in general makes the brain age faster (Carper, 2000). One simple reason is the processing of calories. In order to metabolize calories, oxygen must be burned. The process of burning oxygen generates free radicals. The brain, even more than the rest of the body, is vulnerable to the effects of free radicals and reduced blood flow. Over the long term, anything that causes free radical damage reduces brain function. Conversely, over the long term, anything that reduces this free radical damage can preserve brain function (Atkins, 2000).

**Vitamins**

**Thiamine**

Thiamine, vitamin B1, is a water-soluble vitamin whose main task is to break down carbohydrates from food and convert them into glucose, the sugar that provides fuel needed to run the brain. About 100 years ago, widespread thiamine deficiency followed the introduction of polished rice, which is rice that has had the outer layer of bran removed. This deficiency disease, called beriberi, was prevalent where rice is a staple, such as in eastern Asia, South America, and the Pacific islands. The symptoms of thiamine deficiency are numbness, respiratory and cardiac disorders and memory loss. At that time, severe memory failures were called “beriberi amnesia.”

One study of thiamine deficiency resulted from the surrender to the Japanese of 32,000 British troops in Singapore in 1942. The troop’s subsequent abrupt change from eating British army rations to eating a diet of polished rice was followed in six weeks by numerous symptoms of thiamine deficiency. The mental changes started with anxiety and continued with memory loss and disorientation. The principal researchers, de Wardener and Lennox (1947), concluded that thiamine deficiency was the main etiological factor in the observed symptoms. When thiamine was administered, patients’ symptoms were reversed, rapidly and consistently. These researchers found that thiamine had direct effects on neurochemical activity in the central nervous system.

In the 1980s, Derrick Lonsdale, M.D., a specialist in pediatric and adolescent medicine, conducted a red blood cell study on more than 1,000 patients, children and adults. He found that 28% had a thiamine deficiency (Lonesdale, as cited in Carper, 2000).
Moreover, these patients had been referred to Dr. Lonesdale for various behavioral problems such as hyperactivity, learning disabilities, tantrum, erratic temper, violent mood swings, depression, anxiety, and sleep problems. He found that when their blood-cell thiamine became normal, their symptoms lessened or completely vanished within a few months. This, he felt, “strongly suggests that the symptoms were caused by disturbed brain chemistry” (Lonsdale, as cited in Carper, 2000, p. 225). He also tied the thiamine deficiency and behavioral problem to a long-time diet of junk food, including “empty calorie” soft drinks.

In the 1990s in Great Britain, Dr. David Benton was conducting his own experiments. One study looked at 129 young healthy men and women. His study supplemented the diets of the men and women for a year with nine vitamins. After the year, Benton reported that participants felt more agreeable than those taking the placebo. The women also reported that they felt more composed, and their mental health improved.

Of all the vitamins they were given, thiamine turned out to be the most important booster of mood, most notably in the women. Even more surprising, Benton found that an extra dose of thiamine may improve brain functioning and make people feel better—even if they are not technically deficient in thiamine (Benton, 1999).

Pyridoxine

Another vitamin important for optimum brain functioning is vitamin B₆, or pyridoxine, which aids in the synthesis of all monoamines. Monoamine is a class of neurotransmitters that includes serotonin, dopamine, and norepinephrine. None of these important neurotransmitters can be manufactured properly in the brain without the presence of vitamin B₆. Additionally Michael Margoles, M.D., author of Chronic Pain, found that all the B vitamins help restore endorphin function and regenerate damaged nerves.

Of the B vitamin group, vitamin B₆ has been the most studied in the brain. Although it is not the only crucial vitamin for brain functioning, researchers have found that vitamin B₆ levels can be depressed by several agents, one of which is environmental toxins. Bernstein (1990) writes in the *Annals of the New York Academy of Science*, that many conditions in clinical neurology can be improved with a vitamin B₆ supplement. Some of the conditions are seizures, autism, depression, headaches, and chronic pain.

Gary Null (1999) writes that the administration of 200 mg per day of B₆ for five months led to significant improvement in children suffering from bronchial asthma. Vitamin B₆ treatment also has proven effective in the treatment of autistic children. Vitamin B₆ is the vitamin that the brain needs in order to manufacture serotonin. Julia Ross (1999) writes that most of us are deficient in B₆, levels of folic acid, B₁₂, thiamine, riboflavin, and B₆, all of which have been associated with mood disorders, and that supplements of all the B vitamins have been successful in correcting the disorders (Ross, 2002). Stressful situations cause the B vitamins to become quickly depleted in the brain. The brain requires B vitamins for repair and maintenance of brain neurotransmitter and adrenal function. All of the B vitamins are water soluble, which means that they must be consumed every day.

Minerals

Brain function also depends crucially on minerals. Minerals activate neural communication, regulate brain metabolism, and protect the brain from toxic metal contamination. Minerals are catalysts for a number of biological functions, including nerve transmission, energy production, growth, and healing. There are 22 known minerals that are vital to health. The body cannot manufacture minerals; it must get them from foods. Minerals, which are found in a wide variety of foods, are supplied mainly by vegetables and legumes (beans). Children are often low in minerals because they usually do not like vegetables, especially green ones.
An important trace mineral abundant in brain tissue is zinc. Zinc is an essential trace metal which is a component of more than 80 enzymes, and a deficiency of zinc has long been recognized as playing a role in a number of physiological disorders including skin conditions such as acne, psoriasis, and eczema; poor wound healing; growth retardation; delayed sexual maturity; and immune disorders (Walsh, Isaacson, Fatima, Rehman, & Hall, 1996).

Zinc has been found in high concentrations in the hippocampus of the brain, and it has been postulated that it may modulate neurotransmitter and synapse functioning. The precise role of zinc in the synaptic site is not yet fully comprehended, yet low zinc levels appear to alter neuron activity, thus affecting behavior. Additionally, zinc deficiency often results in elevated levels of copper in the blood because of the dynamic competition of these two trace minerals in the body. Elevated levels of copper have been associated with attention deficit disorder, hyperactivity, and schizophrenia (Smith, Holbrook, & Danford as cited in Walsh, 1994).

The brain uses at least 60 zinc enzymes; thus, a deficiency of this mineral has a marked effect on mood. Anxiety and depression have been observed in patients who develop zinc deficiency as a result of intravenous feeding. These patients experienced relief from their acquired depression after zinc was administered. A deficiency of zinc means poor growth, poor sexual development, irritability, fatigue, apathy, amnesia, depression, and a poor sense of taste and smell. Additionally, in the last decade, over 50 articles in professional journals established a link between anorexia nervosa and zinc unavailability (Mathews-Larson, 1999).

The Health Research Institute and the Pfeiffer Treatment Center in Warrenville, Illinois, has been studying zinc and its effects on the brain for years. One of zinc’s important jobs is to remove toxic metals, particularly copper, lead, mercury, and cadmium, from our brains. Without zinc, the copper to zinc ratio can be impaired and cause all kinds of problems, including depression, anxiety, emotional instability, mood swings, and schizoid behavior (Walsh, Isaacson, Fatima, & Hall, 2003). Good sources of zinc include oysters, wheat germ, pumpkin seeds, pork, liver, lamb chops, beans, and eggs. Too much caffeine depletes the body of precious zinc.

**Amino Acids**

Amino acids are the building blocks of proteins and are crucial to the manufacturing of neurotransmitters. These isolated protein fragments are the main foods that the brain uses to make its most powerful pleasure chemicals: Serotonin, dopamine, nor epinephrine, and GABA. There are at least 22 amino acids contained in protein foods. High protein foods are fish, chicken, eggs, soy products, and beef. These foods contain all 22 amino acids including the nine that are essential. Grains and beans do contain protein, however, they need to be combined to provide a complete protein (for example, rice with beans or corn with nuts). Each amino acid has its own name and unique job to perform; however, only a few very special aminos can serve as fuels for the brain’s moods. For example, the amino acid tryptophan, found in turkey, beef, and cheese, is crucial for the manufacturing of serotonin, the feel-good neurotransmitter that helps regulate sleep.

Another set of neurotransmitters, the catecholamines (dopamine, norepinephrine, and adrenaline) are manufactured from the amino acid tyrosine. These neurotransmitters are responsible for energizing the brain and keeping it awake and alert. If people have ever experienced a brain “stall” mode, craving coffee, chocolate, NutraSweet, or NoDoz, they were probably low in the catecholamines. Crucial tyrosine can be found in protein-rich animal-derived foods. Three eggs contain about 840 milligrams of tyrosine. A chicken breast contains 900 milligrams. Protein in the morning, in some form, is crucial for the hungry brain. Unfortunately, the typical American breakfast might consist of...
a bagel or a piece of toast or a bowl of sugary cereal. Where is the protein to jumpstart the brain? In contrast, in Japan, a child may have soup fish for breakfast, or in Latin America, a child might have beans and rice for breakfast.

Physical activity can raise the catecholamine levels, and low calorie dieting, so common to high-school girls, can deplete the catecholamines (Ross, 2002). Also, fast food consumption and skipped meals, all too commonplace in children’s diets, can add to the depletion of the catecholamines by contributing to the depletion of B vitamins, vitamin C, calcium, magnesium, and vitamin D. Like protein, all are key players in building neurotransmitters. Thus, it is important to help students make the connection that their food choices are linked to brain function.

Because brain chemicals are produced by the foods we eat in combination with our biochemical makeup, we can control how our brain cells talk to each other. Vitamins, minerals, amino acids, and fats all play their part. Vitamin deficiencies affect mood and memory, and are involved in the synthesis of neurotransmitters. Minerals are the catalysts for transmission and for energy production for the electrical “contact” for neurotransmission. Amino acids are the main foods for the manufacturing of the neurotransmitters.

**Essential Fatty Acids**

Most people are astounded to learn what doctors have largely ignored for decades: The fibers woven to form the tapestry of the brain are primarily composed of fat—60% of the brain’s structure is fatty material. The scientific papers examining the role of fat and the brain now number in the thousands. For example, in Great Britain, doctors found that babies who were breast-fed had IQs that were several points higher than those of bottle-fed children. Breast milk contains the fatty acids strategic to brain development. Commercial baby formulas, however, contained none of these fats prior to 1997 (Schmidt, 1997).

There are two types of fatty acids that are considered essential and one non-essential that the body can make. Omega-3 (ω-3) and omega-6 (ω-6) are considered essential. Omega-9 is considered non-essential. Omega-3 and omega-6 cannot be synthesized in the body, and as such, must be obtained from the diet. All of these fats are important for the hungry brain DHA, or docosahexaenoic acid, which is synthesized from omega-3 fats and is a building block for brain cell membranes. The medical community has long known that infants and young children need to get plenty of DHA from their food for their rapidly growing brains. Today we have discovered that DHA is essential for mental functioning in all stages of life (Atkins, 2002).

Although fat, per se, as a brain nutrient is the *new kid on the block*, as early as the 1970’s Dr. Michael A. Crawford (1976) described two special kinds of fats all mothers needed throughout pregnancy and breastfeeding to assure that the brains of their unborn babies would develop to full capacity. A fetus’s brain depended on special foods its mother had to eat. Crawford reported that the two essential families of fats, omega-6 and omega-3, provided the crucial building blocks. The child who did not get enough of these essential fatty acids from the mother before birth and from breast or bottle milk afterwards, might end up with a smaller brain, one with fewer cells than normal.

In a study conducted by Purdue University in May of 1995, it was reported that boys with lower levels of omega-3 fatty acids in their blood showed more problems with behavior, learning, and health than those subjects with higher levels of total omega-3 fatty acid levels (Stevens, Zentall, Abate, Kuczek, & Burgess,
1995). The problems reported by the researchers were an increased frequency of hyperactivity, impulsivity, inappropriate conduct, anxiety, temper tantrums, and sleep problems.

Dr. Charles Grant points out in his book, *ADD and ADHD: Complementary Solutions* (1999), that fatty acid and phospholipid deficiencies have been linked to attention deficit hyperactivity disorder (ADHD). These fats are critical to the membrane health of neurons and to the cells lining the intestines. Everything works better when optimal amounts of essential fatty acids are present. The omega-3 oils and a little of the omega-6 oils are universally good supplements for just about everyone, especially anyone with ADHD. Good oils in the brain membranes increase the fluidity of brain activity. This is termed *neuroplasticity*. Flexible and vibrant membranes enhance the passage of nutrients in and waste products out, and receptor sites, such as those for dopamine, perform more efficiently. Additionally, and the cells are less vulnerable to injury.

Omega-3 fatty acids are found in the leaves and seeds of many plants, in egg yolks, and in cold-water ocean fish such as salmon, herring cod, tuna, and mackerel. Omega-6 rich foods are found in dark-green leafy vegetables, egg yolks, and whole grains and seeds. They are abundant in the seeds of plants, especially borage, black current, and evening primrose, which are not common in the average person’s diet.

A third group of fatty acids, the omega-9s, is not essential, but is extremely helpful. They are the monounsaturated fats. The most widely known is olive oil, also known as oleic acid. Omega-9s are also found in peanut oil, macadamia nut oil, sesame oil, and almond oil. Avocados, which children often eat as guacamole, contain an excellent source of monounsaturated fats.

**Conclusion**

For optimal brain functioning we need a diet containing natural foods: Whole grains, fruits, vegetables, nuts, and lean protein. It is important to keep in mind that neurotransmitters, like everything else in the body, are made out of the foods we eat. We really cannot feel right and function optimally if the emotion sites in the brain are not fed with the proper fuels they need (Ross, 2002).

**References**


Jones, T., Borg, W., Boulware, S., McCarthy, G., Sherwin, R., & Tamborlane, W. (1995). Enhanced adrenomedullary response and increased susceptibility to neuroglycopenia mechanisms underlying adverse affects of sugar ingestion...
weeks to eliminating anxiety, depression, fatigue and
anger from your life*. New York: Ballantine Publishing
Group
New York: Broadway Books.
Schoenthaler, S., Doraz, W., & Wakefield, J. (1986). The
impact of a low food additive and sucrose diet on
academic performance in 803 New York City public
schools. *The International Journal of Biosocial
Research, 8*, 185-195.
fats*. Berkeley, CA: Frog Ltd.
Analysis and evaluation of zinc and copper in human
plasma and serum. *Journal of American College of
Nutrition, (4),* 627-638.
Stevens, L. J., Zentall, S. S., Abate, M. L., Kuczed, T., &
Burgess, J. R. (1996). Omega-3 fatty acids in boys with
behavior, learning and health problems. *Physiology &
Elevated blood copper/zinc ratios in assaultive young

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Feeding the Brain for Academic Success: How Nutrition and Hydration Boost Learning

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It’s 8:35 a.m. Your chalk is in hand and you’re ready to start your day. You have carefully constructed a learning experience of visual input, hands-on activities, reading and experimentation—to help your students learn.

When you look around the classroom, do you see bright eyes and positive, expectant expressions, or do you see squirming, sleeping, or distracted students? What happens to your classroom mid-morning? Mid-afternoon? Do you have students who are stressed, depressed, and anxious? According to experts, the internal environment of the brain is an integral part of learning, just as important as the classroom environment. You may find in some cases that your students are not able to learn due to poor nutrition or inadequate hydration.

Within your student’s brain, a biochemical process of learning is occurring that parallels the classroom experience: Making connections, finding meaning, and solving problems. Formation of memory requires physical growth and reshaping of networks of brain cells. So that wonderful experience—when the lights go on and your student says, I get it!—is a neurochemical process as well as an academic one. Nourishing the brain with healthy food and water will optimize the internal environment, enabling students to truly engage in the classroom environment and achieve their potential.

What Does the Brain Need?

Place two fists together, with your inner wrists touching. Your brain is about this size and shape. In contrast to the rubbery pink models we have seen, the brain is amazingly soft, composed primarily of fat and water. It is grayish and pudding-like and composed of 100 billion brain cells called neurons. Neurons drive our thinking, learning, feeling, and states of being. Neurons need good fats, protein, complex carbohydrates, micronutrients (vitamins, minerals and phytonutrients) and water. These nutrients are used to drive the learning functions of neurons.

Neurons Connect

Neurons are shaped somewhat like an outstretched hand, with fingers spread. Dendrites (fingers) receive information from other neurons, which is then sent through the axon (arm) to another neuron. The connection between two cells is called a synapse, where the dendrite of one cell nearly touches the body or axon of another cell. Neurons can connect multiple times with the same cell, grow extensions to connect with distant cells, and connect with many different cells at once by growing more dendrites. The outer, whitish insulation of some neurons, called myelin, promotes rapid transmission of electrical signals across the neuron. The brain is dynamic, responsive, and efficient: New connections will be made to record and integrate new information learned. Old, unused connections will be pruned away. This process of building and pruning is not confined to the time of the classroom experience, but continually evolves with all learning that occurs in a child’s life, integrating what is learned within and outside the classroom, integrating life’s experiences into the knowledge base and personality of the child. The raw material for building and pruning of these connections comes from the food we eat.
**A Biochemical Language**

As neurons connect, they communicate using a process called neurotransmission. As the child thinks, speaks, moves, or feels, electrical impulses trigger the release of messenger chemicals, called neurotransmitters (NTs), which travel across the synapse, transmitting information to the next cell. This cell-to-cell communication forms the basis of learning. NTs help connect verbal, emotional, visual, and kinesthetic memories. They connect prior learning to new learning. NTs correlate with mood and behavior. They regulate learning states and levels of alertness. There are hundreds of these NTs, which are manufactured in the brain—all from food we eat.

**Energy and Protection**

Within the body of the neuron, corresponding to the palm of the hand in our analogy, is where the cell manufactures NTs, using protein, vitamins, and minerals. Energy is generated from food and regulates growth and change of cells. Neurons are prone to damage from environmental toxins that make their way into our systems, as well as toxic by-products formed in the body. The first line of defense against this damage is antioxidants from food. Diets low in antioxidants have consistently been shown to cause and contribute to illness and disease. The brain, due to its high fat content, is especially vulnerable to damage and requires high levels of antioxidants for protection.

**Good Fats**

In contrast to past years when fat was considered an unhealthy part of the diet, fats are now known to be essential. Of the solid matter in the brain, 60% is fat, since the brain consists largely of fatty membranes. Most brain fats are polyunsaturated, meaning their structure contains few or no double bonds, making the molecules flexible. These fats help maintain flexible, dynamic membranes that are able to transmit and receive information, and maintain other cell functions such as energy production and water storage. Cholesterol, a saturated fat that is often linked with heart and vascular disease, is an essential part of brain development, especially in formation of myelin and synapses. Deficiencies have been noted in mood disorders (Beasley, et al., 2005). Sufficient quantities of cholesterol are manufactured in the body without dietary sources. Fat provides energy for the brain as well, when it undergoes a transformation using B-vitamins and other trace nutrients within the neuron to produce pure ATP. The best fats to consume are omega-3 oils from fish, nuts, seeds, and dark leafy greens. DHA, a key omega-3 fatty acid, is concentrated in the retina and brain, with deficiencies linked to impaired visual acuity and depression (Stillwell, et al., 2005). As the primary structural fat in the brain, it may prevent attention deficit disorder/hyperactivity disorder (ADD/HD) and enhance learning and academic performance as well (Singh, 2005). Omega-6 fatty acids can be found in corn and safflower oils as well as borage oil. A mixture of omega-6 and omega-3 fatty acids improved appetite, mood, organization, sleep, and anxiety, resulting in lower test anxiety (Yehuda, et al., 2005).

What about trans fats? Saturated fats? Trans fats displace DHA, creating stiff membranes instead of flexible ones (Dopeshwarkar, 1981). Stiff membranes impair subtle changes in shape that are essential for cell communication. Trans and saturated fats are like sludge in the circulation system of the brain, impeding the flow of oxygen to the brain and the flow of wastes away from the brain. Furthermore, a study of brain fats in animals showed trans fats concentrate in the retina and synapses (Grangirard, et al., 1994).

**What are the implications for the classroom?** Trans fats accumulating in synapses can impact all brain communication—learning, thinking, movement, creativity, and memory. Trans fats accumulating in the retina can impact vision and eye-brain coordination. Thus, a diet of processed cakes and crackers, French fries and fried meats—sources of trans and saturated fats—will build a different brain than a diet of broiled fish, nut butter, salad dressings made with olive or safflower oil, eggs, and lean meats.

**Protein**

Protein provides amino acids, building blocks that
are used to form NTs and support structures in neurons. The amount of nutrients in the bloodstream can influence NT production and thus brain function (Fernstrom, 1994). Tryptophan, an amino acid found in turkey and milk, is a precursor used to produce serotonin. A carbohydrate meal allows tryptophan to be absorbed preferentially, contributing to serotonin production (Yokogoshi & Wurtman, 1986). Serotonin creates feelings of well-being and drowsiness. A high-carbohydrate breakfast, therefore, could lead to a relaxed and drowsy state that is not conducive to focused, attentive learning. Tyrosine, an amino acid found in almonds, avocado, bananas, and meat, is used to make dopamine. This NT is associated with focus, movement and enthusiasm. Tyrosine in the diet can influence dopamine production in different areas of the brain (McTavish, et al., 1999). Dopamine balance is important because ADD/ADHD are associated with disorders of dopamine metabolism.

What are best sources of protein? Protein comes in combination with other nutrients; it can be found in a healthy food or unhealthy food. For instance, nuts provide protein. Raw almonds have good fats and protein as well as an abundance of vitamins and minerals. On the other hand, roasted, flavored peanuts have reduced nutrient content due to additives and overheating of oils. Flavoring often consists of chemicals and dyes, additives that can cause behavioral reactions in children (Connors, et al., 1976). When choosing protein sources, it is best to choose natural, whole sources without additives or harmful fats.

**Carbohydrates**

Glucose, a simple sugar, is the main fuel for the brain. Carbohydrates are chains of sugars that store energy for future use. Most of us have experienced the energy boost we get from eating sugary foods. However, many students consume excess sugar. The impact of dietary refined sugar on brain function and overall health has been noted by nutritionists (Yudkin, 1982). A sugary breakfast can lead to a burst of energy followed by fidgeting, headaches, trouble concentrating, or drowsiness—often in mid-morning or mid-afternoon. As sugar levels rise in the bloodstream, the pancreas releases insulin, which directs sugar out of the bloodstream and into cells. The insulin surge is the body’s way of maintaining even blood sugar levels. This drop in blood sugar sometimes creates a feeling of fatigue or irritability. Many instinctively reach for more sugar to boost their energy, thus initiating this cycle again.

The solution? Meals and snacks should contain complex carbohydrates (i.e., whole grains or products made with whole grain flour) rather than refined sugars. Whole grain products contain not only complex sugars for energy, but fiber (a type of carbohydrate) which slows the rate of absorption of sugar. Whole grains also contain B-vitamins in the hull or bran, and vitamin E in the germ or center of the grain. In addition to the additional nutrients and fiber, complex carbohydrates have a lower glycemic index (GI). The GI is the rate of conversion of a food to sugar—the higher the GI, the greater the insulin response. High GI foods have been shown to increase appetite and are major a contributor to obesity in children. High GI foods may also impair cognitive performance directly, or contribute to the cognitive impairment noted in diabetes (Ciok & Dolna, 2006).

**Micronutrients**

Micronutrients, such as vitamins and minerals, are utilized in small amounts. They are absolutely necessary for brain health. For example, B vitamins help brain cells produce ATP by fueling mitochondria, the cell’s energy-producing component. B vitamins, as noted earlier, are found in whole grains and in leafy green vegetables. Another important micronutrient is zinc. This mineral is involved in producing NTs and is active in hundreds of other brain pathways. Zinc levels in the brain are responsive to dietary intake (Takeda, 2001). Genetic models show that zinc aids in regulation, growth and connection of neurons (Sun, et al., 2006). In addition, zinc is essential in the formation of memory and is found abundantly in the hippocampus, the area of the brain responsible for processing memory (Levenson, 2006). Zinc is found in seeds and...
nuts as well as in red meat. Calcium is a mineral found in dark leafy greens and dairy products. It is used to help maintain the electrical environment of the brain and also to regulate nerve transmission. Calcium also aids in cleansing the brain by binding or displacing some harmful substances.

Another group of micronutrients, known as phytonutrients, are plant compounds that have tremendous health benefits (Kiefer, et al., 2004). Phytonutrients impart color to fruits and vegetables. Though they are not directly involved in producing NTs or building structures in the neuron, they are critical for repair and protection of neurons. Some phytonutrients act as antioxidants that neutralize free radicals and protect brain cells. The current recommendation of five to nine servings of fruits and vegetables a day is not being met with most children. According to the National Health and Nutrition Survey (NHANESIII), less than 15% of children are meeting this recommendation. Encouraging snacks of whole fruit and incorporating salads and cut-up vegetables from the color groups will provide plenty of vitamins, minerals, and phytonutrients.

**Dehydration most commonly occurs because children go long periods of time without drinking water. When they are thirsty, they often choose sweetened drinks instead of water, thus promoting further dehydration.**

Water

One of the most fascinating aspects of neurons is that they store water in tiny balloon-like structures called vacuoles. Water is essential for optimal brain health and function. Water is necessary to maintain the tone of membranes for normal neurotransmission. It enhances circulation and aids in removing wastes. Water keeps the brain from overheating, which can cause cognitive decline and even damage in extreme cases. This is one of the main reasons to encourage students to drink water during exercise. Children are at greater risk for dehydration because their bodies have different water content and cooling mechanisms than adults (D’Anci, Constant, et al., 2006). Dehydration most commonly occurs because children go long periods of time without drinking water. When they are thirsty, they often choose sweetened drinks instead of water, thus promoting further dehydration. Dehydration of only 1-2% in children and young adults can lead to reduced cognitive abilities (D’Anci, Constant, et al., 2006). Young adults may have prolonged cognitive deficits, confusion and fatigue after exercise or exposure to heat (D’Anci, 2006). Compared to adults, children experience a greater rise in core temperature with the same percentage of weight loss from dehydration (Bar-Or, et al., 1980). Despite this tendency to overheat more quickly, their thirst mechanism is not sufficient to replace lost fluids. Research shows that children engaged in exercise will become progressively more dehydrated unless they are forced to drink (Bar-Or, et al., 1980). Children in classrooms can be given structured water breaks or encouragement to keep a water bottle at their desks to sip throughout the day to achieve the recommended intake of eight glasses a day, with four consumed during the school day.

**Good Nutrition and Hydration—Healthy Habits for a Healthy Classroom**

Nutrition and hydration are part of a foundation for healthy learning. Helping students make healthier choices is an essential part of their education and well-being. What can educators do to help create an optimal internal environment?

- Have students keep a water bottle at their desk or take water breaks throughout the day.
- Encourage students to bring only healthy treats (such as whole fruit, whole grain crackers, or veggies and dip) for birthday celebrations.
- Teach children how to choose the healthiest foods available from the menu.
- Be aware of your school’s Wellness Policy and contribute or obtain support for change in your classroom and school.
- Incorporate nutrition education into many areas of your curriculum.

By incorporating nutrition and hydration in the classroom experience, your students will be more
attentive and able to enjoy learning.

References


*Nutrition Review, 64*(9), 428-432.


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Physical Activity, Fitness, and Cognitive Processes in School-Aged Children

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Time spent in physical education addressing health-related content and performance based outcomes of the national standards may actually contribute to enhanced academic achievement (van der Mars, 2006). The importance of the mind-body connection is not a new idea, as many learning theorists have assumed interdependence between cognitive and physical health. Physical education teachers have held fast to the belief that children do better in school when they have health-enhancing levels of physical fitness, most often observed as normal body weight and regular engagement in moderate to vigorous physical activity (i.e., running, jumping rope, playing basketball).

Today, teachers aspire to having children move freely, like they themselves did during their childhood, as the advent of the 21st century has led to alarming increases in sedentary behaviors (U.S. Department of Health and Human Services [USDHHS], 2000). Traditionally children have participated in physical education, recess, and walked or rode bicycles to schools; yet many of these opportunities are being reduced or eliminated. Over the past ten years enrollment in physical education classes has held steady (National Association for Sport and Physical Education [NASPE], 2006); however, closer scrutiny of physical education lessons has suggested that low percentages of time are spent in moderate to vigorous physical activity engagement (Coe, Pivarnik, Womack, Reeves, & Malina, 2006). Despite general consensus regarding the expectations of student performance, as reflected by the NASPE physical education standards (2004), many physical education programs, particularly on the high school level, are considered to be poor performing (Castelli & Rink, 2003). These programs are inhibited by marginalization, a lack of accountability, and little administrative support.

Because of time, safety, and other educational issues such as school of choice (where a child elects not to attend a neighborhood school, but instead enrolls in one across town), the frequency of walking or riding a bicycle to school has declined (USDHHS, 2000). Additionally, public policy such as the No Child Left Behind mandate (The No Child Left Behind Act, 2002), has placed external pressures on schools and teachers to enhance student performance in reading, mathematics, and science. As an attempt to increase academic learning time, particularly in these subjects, some schools have reduced or eliminated recess (Skrupskelis, 2000).

Increased sedentary behaviors, stemming from societal changes, policies, or ineffective curricula, have been directly linked to public health issues such as childhood obesity. Approximately one-third of all children are overweight or at risk for overweight (Hedley, et al., 2004), a drastic increase from just a decade ago. Additionally, increased incidence of juvenile or type II diabetes formally thought of as adult onset disease have been recorded (USDHHS, 2000). The American Heart Association (AHA) and the Center for Disease Control (CDC) are presently reconsidering the role of schools in addressing these public health issues.

The purpose of this article is to inform educational personnel of the physical and cognitive health benefits associated with physical activity and fitness. Particularly, this article will focus on the mechanisms by which a school can expand its role in addressing public health...
issues while concomitantly enhancing cognitive performance through the modification of present practice.

Cognitive Processes and Physical Attributes in the Educational Context

In school-age children, common measures of cognitive performance are standardized testing, grade-point average, and grades, as well as measures of concentration, memory, and other overt behaviors. Longitudinal studies conducted in the late 1970s (Shepard, Volle, JeQuier, LaValle, LeBarre, & Rajic, 1984) and 1980s (Shephard, 1997) brought some initial positive associations between academic achievement and enrollment in physical education. A study by Issacs, Anderson, Alcantara, Black, & Greenough (1992) confirmed the associations between physical activity, motor skill, and cognitive processing by using animals and a rigorous experimental design. Specifically, Issacs, et al. (1992) discovered that rats who were trained both aerobically (i.e., running on a wheel) and participated in activities with a complex motor demand (i.e., climbing ropes, seesaws, and rope bridges) had more efficient cognitive function because of increased blood flow to the brain.

Since that time, findings related to increased cognitive performance have been established in older adults (Kramer, et al., 1999) as well as in children (Hillman, Castelli, & Buck, 2005). Specifically, work by Hillman, et al. (2005) has suggested that enhanced neurocognitive function is associated with aerobic fitness, as high-fit children exhibited faster reaction time, improved accuracy, and better attention than low-fit children on a computer generated stimulus-response task. Yet, another study suggested that fitness effects are not exclusive to aerobic capacity but more a result of overall fitness that is influenced by an individual’s genetics and nutritional habits (Etnier, Nowell, Landers, & Sibley, 2006). As such, it is difficult to quantify these effects into specific recommendations for behavioral change or curriculum reform.

Studies have equated small, positive gains in cognitive performance with high fitness (CDE, 2001) and regularity of physical activity (Coe, et al., 2006; Sibley & Etnier, 2003). Additionally, increased physical education and reduced academic subject matter time was determined not to be harmful to academic performance (Dwyer, Coonan, Leitch, Hetzel, & Baghurst, 1983; Sallis, McKenzie, Kolodyt, Lewis, Marshall, & Rosengard, 1999; van der Mars, 2006).

Utilizing a random control design, students in three different conditions (health-fitness, sport-fitness, and self-management) were examined to determine the influence of physical activity on academic performance (Sallis, et al., 1999). This project, Sports, Play, and Active Recreation for Kids [SPARK], used a comprehensive curriculum to educate students in health-related fitness content and promote cardiovascular activity within and beyond school. Although academic achievement scores did not significantly increase, it was concluded that the additional time spent in physical education did not detract from academic performance. More specifically, those students who participated in the health-fitness curriculum had improvements in academic achievement, though not significant from the other conditions.

The California Department of Education (CDE, 2001) conducted a study matching individual student scores from the Stanford Achievement Test with results of the state-mandated physical fitness test, known as the FITNESSGRAM (Welk, Morrow, & Falls, 2002). In this study, reading and mathematics scores were matched with fitness scores of 353,000 fifth graders, 322,000 seventh graders, and 279,000 ninth graders. A positive relationship was observed for physical fitness and the Stanford Achievement Test scores.
across all grades. A higher level of fitness was associated with higher academic achievement in both mathematics and reading. In a similar study examining the relationship of physical fitness to academic achievement on standardized tests in 3rd and 5th grade students, Castelli, Hillman, Buck & Erwin, (in press) found that overall physical fitness was positively related to academic performance. Findings identified that performance in mathematics was most closely related to aerobic fitness. Additionally, children with a lower body mass index (BMI) also performed better academically, thus corroborating the CDE and SPARK studies on children. Unlike the previous studies, children from both high and low poverty circumstance were just as likely to benefit from attainment of physical fitness.

Despite these positive associations, researchers are not yet able to prescribe recommendations beyond that of increasing physical activity to 60 or more minutes per day for children (NASPE, 2004). A recent study examining the relationship between physical education enrollment and academic performance in sixth grade students discovered that some physical education classes may not offer a long or hard enough amount of physical activity to make a difference in cognitive performance (Coe, et al., 2006). Only those students who did meet the physical activity guidelines and displayed vigorous activity during engagement had higher grades than their inactive counterparts. In no way does this literature suggest that an individual who runs a single lap at a higher intensity than his/her peers will likely become smarter as a result. Instead, these data suggest that regular physical activity engagement at a moderate to vigorous level can help many individuals reap cognitive benefits when compared to their inactive peers, even from early stages of child development.

Findings from these studies indicate that positive contributors to cognitive performance such as physical activity and fitness can be increased by key school personnel in order to improve physical health and, potentially, academic performance in students. Federal mandates have increased the pressure to achieve basic levels of competency in reading, mathematics, and science and have resulted in diminished opportunities for physical activity during the school day. Counter to these mandates, national organizations such as AHA, CDC, and NASPE have suggested that schools provide enjoyable, lifetime physical activities, and promote motor skills development. Several elements of the educational context, such as policies, teacher and student attitudes, may influence the relationship between physical fitness and academic performance (Shephard, 1997). Therefore, it is timely for schools to take necessary action.

**Federal mandates have increased the pressure to achieve basic levels of competency in reading, mathematics, and science and have resulted in diminished opportunities for physical activity during the school day.**

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**Comprehensive Provision of Physical Activity**

Increasing the frequency and intensity of physical activity engagement is a delicate and complex process requiring a change in behavior. A comprehensive commitment by the schools and the communities in which they are nested is required, as physical activity opportunities are contextually based and vary substantially by situation (Barnett, O’Loughlin, Gauvin, Paradis, & Hanley, 2006). Within the school day, an elementary-aged child should participate in 30 minutes of daily physical education and an additional 30 minutes of recess (Pate, et al., 2006). Students in secondary education should participate in at least 50 minutes of physical education each day and be offered physical activity opportunities during breaks in academics (i.e., walking during lunch hour, open gym during study hall).

Given the findings in the literature as well as variation by setting, several recent developments (discussed below) warrant consideration in educational programming: (a) reform of the physical education curriculum, (b) physical activity as part of the school curriculum, and (c) connectedness with community programming. If schools are to play a pivotal role in changing the physical activity behaviors of children, the
Effort must be comprehensive throughout the formal as well as hidden curriculum.

**Reform of the Physical Education Curriculum**

An administrator and physical education teacher(s) should conduct an evaluation of the effectiveness of the present physical education curriculum. The administrator should observe at least one physical education lesson and begin that observation by asking the teacher how the lesson relates to the NASPE national and state standards. Each activity within a lesson should be structured to address health-related content identified by the NASPE national standards (2004), as enactment of these recommendations will enable children to enjoy physical activity throughout their lifespans. Specifically, the administrator needs to quantify the amount of student physical activity time provided during the lesson. Students should be physically active more than 50% of the time in each lesson in order to target behavioral change.

Through this evaluation process, the teacher should also conduct a self-reflection, in writing based upon the same criteria suggested for use by the administrator: (a) the attempt to put standards into practice, and (b) the amount of physical activity time provided during the lesson. It is important to realize that physical activity time may be reduced when the teacher is introducing a new unit, there are high safety demands, or the tasks are complex in nature. The teacher and administrator should consider these factors when scheduling the observation date. After reflection by the physical education teacher and evaluation by the administrator, if the physical education lessons are not structured in this manner, then reform should take place.

The physical education curriculum should also have a predominantly health-related content base with additional attention given to the promotion of social responsibility and refinement of motor skills. Specifically, during physical education instruction teachers should address ways in which students can be physically active beyond the school day or increase physical demands of the activities in which they are currently engaged. As suggested in an article by Castelli & Beighle (*in press*), one simple way to increase physical activity during recess time is by taking one or two physical education lessons to teach students how to modify traditional playground games to increase the level of engagement in activity. Teachers should explain what it means to have active recess, where there is “no parking on the playground.”

The integration of easy-to-use technology such as pedometers can also help a physical education teacher extend his/her curriculum beyond the individual lessons. Children could wear pedometers throughout the school day, recording step counts during recess or activity break times. The promotion of physical activity begins within the formal physical education instruction and should be supported throughout the entire school curriculum.

**Physical Activity as Part of the School Curriculum**

Nearly half of young people are not active on a regular basis (USDHHS, 2000) and the school environment may be the only place in which some young people have an opportunity to do so. The positive effects of physical activity come from accumulated amounts and therefore can result from several short bouts provided throughout the school day. Given the brevity of classes, time required for instruction and management, physical activity should not exclusively come from physical education classes during the school day. School-wide events, active recess, and brief bouts of physical activity in the classroom setting are mechanisms that can be utilized to endorse engagement throughout the school curriculum.

The Child Nutrition and WIC Reauthorization Act of 2004 required each school to develop a wellness policy. In many situations, the physical education teacher has already collaborated in the policy development. The physical education teacher who is a member of the wellness team may want to establish a physical activity committee (PAC) (Castelli & Beighle, *in press*). This committee, comprised of subject matter teachers, administrators, parents, recess supervisors,
coaches, students, and other community members, can plan events that promote healthy choices. For example, on National Walk to School Day, this committee could promote school-wide participation. A recent feasibility study examining the integration of events created by a PAC have valuable potential for increasing physical activity in elementary-aged students (Oliver, Schofield, & McEvoy, 2006).

Recess plays an important role in the cognitive development of children.

According to Pellegrini and Bohn (2005) recess plays an important role in the cognitive development of children. In combination with the health benefits, children can also improve social responsibility and motor performance during recess. It is important for the PAC to provide opportunities and incentives for active, not passive, recess. Active recess involves gross motor movements requiring an individual to increase his/her breathing and heart rate. Whether briskly walking while talking to a friend or intensely engaged in a competitive game of football, students are choosing their own level of engagement.

Recently, increased attention is on the classroom as another possible outlet for physical activity. For example, a new program entitled TAKE 10! has successfully introduced physical activity opportunities into classroom instruction (Stewart, Dennison, Kohl, & Doyle, 2004). Some teachers have already embraced this notion and have children physically act out poems or dance to increase comprehension of content. In class, during an activity breaks, or through a school-wide event, the PAC can promote engagement in many different forums.

Connectedness with Community Programming

A responsibility of the PAC can be to promote physical activity beyond the school day. Before and after school programs as well as those conducted in the community on the weekends are other places in which children can be physically active. The PAC endorsing these types of events is more likely to impact engagement. For example, a community may want to encourage young children to have a positive experience with running, so they host a one-mile fun run. A child and parent could run in an event prior to a larger competition on the same course. Children can train during physical education programs, but also keep physical activity logs of their efforts with parents outside of school and subsequently be rewarded with beads for their shoelaces or rubber wrist bracelets for their continued participation. The largest incentive however would be to run down the middle of main street on race day. The community that embraces physical activity as an important element in public health can create an environment conducive to its continuation.

Because of the uniqueness of each community, it is difficult to suggest particular events. What the PAC needs to do is investigate all of the physical activity possibilities within the community and unite with the key promoters of those events. In all likelihood, the event sponsors would be thrilled at the chance to increase participation. The sponsors may even be willing to wave registration fees, provide t-shirts, or conduct a school demonstration. The PAC may choose to start small, such as taking students to a local bowling alley as a field trip, or may wish to create their own physical activity event, but whatever the decision of the PAC, school-community linkages are an important factor in addressing public health issues (Pate et al., 2006).

In Summary

Schools and teachers should play an instrumental role in changing the physical activity behaviors of children (Pate, et al., 2006). The school wellness team provides an ideal unit to increase physical activity engagement during physical education, academic breaks, as well as in the classroom setting. The formation of a PAC provides a more comprehensive endorsement of physical activity across the curriculum and into the community setting. If school and
community leaders can successfully increase physical activity engagement of children there are numerous physical and cognitive health benefits. One positive outcome of direct importance to teachers and administrators is the likelihood of increased academic performance, as physical activity and fitness are associated with greater cognitive function.

References


Dr. Darla Castelli has been working with school-age youth in physical activity settings for over 20 years. After obtaining her master’s degree from Northern Illinois University in exercise physiology, she went on to teach health and physical education before becoming an administrator in Maine. Darla served as president of the Maine Association of Health, Physical Education, Recreation and Dance and received Teacher of the Year honors in 1995 for her work at Kennebunk High School. Since 2002, when Darla obtained her Ph.D. from the University of South Carolina, she has been investigating the effects of physical activity and fitness on motor competency and cognitive health in children. For her role in this research, Darla was recently named a Young Scholar by the International Association of Physical Education in Higher Education and Illinois Association for Health, Physical Education, Recreation and Dance Past-Presidents Scholar. Currently, Darla is an assistant professor in the Department of Kinesiology and Community Health at the University of Illinois at Urbana-Champaign.
Exercise and the Brain: How Movement Enhances Thinking

"We’re animals. We should be moving."

That’s how Dr. John Ratey, an associate clinical professor of psychiatry at Harvard Medical School, an expert on the physiological benefits of exercise on the brain, distills the importance of exercise to brain functioning in an interview published in Harvard Magazine (Shaw, 2004, p. 99). It’s well known that exercise tones the body, but how many of us appreciate the profound benefits that physical activity has on the brain? Both researchers and academics conclude that exercise improves learning and mood. Robert Dustman (Early, 1995) believes that making the heart and lungs stronger, makes one smarter. John Ratey (personal communication, March 2, 2006) comments “At Harvard, we know that exercise is food for the brain; it is so good we call it Miracle-Gro.”

Ratey, co-author of Driven to Distraction: Recognizing and Coping with Attention Deficit Disorder from Childhood through Adulthood (Hallowell & Ratey, 1994), notes that researchers have found that exercise enhances production of brain-derived neurotrophic factor (BDNF), which promotes the production of new nerve cells. In addition, exercise promotes release of neurotransmitters, which increase focus, promote learning, improve self-esteem and motivation, control cravings and help us regulate our moods. This parallels the effects of such popular antidepressants as Prozac and Ritalin, prescribed widely to treat depression and Attention Deficit Disorder. Some research studies have found, Ratey contends, that “exercise is as good as or better than some of our antidepressants.”

With regular exercise students gain substantial physical, social emotional, and educational benefits. Exercise is the optimal mood regulator and daily physical activity has led to better academic performance and a more positive outlook toward school. The following three themes emerge in the research about physical activity and the need for recess:

- Recess, like any exercise, may be correlated to brain development
- Recess has a positive effect on classroom behavior
- Recess enhances social development

Lessons from Research

Everyone’s brain, not just those afflicted with learning disabilities, needs exercise. For students, exercise benefits focus, improves one’s attitude towards studying, and helps memory and performance. Studies have shown that it can improve concentration and ultimately raise test scores (California Department of Education, 2001).

In a meta-analysis (Ettinger et al., 1997), thirteen separate studies looked at the connection between exercise and brain physiology. The greatest changes were in the young and the elderly, causing researchers to propose that exercise promotes brain development in the young. Scientists also theorize that physical activity prevents deterioration of the brain in the old.
An experimental study (Dustmen, et al., 1984) examined the effects of aerobic exercise. Participants were divided into an aerobic exercise group, strength- and flexibility group, and a non-exercise group. Tests were administered measuring visual acuity, response time, visual organization, memory, mental flexibility and depression. After the fourth month, the aerobic group performed significantly better than the strength-and-flexibility group and the non-exercise group in eight tests. The maximum oxygen uptake levels were increased by 27% in the aerobic group. It is speculated that improved neuropsychological performance of the aerobic group occurred because of enhanced cerebral metabolic activity.

Ratey also notes the success of an innovative program in Naperville, Illinois, widely known for its approach to school exercise. Half of a test group of freshmen with low reading scores at Naperville Central High School were scheduled for an aerobic-intensive early morning gym class immediately prior to their remedial reading course. The other group studied reading several hours later. For the test group, reading scores rose an average of 1.4 grade levels, more than the control group. Based on these promising results the test program is being expanded.

Research on rats also shows a strong brain-exercise connection (Isaacs, Anderson, Alcanantra, Black & Greenough, 1992) tested this speculation by studying the brains of female rats to find out what changes that enhance cerebral metabolic activity take place in exercising subjects. Group One was assigned to be the “cage potatoes” and had no activity. Group Two worked out on treadmills for a specific amount of time each day. Group Three went to the “Disneyland” of rats and had the freedom to explore treadmills, mazes and beams. Results of the exercise versus non-exercise rats showed a decrease in diffusion distance defined as the mean distance from a random point to the nearest capillary. The rats in the exercise programs had 20% more blood vessels in their brain than their sedentary counterparts, thus providing more oxygen to the brain.

Children’s brains, as well as those of rats, benefit from movement. Yet many schools are organized around a schedule that traps students in a sedentary reality. The purpose of these schedules is to maximize academic performance. However, this approach is at odds with the latest brain research, which links exercise and physical activity and health to learning and academic performance.

Dr. Roy Shephard at the University of Toronto studied 500 Canadian children and found that those who spent an extra hour each day in a gym class performed better on exams than their less active peers. Notably, this extra gym took an hour away from academics (Olsen, 1994).

### The Fourth R

While it is important to teach the three R’s, research shows that the fourth R, recess, also plays an important role in the school day. Pelligrini (1995) identified three reasons that schools use to justify abolishing recess: School time is needed to raise test scores, recess disrupts work and causes inattentiveness, and recess contributes to aggression and social behavior. Educators would do well to reconsider the curricular benefits of exercise and movement. Within the current educational system, the single most important barrier to physical activity is the perception that time spent out of the classroom at recess will undermine academic achievement.

A discussion with a parent of three students asks us to consider the ultimate goal of education. Lisa Gaston (personal communication, October 15, 2006), shares that:

> Over the years I have noticed, and confirmed with teachers, a declining level of physical activity throughout the day. I have watched “recess” go from a break in the morning and afternoon . . . to eventually only the lunch hour and moving from class to class being called recess.
As a parent, I am concerned for both the teachers, who probably could use a few minutes of fresh air throughout the day, and the physical health of our children. Certainly children learn better and retain information more effectively with movement and fresh air. . . Where are we pushing education and our children if ten-year-olds must spend six plus hours a day (not to mention the following hours of homework!) being pumped full of knowledge at the expense of movement and exercise. Whatever happened to the whole child? A well-rounded child?

**Recess and Classroom Behavior**

Research to determine the effect of recess on classroom behavior in regard to time on task, fidgeting and listlessness was conducted in a Southern school with a policy against recess (Jarret, et al., 1998). The participants were two fourth grade classes from middle and upper middle class neighborhoods. The students had physical education classes three times a week and during the study had a 20 minute recess on one of the other days. Researchers observed the students and collected data. Before recess was implemented, students were fidgety 11% of the time and off task 12% of the time during a two-hour period. After recess was implemented, teachers observed that academic ratings were higher after recess and fidgeting was considerably lower. Sixty percent of the children benefited by either becoming less fidgety or considerably more on task. All of the children with ADD benefited from the exercise. It was speculated that, as their medication wears off, recess may play a restorative role. The effect of the recess “break” is believed to provide a change of pace which, according to brain research, is necessary to help students refocus on class work.

**Recess and Social Development**

Since recess is a “break” from the rest of the academic school day, it is a time when children experience more freedom. They also have opportunities to learn and practice critical social skills. In a meta-analysis, Waite-Stupianky and Findlay (2000) discuss the social, emotional and reasoning benefits of recess. In organizing games, children learn the advantages of rules and self-discipline. “The playground during recess is one of the few places where today’s children can actively confront, interpret and learn from meaningful social experiences” (Jambor, 1994, p. 18). Children have opportunities to problem-solve and practice conflict resolution in order to continue games and activities. In addition, recess provides teachers with time to study the social interactions of the students, to discover the leaders and the bullies, and to note appropriate and inappropriate social behavior. “The educational role of recess for both social and cognitive development is becoming increasingly clear” (Jambor, 1994, p.18).

**Schools and Opportunities for Exercise**

Schools play an important role in providing opportunities for exercise, both in the physical education class and the academic classroom. While classrooms teachers believe there are both learning and social-emotional benefits associated with recess, and children come back refreshed, reenergized and ready to learn, they feel the pressure to meet district, state, and national standards. Some teachers use recess as a reward for finishing work or withhold recess as a punishment for not finishing work. They feel that recess is the most powerful tool they have to make the students meet both academic and social standards in the classroom. However, Sherita Lyles, a third grade teacher in Oak Park, Illinois, takes the opposite approach. It is when she sees her students losing concentration that she uses recess not as a punishment or a reward, but as an educational tool. She brings them outside and allows her rambunctious students to run around the playground. After the vigorous physical activity, Lyles says that the students (and teacher) all come back to the classroom refreshed and ready to
focus (S. Lyles, personal communication, January 3, 2007).

McAuliffe Chicago School assistant principal, Serena Peterson, noted that since students have been exercising during the school day, “Kids stay on task better and the number of discipline referrals has dropped” (S. Peterson, personal communication, December 21, 2006). She noted that integrating movement with instructional facts is a win-win for both students and teachers.

Nina Gruber, Physical Education Curriculum Leader in Oak Park suggests using physical activity as part of an interdisciplinary unit, combining social studies, math and running to learn about the United States. “Each day, the class runs one mile at the beginning of recess. Upon returning to the classroom, students add the class total, multiply the total by 5, note their new location on the map and research the area. Energized students may then celebrate their accomplishment. They have fun while learning through the multiple intelligences” (N. Gruber, personal communication January 3, 2007).

Exercise and movement can take place outdoors or indoors. If there is no outdoor area in which to play or run consider this list of classroom energizers from Lieutenant Governor Pat Quinn’s Walk Across Illinois Fitness Program (Noel, 2006) currently being piloted in thirty Chicago public schools.

Moving to Music – students play stop-and-go game moving around the room. When the music stops, they find a partner and “pair-share” a concept of their current lesson. Movements may include: Hop, skip, gallop, jump, march, sneak, shuffle and may be done slowly, rapidly, gracefully, softly, integrating verbs and adverbs.

Brain Gym Stations – students rotate around the room to station cards: Hook-ups, cross crawl, double doodle, lazy 8’s.

Chair Cross Laterals – students, while sitting, jump feet and do arm movements such as swimming, twisting, hand jive, Math Macarena.

Jump for Brain and Bones – students stand next to their desks and jump to music for three to five minutes then walk around the room to cool down.

Partner Toss Up – students move around the room to music. When the music stops, they find a partner and patty cake. Music starts again, student move. When the music stops, the students must find a new partner and do different movements such as do-si-do. The activity continues adding movements with new partners while reviewing previous movements and partners.

Conclusion

Teachers who appreciate and embrace physical activity and recess as an educational tool have found that it is beneficial not only for student health, but also for academic achievement, and social and emotional development. As schools focus on measuring academic improvement and test scores, teachers must get all students moving so that not even one is left behind.

References

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To achieve the impossible dream, try going to sleep.
- Joan Klempner

Daytime success requires a well-rested body and mind capable of acting and reacting with alertness, energy, enthusiasm, productivity, and creativity. If you’ve been sleeping less than seven or eight hours a night, it’s just not going to happen. If you’re awake enough to continue reading, let’s find out just how alert (or drowsy) you really are . . .

Do you need an alarm clock in order to wake up in the morning? Do you hit the snooze button a few times before finally getting out of bed? Do you feel tired, irritable and stressed out during the week? Does a boring meeting or lecture make you sleepy? Do you sleep extra hours on the weekend?

If you endorsed any of the above questions, consider yourself one of millions of chronically sleep-deprived people—blissfully ignorant of how sleepy, moody, inefficient, and ineffective you are—or how dynamic you could be with proper sleep.

In the last century, adults have reduced their time spent sleeping by 20%, and this has serious consequences. Nearly half of adults are moderately to severely sleep deprived. This affects job performance and how we behave as spouses and parents. In America alone, sleep deprivation costs more than 100 billion dollars annually in loss of productivity, illness, accidents, and even loss of life itself. Nearly every high school and college student is seriously sleep deprived; they need 9½ hours of sleep each night to be fully alert, yet average only six. Additionally, millions suffer from one or more of the 88 known sleep disorders. In fact, 70% of us experience sleep problems at least one night a week. We have become walking zombies.

We mistakenly assume we are good sleepers because we fall asleep immediately when we get into bed. In truth, a well-rested person takes 15 to 20 minutes to fall asleep. Think how ridiculous it would sound to brag about being a good eater because you devour meals the instant they are put in front of you. Such behavior would be indicative of food deprivation, not good nutrition practices. Likewise, if you fall asleep the instant you hit the pillow, you are manifesting all the signs of serious sleep deprivation. Most of us are functioning far below the level of alertness that enables us to be energetic, wide-awake, happy, creative, productive, motivated, and healthy human beings.

Sleep is a necessity, not a luxury. An intricate symphony of essential and diverse brain waves is played every night while we sleep. Much of the first part of the night is spent in deep (slow wave) sleep, known for its quiet, restorative, and growth-inducing properties. As the night progresses we experience several REM (rapid eye movement) periods accompanied by intense neurological activity and dreaming. These REM periods begin approximately 90 minutes after sleep onset and recur every 90 minutes throughout the night. The first REM period lasts approximately 10 minutes, while the last REM episode (between the 7th and 8th hour of sleep) might continue for one hour. Whenever you have a short night of sleep you are eliminating the long REM periods that come towards morning. Such REM sleep loss produces serious daytime consequences; REM sleep is thought to play a major role in facilitating memory storage, organization and retention, learning, creativity, critical thinking, productivity, and performance. While many people brag about “getting by” on less than eight hours of sleep, they are operating on half battery. You cannot afford significant sleep loss and perform at your peak.
When you don’t get adequate sleep, you’re likely to experience:

- Daytime drowsiness and unintended sleep episodes
- Increased risk for hypertension, heart attacks, stroke, and type II diabetes
- Mood shifts, including depression, increased irritability, and loss of sense of humor
- Stress, anxiety, and loss of coping skills
- Lack of interest in socializing with others
- Feelings of being chilled
- Reduced immunity to disease and viral infection
- Feelings of lethargy
- Reduced productivity
- Reduced ability to concentrate, remember, and handle complex tasks
- Reduced ability to think logically or critically
- Reduced ability to assimilate and analyze new information
- Reduced decision-making skills
- Reduced vocabulary and communication skills
- Reduced creativity
- Reduced motor skills and coordination

If that isn’t convincing enough, new studies by Spiegel, Tasali, Penev and Van Cauter (2004) and Flier and Elmquist (2004) show that chronic sleep deprivation is one of the biggest predictors of obesity. Your quantity and quality of sleep, in part, dictate the hormonal activity linked to your appetite. Two hormones, leptin and ghrelin, control the yin yang of hunger. Low leptin levels and high ghrelin levels cause hunger to rise. When you are sleep deprived, leptin levels drop dramatically and ghrelin levels shoot through the roof causing voracious appetites. In particular, if you sleep less than six hours a night, you wake up starving for sugar-laden junk food. This explains what doctors have been seeing for decades—people who are chronically sleep deprived often find themselves putting on weight.

To compound the problem of weight gain, sleep studies find that lack of REM sleep results in less motivation to exercise and a loss of abdominal muscle (Van Cauter, Leproult, & Platt, 2000) in middle aged men. These individuals are likely to fall victim to the “pot belly” syndrome. Why? Deep sleep produces an important growth hormone (Van Cauter, & Copinschi, 2000) that keeps the muscles strong and intact. Without this hormone, muscles begin to lose their elasticity and turn into fat. A simple increase in sleep would cause more production of this growth hormone and less belly hanging out of our t-shirts.

But putting on the pounds isn’t the only thing you should be worried about. Several new research studies have added to the plethora of evidence suggesting that sleep is a true necessity. People who sleep six hours or less each night—that’s the average for 70% of the population—show increased levels of cortisol (the stress hormone) (Leproult, Copinschi, Buxton, & Van Cauter, 1997). They also lower their resistance to viral infection by 50% over those getting 7 ½ to 8 ½ hours.

A link has also been found between lack of sleep and a rise in blood sugar levels (Knutson, Ryden, Mander, & Van Cauter, 2006), possibly leading to type II diabetes (Spiegel, Knutson, Leproult, Tasali, & Van Cauter, 2005). In another study, sleep researchers again tested people who get only six hours of sleep each night during the work week and found substantial increases in cytokines (Vgontzas, Bixler, & Chrrousos, 2005) that invade and eat the arteries and heart. This means that sleep deprivation further increases your chances of suffering from a heart attack or stroke.

In fact, for all individuals, the best predictor of how long you are going to live is not nutrition or exercise, although these are both important. The single best indicator of longevity is the quantity and quality of your sleep. When such a simple thing as going to bed can save lives, why is it that so many people insist it’s good to get by on only six to seven hours a night?

Unfortunately, we don’t value sleep in our society. We fail to recognize the nearly linear relationship between sleep deprivation and daytime alertness. Every hour we are awake adds to our sleep debt. It
takes one hour of sleep to repay two hours of wakefulness. After 16 hours of wakefulness our cognitive abilities are dramatically reduced, and we need eight full hours of sleep to replenish the 16 hour debt. When we don’t pay back in full what we took out during the day, our sleep debt accumulates. If during the work-week we only sleep six hours each night, by the end of the week we are no better off than someone who has just pulled an all nighter. Increasing your sleep also follows this linear relationship. When eight-hour, adult sleepers increase their sleep by one hour, there is a 25% increase in alertness. School children who increase their sleep from 9 to 10 hours for three nights, can raise their performance on memory and attention tasks an entire grade level (Wolfson & Carskagon, 1998).

But can you get too much sleep? No. The body will take what it needs, and then you will wake up. Although you might feel groggy if you wake up at noon, you are not more tired. This feeling results from waking up in the middle of the circadian rhythm’s natural midday dip in alertness.

The Golden Rules for Great Sleep
1. Get an adequate amount of sleep every night
Identify the amount of sleep you need to be fully alert all day long, and get that amount every night. Most adults need between 7 ½ and 8 ½ hours of sleep. Some individuals do fine on 7 hours and others need 9 or 10. Women seem to get slightly less sleep than men and have more insomnia. However, their sleep need is greater than that of men, especially in the premenstrual phase, during pregnancy, and at the onset of menopause. The amount of sleep you need is also genetically linked. If both of your parents were short sleepers and fully alert all day long, you might be one of the lucky few who can do fine with less sleep. However, the percentage of people who can do well on five hours of sleep or less each night, rounded to the nearest whole number, is zero. As a rule of thumb, most of us need at least one more hour of sleep every night.

You can precisely determine your personal sleep requirement. Here’s how: Start by selecting a bedtime when you are likely to be able to fall asleep within 15 minutes of getting into bed. Settle on a time at least eight hours before you need to get up. Maintain that bedtime for the next week and keep track of the time you arise. If you need an alarm clock to wake up, if you find it hard to get out of bed in the morning, or if you’re tired during the day, you haven’t slept enough. Don’t change your rising time. Instead, go to bed 30 minutes earlier than usual for the next week—and continue this practice by adding 15 to 30 more minutes each week—until you wake without an alarm clock and feel alert all day. After four weeks on your new sleep-wake routine you will likely say: “I never before knew what it was like to be awake!”

2. Establish a regular sleep schedule
Go to bed at the same time every night, and wake up (without an alarm clock) at the same time every morning, including weekends. That is 7 days a week, 365 days a year. Regularity is important for setting and stabilizing your internal sleep-wake biological clock. Within a few weeks, the hours you spend in bed will begin to synchronize with the sleepy phase of your biological clock, and conversely the hours you spend out of bed will correspond to the time when you feel most alert and refreshed. Keeping a regular schedule will make you feel significantly more alert than sleeping for the same amount of time but at differing hours across the week and the weekend. Within a few weeks such regularity will actually reduce the total sleep time required for full daytime alertness.

3. Get Continuous Sleep
For sleep to be rejuvenating you should get your required amount of sleep in one continuous block. Six hours of good, solid sleep is often more restorative than eight hours of poor, fragmented sleep. Following the sleep tips below will help you to sleep more soundly.

Strategies for Great Sleep
• Eliminate Stress. Even though you’re able to get to bed early enough to get a full night’s rest, stressful events in your day may make you too anxious to fall asleep. Brief bouts of insomnia are normal—stress happens. But if
stress is seriously impairing your ability to sleep night after night, you may need to explore the root of the problem more in depth. Cognitive Behavior Therapy (CBT) works to tease out the issues causing your insomnia. CBT shies away from using long term medications that can actually impair sleep and focuses instead on changing negative behaviors and attitudes that make sleeping difficult. If you are having trouble lessening anxiety before bed, there are some exercises that may help. Try learning to visualize. Lie on your bed with your eyes closed and think about a favorite place or moment in your life that afforded peace and relaxation. You could also try deep breathing and muscle relaxation. Clearing your mind through meditation prepares you well for sleep.

- Eat nutritiously. Going to bed on an empty stomach can impair sleep. While you shouldn’t eat a large, fatty meal before bed, if you’re hungry a small healthy snack could ensure that you sleep through the night.
- Exercise daily.
- Stop smoking.
- Avoid caffeine after 2 p.m.
- Avoid alcohol within three hours of bedtime.
- Take a warm bath and read for pleasure before bed.
- Make sure your bedroom is quiet, dark, and cool.
- Avoid using the bedroom for anything other than sleep and sex. If you’re doing work on your laptop before bed, you may begin to associate the bedroom with the stress of your job, which might cause insomnia. If you can’t sleep because of insomnia, don’t just lie in bed, get up and walk around. Do something to take your mind off the stress.
- Make sure your alarm clock is not facing you. The glow from a digital clock, as well as worrying about the time of night, can both impair sleep.
- Use a good down pillow. Here’s a test: Fold your pillow in half; if it doesn’t open by itself, you have a dead pillow.
- Select a mattress that will help you maintain proper alignment of your head, neck and spinal cord (as if you were standing up). Your mattress should also guarantee minimal motion transfer due to partner movement.

4. Make Up For Lost Sleep

An occasional late night won’t do much damage to your alertness. But remember that sleeping only six hours a night for five nights has the same effect as staying awake for 24 consecutive hours once a week. Sleep loss does not dissipate into thin air over time any more than a debt on your credit card will disappear because you haven’t spent anything in recent days. Make up for any lost sleep as soon as possible, although it might take several weeks to make up for years of sleep deprivation. As a stop-gap measure, if you can’t get an adequate amount of sleep at night, taking a power nap of no more than 20 minutes during the midday dip will improve alertness. However, daytime naps longer than 20 minutes enter into delta wave sleep, which will cause gogginess upon arousal. Also, indulging in a nap too long or too close to bedtime may cause nocturnal insomnia.

The first step towards leading a Power Life is to make sure you are well rested. Good sleep will make you feel wide awake, full of energy, and put you in a good mood. It will improve your health, performance, productivity, athleticism, memory, concentration, communication skills, creativity, and longevity. When
having a great day starts as simply as having a great night, what’s holding you back? Reading by itself doesn’t do anything; you have to put what you’ve just learned into effect.

References


James Maas, Ph.D is a Stephen H. Weiss Presidential Fellow and the past chairman of the Psychology Department at Cornell University. Dr. Maas, a pioneer in sleep research, is the author of Power Sleep and Remy and the Brain Train. He has produced several documentaries and has appeared on Good Morning America, Oprah, 20/20 and the Today show. He can be reached at 211C Uris Hall, Department of Psychology, Cornell University, Ithaca, NY 14853.
A children’s health epidemic is at work within the United States. America’s children have never been as overweight and sedentary as they were in 2004. According to the Centers for Disease Control and Prevention (CDCP), nearly 15% of school age children, nine million children ages 6-19, are overweight and fail to get regular physical activity (Vail, 2004). The term “overweight” is primarily used as researchers do not often differentiate the terms “obese” and overweight” in the study of children. Children that are overweight are identified as “those children between the ages of 2 and 18 that possess body mass indexes equal to or greater than the 95th percentile of the age- and gender-specific BMI charts developed by the CDCP” (Institute of Medicine, 2005a, p.4). Between 61 and 64 % of all adult Americans are classified as overweight or obese, individuals whose body mass index is 25% or above, and smart lifestyle choices are sorely lacking in the United States (Weight-control Information Network, 2006).

According to the United States Department of Health and Human Services (USDHHS) the combination of a poor diet and a lack of regular physical activity account for over 300,000 deaths a year and is now the second leading cause of death in the U.S. (2006). Children are following the adult trend. The percentage of children identified as overweight or obese has climbed from 5% in 1985 to nearly 15% in 2000 (Center for Health and Health Care in Schools, 2005). These children are part of the 53.2 million children that attended either public or private school in 2000 (Institute of Medicine, 2005b). Obesity (or the term overweight for children), while itself a dangerous disease, can lead to the development of additional diseases like type 2 diabetes and hypertension.

Society’s interest in the children’s health epidemic continues as increasing numbers of school children are diagnosed with diseases once reserved for older adults. Type 2 diabetes and hypertension are diseases now commonly diagnosed in children. In one population-based sample within a study completed in 2000 by the CDCP roughly 60% of obese children between the ages of 5 and 10 had at least one cardiovascular risk factor such as elevated cholesterol, blood pressure, or insulin (Institute of Medicine, 2005). Overweight children are also more likely to remain overweight as adults and as a whole are “more likely to develop asthma, high blood pressure, joint and orthopedic problems . . . and type 2 diabetes” (Vail, 2004, p.14). Type 2 diabetes, while managed primarily through diet and regular exercise, carries some of the risks as insulin-dependent type 1 diabetic patients. Untreated, a type 2 diabetic may experience some of the same risks of type 1 diabetes such as reducing life expectancy, slow recovery time from illness, and loss of vision.

In light of these statistics, the education system is a place where a large number of children may be taught healthy behaviors. The responsibility of schools to develop and implement wellness policies and to strengthen nutrition education is evident. Blaming one group or influence for this crisis is neither necessary nor helpful. Assertive, proactive work to change eating and lifestyle behavior is a potential, and literal, lifesaver for these children.

Several public schools were identified for further investigation within this preliminary study. The author researched artifacts and documents related to school wellness, federal programs and mandates related to nutrition and wellness, and the presence of grassroots efforts toward policy change in schools to identify key

The percentage of children identified as overweight or obese has climbed from 5% in 1985 to nearly 15% in 2000.
issues and important players within school wellness initiatives. It is through the personal interviews conducted that the spirit and energy behind wellness initiatives became evident. It is each organization’s impact upon wellness policy development and implementation that further defines a burgeoning movement in schools today.

In 2004 the federal government mandated the creation of wellness policies by schools that participate in a program authorized by the Richard B. Russell National School Lunch Act of 1966.

Wellness Perspective

Local wellness policies within schools are created with the specific, unique needs of each educational environment. In 2004 the federal government mandated the creation of wellness policies by schools that participate in a program authorized by the Richard B. Russell National School Lunch Act of 1966. However mandated it is the discretion of local entities such as school boards, administrators, teachers, and other key groups to create and implement policies that best serve the needs of each unique educational community.

Many schools address the changing nutritional needs of an increasingly sedentary school-age society; however, only a few display an innovative and assertive stance on wellness policy and nutrition education within schools. Both traditional public schools and newly opened charter schools support healthy behaviors and smart choices within the lunchroom and the classroom. One secondary school, Evanston Township High School, is a leader in promoting the healthy choices children need to make today.

Evanston Township High School

Located in Evanston, Illinois, Evanston Township High School (ETHS) is making major changes to the types of foods offered within its four student and one faculty/staff cafeterias. Megan Gibbons, food services coordinator, works with vendors such as Pepsi and Coke to reconfigure pop machines to encourage water consumption. “We refaced the machines three years ago putting water at the top of the selections offered. Next listed are 100% juice drinks followed by juice blends, diet pop, and one or 2 types of regular pop,” she added (M. Gibbons, personal communication, October 14, 2006). A plan to phase regular pop out entirely is in place, and as it stands the freshman cafeteria vending machines do not feature regular pop.

Aside from soft drink vending machine changes the quality of snacks offered has improved at ETHS. The amount of unhealthy snacks has been reduced as 75% of items sold in the cold temperature vending machines are low fat dairy options. This change is funded by National Dairy Council grants. A wider variety of fruits and vegetables are now offered with cold, chopped vegetables selling especially well. “The hot vegetables just don’t go over as well,” stated Gibbons. Another snack area—corn snacks—has also undone a transformation of sorts. “We only carry baked snacks. When we moved from regular Flamin’ Hot Cheetos to the baked version we had a mini-revolt on our hands. It didn’t last long—they seem to enjoy the baked Cheetos dipped in Philadelphia Cream Cheese,” Gibbons sighed (personal communication, October 14, 2006).

Another change observed by ETHS food service staff is the increase in milk consumption since the milk vendors switched from 8 ounce paper cartons to 8 or 16 ounce plastic cartons. “Incredibly, the students will drink [more milk] if they can see it, grab it, and go,” added Gibbons. “We cut out whole milk and only offer 2% white, skim white, 2% strawberry flavored milk, and 1% chocolate milk” (M. Gibbons, personal communication, October 14, 2006).

To encourage wellness and the development of healthy nutrition habits the food service staff holds special interest promotions throughout the school year.
Some promotions run over the course of a week while others last up to a month in length. Titles of previous topics, once funded through Action for Healthy Kids, include: Eat Your Colors, Milk Products, Water and Activity, and Whole Grains. “This year we’ll have an intern run the promotions, and a registered dietician will go to the classroom to discuss each promotion and present ways for students to build healthy meals in the cafeteria,” added Gibbons (personal communication, October 14, 2006). In addition to this educational component nutrition and wellness are embedded within both the health and the physical education curricula. Education in the classrooms is aimed to complement. Students also hear quick nutrition blurbs during homeroom period. The messages within the lunchroom intend to both complement and reinforce the formal lessons received in the classroom.

Promotions both educate students and increase sales. Like many school cafeterias, ETHS is self-supported and must meet sales objectives to stay in the black. “We keep the popular foods but make them healthier…low fat cheeses, whole grains, or all white meat chicken nuggets to name a few healthier ingredients,” stated Gibbons (personal communication, October 14, 2006). Staff at ETHS work to change student behavior by stressing a balance be achieved in food choices. If a student loves the cheese-filled breadsticks, perhaps a side of fresh vegetables with dip would be a better option than French fries. As ETHS’ juniors and seniors have an open-campus for lunch, the school’s cafeteria must remain competitive with off-campus restaurants. One way this school does this is by contracting with Subway and other outside vendors to provide healthier fast food options to students that remain on-campus.

**Perspectives Charter Schools**

At Perspectives Charter Schools (PCS) in Chicago, Illinois, health and wellness education are solidly within the school’s mission entitled A Disciplined Life. The Healthy Lifestyle Initiative implemented within the 2005-2006 school year is a three-prong approach to smart lifestyle choices in the areas of wellness, good nutrition, and physical activity. PCS provides a comprehensive learning environment that encourages the development and practice of life-long wellness behaviors (Perspectives Charter Schools, 2006). Their on-site food service chefs work diligently to provide healthy meals made with whole foods and less processed items. The program was first implemented at the PCS South Loop Campus and it is slated to be implemented at the new Calumet campus that opened in Fall, 2006 (S. Menyhart, personal communication, August 30, 2006).

Stephen Menyhart, Nutrition Teacher at the Calumet Campus, developed four nutrition classes during the 2005-2006 school year to complement the school’s wellness focus. He trained as a Food Educator under Dr. Antonia Demas, the creator of the Food is Elementary curriculum. Her curriculum provided information and the encouragement for Menyhart to teach the hands-on, sensory-focused lessons at his previous position in another school. Prior to the 2006-2007 school year, Menyhart and three others were chefs at the school’s South Loop Campus. Curricular areas addressed within these classes included the revised food pyramid, reading nutrition labels, lessons on fats, oils, sugars, and salts, and the disease diabetes. “Our overreaching goal was, and is, to help students develop healthy habits [to last] the remainder of their lives,” stressed Menyhart (personal communication, August 30, 2006).

Integrated physical education classes, food and nutrition education, health, and hygiene are all addressed by the Healthy Lifestyles Initiative curriculum. Encouraging community involvement is another important facet of the Initiative. “We have a standing invitation to parents to come and have breakfast with the students,” stated Menyhart. “We also work to make the atmosphere a positive environment by banning junk food from the Campus. No candy, chips, or soda are allowed,” he concluded (S. Menyhart,
personal communication, August 30, 2006). Reaching secondary students is decidedly different from reaching the other levels in education. One elementary school in Oak Park is encouraging healthy wellness behaviors, one bite at a time.

William Hatch Elementary School

Take a look at Hatch Elementary of Oak Park, Illinois’ school calendar for the 2006-2007 school year. The wellness and nutrition calendar, that is: Food for Thought breakfasts, room parents meetings to present healthy snack and treat options for the classroom, Smoothie and Salad Bar Lunch Fundraisers, food tasting events with students, and “Game On” activities—and that is only for the month of September. Ms. Sandy Noel, Physical Education Teacher and a 2006 recipient of the prestigious Golden Apple award for Excellence in Teaching, speaks proudly about the changes she and others have made at Hatch, “We have to do something. Research has established that better nutrition and exercise created better learners. We need to be proactive and help our kids make better choices both now and in the future” (S. Noel, personal communication, November 26, 2006).

The activities at Hatch involve all grade levels and continue throughout the school year. The nutrition curriculum teaches students nutrition basics such as the importance of eating breakfast, drinking water throughout the day, getting 5-7 servings of fruits and vegetables each day, and choosing whole grains while eliminating trans-fats from the diet. In addition, wellness promoting lifestyle habits such as exercising sixty minutes each day and sleeping 9-10 hours each night are encouraged and explained as ways to become a better student. “We tell parents that test scores will go up if your kid is healthier, and they listen. Attaining parental involvement and support of our efforts is vital to the success of our wellness initiatives, stressed Noel (personal communication, November 26, 2006).

“Involvement from the community near our school has also been phenomenal,” emphasized Noel (personal communication, November 26, 2006). An event planned for January is the Brain Food Dinner and presentation. A chef from a local restaurant comes in to the school to cook a delicious, healthy meal that reinforces elements within the nutrition curriculum. Parents, teachers, and students eat together and create a lasting shared memory. Parents also hear a presentation of the research behind the wellness initiatives at Hatch and the students created movements for a “Health Rap” presentation that evening. “Thanks to the generous giving of time and energy from local chefs the dinners, food tasting events, and field trips all work together to emphasize that healthy food is both tasty and fun, “Noel stressed (personal communication, November 26, 2006). Another organization involved with Hatch Elementary is Seven Generations Ahead. This Oak Park non-profit organization works at the grassroots level to bring whole foods into the classroom.

Seven Generations Ahead

Seven Generations Ahead (SGA) works to facilitate “procurement links between local farms, food service, and distributors” (SGA, 2006). Other districts partnered with include the Archdiocese of Chicago and Oak Park-River Forest High School in River Forest, Illinois. One goal for the 2006-2007 school year is to work closely with Chicago Public Schools. Lozano Elementary School on Chicago’s Northwest side is slated to actively partner with SGA in mid-September of 2006. A cornerstone of the organization’s mission is a program that educated school kids about fresh fruits, vegetables, and other healthy food choices.

Fresh From the Farm is a “farm-to-school” program that aims to reconnect kids to the foods they eat and the manner in which they are produced. Volunteers from the organization go into schools such as Hatch Elementary to educate children on different whole foods and the process by which the fruit or vegetable is grown and harvested. These curricular activities aim to get kids excited about fruit, for example, both inside and outside of the classroom.

An ecology/nutrition class curriculum was developed and is a key piece to this process. To engage parents and the community a “healthy eating night” will parallel lessons taught within the classroom. A farm
classroom visit was planned to expose students to the “how-to’s” of farming: Rural life, the food growth cycle, and local food and its processing prior to heading to market. Connecting kids to the process and helping them see a new connection between the food they eat at lunch and the food industry is a key element within SGA’s comprehensive reform efforts.

One sample curriculum unit taught was an eight-lesson, thematic unit which exposed students to one food: Blueberries. The fruit was locally grown and organic. The teachers explained the growth process from seeds and soil preparation through the growing season into the harvest. Students were taught the cultural ties of blueberries, the origin of the food, the intercultural ties of the fruit, and the nutritional impact of blueberries upon the body to complement other instruction. Student buy-in and involvement with the food from seed to true fruition in the kitchen makes this program unique. According to Christine Luago, Healthy Foods Initiative Coordinator; children “can often see healthy food as punishment, and we work to change that” (C. Luago, personal communication, September 4, 2006).

“[Our job is]…not just to educate but to get a healthy school culture going,” she continued. Luago’s enthusiasm for the health of children led her to volunteer for SGA. This enthusiasm was a result of her experience as a Peace Corps worker in Bolivia, where she saw native children eschew processed food in favor of whole foods. “[The kids]…saw processed food as a treat and not as the everyday food we see it as here” (C. Luago, personal communication, September 4, 2006). Through teacher training, parent education, and progressive curriculum development SGA strives to offer many healthy options to kids and to help them make the right choices.

A change in student attitudes and behaviors are supported outside of the classroom as well. “As a staff we do teacher trainings and conduct neighborhood outreach activities. University of Illinois-Chicago (UIC) Extension School to train culturally sensitive educators,” stated Luago (personal communication, September 4, 2006). Different ethnic groups have traditional dishes, foods, and cooking styles that may benefit from exposure to new foods and alternatives in food preparation techniques. To teach healthier options without offending a community’s members and its unique qualities is necessary to support the work done in school within the home.

A school’s culture may be a barrier to successful education and outreach to an educational community. “One school we were working with was hesitant to change. There was a basic lack of access to healthy food and produce, and Seven Generations Ahead worked to change that,” added Luago (personal communication, September 4, 2006). While some schools often do not see the long-term benefits, Luago and others believe that their work helps kids develop wellness behaviors to last a lifetime. Another organization that shares similar goals of educating and inspiring kids to make healthy choices is Action for Healthy Kids.

**Action for Healthy Kids**

Another grassroots organization working to improve the health of school children is Action for Healthy Kids (AHK). Founded in 2002 by Dr. David Satcher, the 16th United States Surgeon General, the public-private partnership joins together more than forty national organizations and governmental agencies to support the school-based change efforts of fifty-one State Teams (AHK, 2004). The national organization supports the volunteer-based State Teams by providing resources such as training, technical assistance, and web-based resources (AHK, 2006a). The grassroots State Teams coordinate volunteer efforts in bringing about changes in nutrition and physical education as well as wellness initiatives. AHK’s national goals include: “Improving schoolchildren’s eating habits, increasing schoolchildren’s physical activity, and educating administrators, educators, students, and parents” about the connection between physical health and academic achievement (AHK, 2004, p.4).

This state-based approach allows volunteers from each state to create an action plan that shares the organization’s overarching goals while targeting personalized goals that take the unique educational culture and resources into account (AHK, 2004). The State Team goals for Illinois are: 1) to “provide food options that are low in fat, calories, and added sugars, such as fruits, vegetables, whole grains, and low-fat or nonfat dairy foods,” and 2) to “provide all children, from pre-kindergarten through grade 12, with quality daily physical education that helps develop the knowledge, attitudes, skills, behaviors and confidence needed to be physically active for life” (AHK, 2006b, p.5). Through presentations and exhibits at a variety of locales, such as the Healthy School Nutrition Environment
Conference, the Food Security Summit, and the St. Louis Dairy Council Annual Meeting, the Team works to educate and raise awareness of the importance of physical activity and nutrition education (AHK, 2006b). The Team also publicizes positive changes in school nutrition and wellness by participating in the USDA’s Team Nutrition Grants and the Federal School Breakfast Start-Up Grants (AHK, 2006b).

“What began as a strong focus upon children and obesity has since branched out to include a renewed, heightened emphasis upon the importance of physical activity, nutrition, and academic performance,” stresses Sandy Noel, Physical Education teacher and State Team member (S. Noel, personal communication, November 30, 2006). To reflect this new three-pronged approach in advocacy, at the start of the 2006-2007 school year AHK evaluated 112 local wellness policies from 42 states to discern how well schools are fulfilling the federal mandate for school wellness. The findings? Only half of the policies evaluated met the mandate’s minimum requirements (Satcher, 2006). To support school districts at this critical time in school health, the AHK publishes special reports to support the continued development and implement school policies nationwide. The two Healthy School Summits convened by AHK promote the continual examination and improvement of the organization’s efforts at the national and state levels. With more than 9 million youth identified as overweight or obese, the AHK community supports the unique role of schools to make a significant impact upon this disturbing snapshot of children’s health (AHK, 2006a). “Physical activity, nutrition, and academic performance—they are all equally important and connected. We must continue to inform, educate, and encourage students and parents alike to stay active and eat well,” concluded Noel (personal communication, November 30, 2006).

Conclusion
Childhood obesity is at epidemic proportions. Schools can work on their side of the education process to inform, educate, and inspire children to make healthy choices regarding food and activity. While wellness policy is mandated by the Federal government, the activism and activities do not stem from that legal entity. The life and energy of innovative wellness and nutrition education is in pro-active teachers, administrators and community members willing to step up and become part of the solution to the obesity problem in school aged kids. The future of this movement is in your hands if you are ready to do something about children’s health.

References


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- Enhances clear thinking
- Raises test scores
- Lowers hyperactivity, anxiety and depression
- Helps maintain a healthy weight

♦ Misnutrition causes symptoms of fatigue and dehydration.

Resources


Center for Ecoliteracy: www.rethinkingschoollunch.org
Green Earth Institute: www.greenearthinstitute.org
Illinois Nutrition Education: www.kidseatwell.org
Natural Ovens: www.naturalovens.com
School Nutrition Association: www.schoolnutrition.org
Seven Generations Ahead: www.sevengenerationsahead.org

BENEFITS OF EXERCISE AND MOVEMENT

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- Enhances creativity and self-esteem
- Creates more positive attitude toward school
- Grows brain cells and increases oxygen to the brain
- Improves brain efficiency for learning and memory
- Improves concentration, focus and test scores
- Helps sleep better
Lack of exercise contributes to childhood obesity, difficulty focusing, memory problems.

Resources

Action for Healthy Kids: www.actionforhealthykids.org
American Alliance for Health, PE, Recreation and Dance: www.aahperd.org
Action for Healthy Kids: www.actionforhealthykids.org
PE for Life: www.pe4life.com
Model School Wellness Policies: www.schoolwellnesspolicies.org

BENEFITS OF WATER AND HYDRATION
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- Enhances concentration.
- Refreshes us and helps us to be more alert.
- Keeps lungs moist for efficient transfer of oxygen to the blood.
- Helps students perform better in the classroom and sports.
- Recommended amount – one eight-ounce glass for every 25 pounds of body weight per day, additional hydration when exercising.

- The first sign of dehydration is a headache.

Resources

Dr. William Sears: www.askdrsears.com
Staley’s first and goal challenge, the four downs of health: www.chicagobears.com
Fiji Water: www.fijiwate.com
Global Health Solutions: www.watercure.com
United Kingdom policy on hydration: www.wateriscoolinschool.co.uk

BENEFITS OF SLEEP
- Improves ability to pay attention
- Enhances abstract thinking and concept formation
- Improves verbal creativity
- Promotes ability to handle complex tasks and problem solve
- Helps maintain positive relationships with family and friends
- Enhances alertness and physical performance
- Improves ability to maintain a healthy weight
- Inadequate sleep causes difficulty focusing, behavior problems, increased health problems.

Resources

Prescription for Sleep including sleep pyramid:
www.prescriptionforsleep.com
Sleep for Kids, games and activities: www.sleepforkids.org
Star Sleeper Campaign with Garfield: www.nhlbi.nih.gov.sleep
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About Thresholds

In the summer of 1973, several professors from the former Department of Secondary Education at Northern Illinois University discussed the possibility for an education journal that united secondary school practitioners and university professors in dialog. They talked about problems, experiments, research, and new developments. This group, under the leadership of Dr. Leonard Pourchot, proceeded to elect a board of directors, establish a non-profit foundation, solicit charter members, elect a managerial staff, and set the wheels in motion for a long range goal of publishing the first issue of *Thresholds in Secondary Education* in February, 1975.

The word “thresholds” best represented the intention to explore ideas and share viewpoints that could lead to new educational advances while respecting achieved values and knowledge bases. The *Thresholds in Secondary Education* journal would stimulate thinking, influence education practices, inform, and inspire.

Over the years, *Thresholds* has broadened its focus beyond secondary education to include dialogue between educational theorists and practitioners from diverse locations. In 1977, the journal was retitled *Thresholds in Education*. Today it remains dedicated to the examination and exploration of new educational inquiries, theories, viewpoints, and program innovations. The title of the journal was well chosen and more than ever is relevant to the needed forum among educators in these complex times. The threshold is a structure familiar to all cultures from ancient times. Taken literally, it is the traverse beam of a doorframe. But it also stands as a metaphor for moving through time, place, and process. Thresholds are crossing-over places where we venture from the securely known to the uncharted spaces.

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