

Quotes:

“Cutting off physical exercise – the very activity most likely to promote cognitive performance – to do better on a test score is like trying to gain weight by starving yourself.”

Dr. John Medina – a developmental molecular biologist / professor of bioengineering @ the University of Washington School of Medicine / Director of the Brain Center for Applied Learning Research @ Seattle Pacific University

SACRAMENTO — State Superintendent of Public Instruction **Delaine Eastin** today announced that the results of a recent study conducted by the California Department of Education (CDE) show a distinct relationship between academic achievement and the physical fitness of California’s public school students.

"This statewide study provides compelling evidence that the physical well-being of students has a direct impact on their ability to achieve academically," said Eastin. "We now have the proof we've been looking for: students achieve best when they are physically fit. Thousands of years ago, the Greeks understood the importance of improving spirit, mind, and body. The research presented here validates their philosophic approach with scientific validation."

“The Physical Education Study Group Report (State of Maryland) supports the following statements:

- Regular physical activity promotes health and improved academic performance.
- Exercise and challenging sensory motor experiences contribute to cognitive development.
- Physical education programs must be restructured to focus on the scientific concepts of human movement rather than sport. Students may then apply these concepts to a variety of physical activities to promote physically active lifestyles.

The research and evidence included in this report has been replicated and has convinced us to redefine both physical education and the role of physical education in the academic mission of the school. By restructuring physical education, we have within our reach a way to improve the health and academic success of all of our students.”

The Maryland Physical Education Group (2001) p7

Connecting Physical Activity/ Fitness to Achievement in Academic Settings

Anthony Elementary (Leavenworth, KS) Edutopia (Dec/Jan 2006)

2004-05 academic year ranked 10th in reading / 9th in math in 10 school district

Implemented daily vigorous physical activity & improved nutrition, daily vitamins @ school

RESULTS after one year

-1st in math / 2nd in reading

-1300+% increase in students passing fitness standards

-drop in office referrals for discipline from 438 to 18

The Effects of Daily Exercise and Nutrition

From Edutopia (Dec/Jan 2006) from Fighting for Fitness [cover story] page 34:

by Evantheia Schibsted

"Increasingly, educators are finding that a healthy lifestyle promotes higher academic performance. Two years ago, Anthony Elementary School, a K-5 school in Leavenworth, Kansas, implemented a health-oriented program for its 350 students, which requires that they exercise, eat more nutritious lunches, and take two vitamin mineral supplements daily.

Before the program, Anthony was ranked ninth in standardized math tests and tenth in English exams in a district of ten schools. One year into the health program, the school's test scores rose to first in math and second in English. Student behavior also improved: Office referrals plummeted from 438 incidents in one year to 18. Additionally the number of students who met the Presidential Fitness Standards rose from 3 to 40 in the first year."

Titusville Schools (Pennsylvania) SPARK p32

Before 2000 ranked below state average in reading and math on standardized tests

2000-01 lengthened school day / reduced academic time to make room for everyday PE

RESULTS:

Reading 17% / math 18% above state average in one year

No middle school fights since the program began

Augusta, GA

163 overweight school children in 3 groups: non exercisers / 20 min daily / 40 min daily

Direct correlation between **amount** of exercise and cognitive improvement (standardized test scores & executive function: planning, organizing, abstract thought, self control) Catherine L Davis Dec 07 Research Quarterly for Exercise and Sport

Hillman et al 2009 (Neuroscience, 159, 1044-1054)

20 normal functioning preadolescent children were tested after a 20 minute bout of moderate (60% maxHR) treadmill walking and after a 20 minute sedentary period on brain activity (event-related brain potential – ERP) and applied aspects of cognition (response accuracy and academic achievement).

RESULTS:

Participants scored a full grade level higher in reading comprehension after PA than after a period of rest.

PA increased response accuracy and ERP levels.

“As demonstrated from previous literature, this study indicated that, after a 20 minute bout of PA, children scored higher on multiple assessments of cognition and academic performance as compared to a 20 minute rest period. **Specifically, children performed significantly better in reading comprehension, with participating children scoring approximately a full grade level higher in reading comprehension after PA than after a period of rest.**”

Swedish Military Study: Dr. Maria Aberg et al, a neuroscientist @ Gothenburg University, Sweden

(Reported in the Proceedings of the National Academy of Sciences [PNAS] Dec 8, 2009, Volume 106, No. 49)

Edited by Fred Gage

This study examined ALL Swedish men born between 1950 and 1976 who entered the military: 1.2 million men (270,000 siblings, 3100 fraternal twins, 1432 identical twins). Grades, test scores, and information of physical fitness were analyzed at age 15 and age 18 on all subjects.

The study **compared the relationships between cardiovascular fitness and intelligence**. The whole group and twins were evaluated separately. “In all cases – by ergometer cycling – they found a significant positive association with cognitive ability testing and their physical fitness.”

RESULTS:

1. Cardiovascular fitness in general for 18 year olds improves cognitive ability and later academic achievement and led to a higher socioeconomic status later in life.
2. Changing the cardiovascular status of adolescents from 15 to 18 had a positive impact on improved scores independent of the whole group.

School Fitness Studies

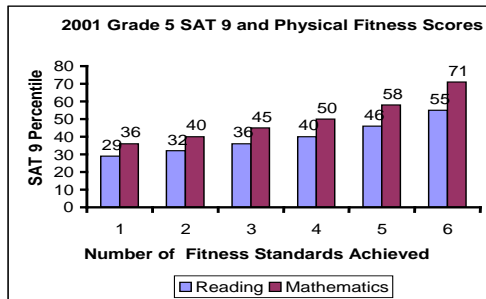
California Dept of Education (CDE) (2001) In this study approximately one million California school children had their Stanford Achievement Test (SAT) scores compared with their (Fitnessgram) fitness scores which are comprised of 6 components. With each fitness test passed the level of academic achievement also improved.

- Direct Correlation between level of fitness and SAT scores

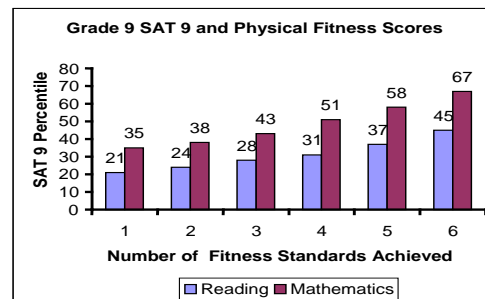
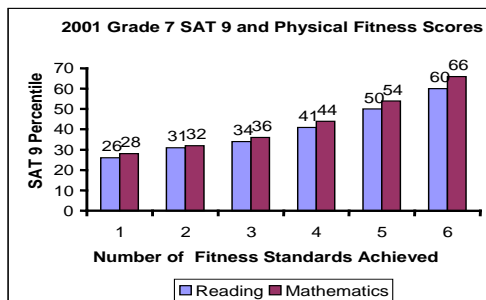
SACRAMENTO — **State Superintendent of Public Instruction Delaine Eastin** today announced that the results of a recent study conducted by the California Department of Education (CDE) show a distinct relationship between academic achievement and the physical fitness of California’s public school students.

"This statewide study provides compelling evidence that the physical well-being of students has a direct impact on their ability to achieve academically," said **Eastin**. "We now have the proof we've been looking for: students achieve best when they are physically fit. Thousands of years ago, the Greeks understood the importance of improving spirit, mind, and body. The research presented here validates their philosophic approach with scientific validation."

California Department of Education



- Higher academic achievement is associated with higher levels of fitness in grade 5,7,9.
- The relationship between academic achievement and fitness in grade 5,7,9 was greater in mathematics than in reading, particularly at high fitness levels.



Massachusetts school district fitness study: (UpdatePlus - Sept/Oct '09)

1,841 participants (4th, 6th, 7th, & 8th graders) 65% non-white, 45% low income

Tests: Fitnessgram, MCAS (Massachusetts Comprehensive Assessment System)

RESULTS:

- "A strong nearly linear relationship between Math MCAS scores and passing fitness tests." "The odds of passing the Math MCAS increased by 38% for each 1-unit increase in the number of fitness tests passed."
- "There was a significant relationship between English MCAS scores and passing fitness tests." "...for the English MCAS, the odds increased by 24% for each 1 unit increase in the number of fitness tests passed."

Fitness and Academic Achievement in Preadolescents (Hillman & Castelli U of Ill 2007) Education Week Feb 13, 2008 / Journal of Sport and Exercise Psychology 2007

- Found the same correlation between level of fitness and academic scores
- EEG scan showed more neurons active during tasks
- More fit students responded better to mistakes

Physical Fitness and Academic Achievement in Third- and Fifth-Grade Students

Darla M. Castelli, Charles H. Hillman, Sarah M. Buck, and Heather E. Erwin

University of Illinois at Urbana-Champaign

The relationship between physical fitness and academic achievement has received much attention owing to the increasing prevalence of children who are overweight and unfit, as well as the inescapable pressure on schools to produce students who meet academic standards. This study examined 259 public school students in third and fifth grades and found that field tests of physical fitness were positively related to academic achievement. **Specifically, aerobic capacity was positively associated with achievement, whereas BMI was inversely related.** Associations were demonstrated in total academic achievement, mathematics achievement, and reading achievement, thus suggesting that aspects of physical fitness may be globally related to academic performance in preadolescents. The findings are discussed with regards to maximizing school performance and the implications for educational policies.

Key Words: cognition, preadolescent, exercise, standardized testing

Journal of Sport & Exercise Psychology, 2007, **29**, 239-252
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BMI and Achievement in 3rd graders: (Byrd J. 2007) The Impact of Physical Activity and Obesity on Academic Achievement Among Elementary Students [Connexions Web site]. March 30, 2007. Available at: <http://cnx.org/content/m14420/1.1/>.

- 12,607 3rd grade students academic scores (1st yr in school for standardized testing) were compared with BMI and opportunities for activity during the school day.
- The Body Mass Index (BMI) of students, as well as the opportunity for physical activity within the school day affected the students' performance in both reading and mathematics achievement.

The Impact of Physical Activity and Obesity on Academic Achievement Among Elementary Students

ID: m14420

Language: English (en)

Summary: This study compared the effect of physical activity and obesity on academic achievement and was based on the premise that the health of a child has an effect on his or her ability to learn and to achieve academically. Specifically, health-related topics of inactivity and obesity were considered. **The participants included 12,607 third grade children entering kindergarten for the first time during the 1998-99 school year.** The data were obtained from the National Center for Educational Statistics' Early Childhood Longitudinal Study (Third Grade), which is a national representative sample of students entering Kindergarten in 1998-99 with the latest wave of individual student, parent, teacher, administrator and school data collected on these same students in third grade. Third grade is a crucial year in elementary school as high stakes exams begin in third grade in most states. **The results indicated that the Body Mass Index (BMI) of students, as well as the opportunity for physical activity within the school day affected the students' performance in both reading and mathematics achievement.** The implications for school and district leaders are discussed with direction for future research presented. This study compared the effect of physical activity and obesity on academic achievement and was based on the premise that the health of a child has an effect on his or her ability to learn and to achieve academically.

Subject: Social Sciences

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Texas Youth Fitness Study

FITNESSGRAM® Data Results Overview

Visit www.ourkidshealth.org for these results and county-by-county data.

Baseline Data – Released July 1, 2008

- More than 2.59 million (of nearly 3.4 million) public school students in grades 3-12 were tested using FITNESSGRAM in spring 2008.
- An estimated 84 percent of schools districts completed the physical fitness assessments.
- Results showed that elementary-age children were the most physically fit. Fitness levels declined with each passing grade level, corresponding with decreasing emphasis on physical education in upper grades.
- Approximately 32 percent of third-grade girls and 28 percent of boys reached the “Healthy Fitness Zone” in all six tests. By seventh grade, only 21 percent of the girls and 17 percent of the boys met this achievement level. By 12th grade, just 8 percent of girls and boys met the health standards in all six tests (see chart for full results).

Correlation Data – Released March 9, 2009

- Data records are of more than 2.44 million students—from 6,532 schools representing 75 percent of the state's public schools.
- The data results were adjusted to remove the influence of a school's social economic status (SES), minority status and size.
- Approximately 78 percent of fourth graders achieving the “healthy fitness zone” for cardiovascular fitness, and fitness levels decline with each passing grade. Twelfth graders are the least fit with 20 percent achieving the “healthy fitness zone.” This is measured through walking or running tests and adjusted for age and gender.
- Approximately 70 percent of students in each of the grades 3 – 12 achieved the “healthy fitness zone” for Body Mass Index (BMI) measured by a height to weight ratio, adjusted for age and gender. Conversely, an estimated 30 percent are either overweight or obese.
- **Significant** associations were consistently found between physical fitness and various indicators of academic achievement, specifically:
 - o Academic Performance (TAKS) – Higher levels of fitness are associated with better academic performance.
 - o School Attendance – Higher levels of fitness are associated with better school attendance.
 - o School Incidents – Higher levels of fitness are associated with fewer negative school incidents.
- When schools are stratified by the state rating system (exemplary, recognized, acceptable and unacceptable), the school with highest and lowest levels of academic performance are the schools that also have the highest and lowest levels of cardiovascular fitness.
- Counties with low or high levels of achievement in cardiovascular fitness or BMI also tended to have corresponding low or high levels of achievement on TAKS.
- According to the Texas Education Agency, reducing absenteeism by 10 percent would earn public schools approximately \$237 million in state funding.

Brain Research

1 Causes structural and vascular plasticity (change)

Environmental enrichment (toys & running wheels) improved learning in lab rats / brains
heavier (more brain cells)

University of California Berkeley psychologists (1960's)

Use/disuse principle – unused sectors of the brain shrink when not used – cats' visual cortex shrinks when eye is sewn shut - Gage

2 Increases brain activity

more circuits involved strengthening learning - Hillman

EEG scans show more neurons recruited for a given task

3 Releases Neurotrophins (growth factors) (Builds the circuits – infrastructure)

BDNF: *Miracle Gro* for the brain

4 Promotes synaptic plasticity

Raises astrocyte levels (cleans synapses where signals transfer between neurons)

5 Modulates neurotransmitter systems (improves signaling)

Serotonin: "Policeman" of the brain – regulates levels of brain activity, mood, impulsivity, anger

Dopamine: influences learning, attention, movement, reward

Norepinephrine: amplifies signals that influence attention, perception, motivation, arousal

6 Stimulates growth of new neurons (neurogenesis)

Running mice have twice as many neurons as non running mice – Van Praag & Gage

Exercisers have a greater levels of BDNF: *Miracle Gro* for the brain (causes neurons to sprout branches)

BRAIN RESEARCH

There is a growing body of evidence within the brain research literature that indicates there are important relationships among physical activity, brain development, and cognitive performance. At birth, a baby's brain contains on average about 100 billion neurons. It is the number of connections between the neurons (termed "synapses") which ultimately define the wiring of the brain. At birth, the brain has not yet developed its full complement of synapses. Synaptic connections between neurons reach their highest average density at about age two. Although the majority of synaptogenesis is driven by the portion of the genetic blueprint which guides brain development, contemporary research indicates that from birth to about age 10, sensory and motor experiences play a significant role in stimulating the proliferation of synapses between particular neurons. During this time, the synapses undergo significant changes. Repeated use reinforces or "strengthens" specific synapses. To a large degree, reinforcement is based on the sensory and motor experiences of the growing child.

At about age ten the period of maximum synaptogenesis ends and the brain begins a period of “synaptic downsizing” based on synaptic prioritization. Over the next several years, it appears that the synaptic connections of the brain are reviewed and prioritized. The strongest synapses (i.e. those which have been reinforced by experience or repeated use) are preserved, while the weakest synapses (i.e. those unused or least used) are sacrificed and undergo atrophy. Although the phrase “use it or lose it” has been repeatedly applied to skeletal muscle mass, it would appear that it also applies to synaptic reinforcement, particularly during this period of the growing child’s life. Again, contemporary research indicates that sensory and motor experiences play a prominent role in reinforcing or strengthening particular synaptic connections and neuronal pathways.

By the end of adolescence, at about age eighteen, the “plasticity” or ability of the brain to re-shape the synaptic wiring has declined. At this point, use and experience have strengthened particular synaptic connections and neuronal pathways. The foundation of motor skills and associated pathways in the brain has been laid down. This is not to say that new motor skills can not be learned beyond this point in life. To the contrary, the brain and the musculoskeletal system are capable of learning new motor skills throughout life. However, the ease at which those new motor skills can be acquired, and the receptivity of the synaptic wiring to change are the most critical issues. Before age eighteen, the synaptic wiring of the brain is most receptive to changes driven by motor experience.

Therefore, this is clearly the most effective time for establishing basic motor skills and acquiring the broadest range of new and advanced motor skills. As individuals grow into adulthood, they can choose which advanced motor skills they will continue to use, enjoy, and develop further. Multiple studies have demonstrated that aerobic exercise can improve cognitive performance. It appears that increased cerebrovascular circulation is most likely responsible for this effect. Research has demonstrated that regularly performed aerobic exercise produces and increases the number of capillaries servicing different tissues and organs, including the brain. Increased capillary density in the brain means greater capillary exchange of nutrients and waste products. Specifically, more oxygen and glucose are delivered to the brain, and more waste products, such as carbon dioxide, are removed. It stands to reason that optimizing oxygen and glucose delivery to the brain can help optimize brain performance. It further stands to reason that if the educational system is seeking to maximize learning and academic performance, that some form of regular aerobic exercise should be an important component of the student curriculum.

In another area of brain research, the cerebellum has become the focus of increased interest. In the past, the cerebellum has been viewed as having strictly motor-related functions. However, a growing body of research suggests that the cerebellum may also have a significant role in sensory and cognitive functions. Various studies suggest that the cerebellum is involved with spatial learning tasks, selective attention between sensory modalities, the manipulation of information in the association cortex, and possibly a role in some types of language processing- all of which have a role in academic learning and performance. Because most anatomical regions of the brain tend to integrate their functional activities, there is reason to expect that there might be some sort of interactive relationship between the motor and cognitive activities of the

cerebellum. Although it is speculative, motor activities and cognitive activities involving the cerebellum may possibly reinforce one another.

In summary, it is critical to develop and reinforce motor pathway synapses for basic motor skills from preschool through elementary school. Children need to experience a variety of daily physical activities which develop the basic motor skills associated with human movement, such as maintaining balance through changes in body position, speed of movement, and the direction of movement. It is particularly important for the child to develop these basic motor skills before the age of ten in order to develop and reinforce as many motor pathway synapses as possible before the “synaptic downsizing” begins.

This recommendation presumes that during elementary school years the child develops the motor pathway synapses to support the basic motor skills noted above. Then, from middle school through high school the child must be challenged with a variety of new physical activities which require the development of new motor skills that go beyond the basics. It should be noted that if the child did not develop a strong set of basic motor skills in elementary school, challenging them in middle school with a variety of new physical activities will not serve the intended purpose and may present a frustrating challenge for some children.

To maintain a fully developed and fully functioning brain, an individual must remain physically active. Regular aerobic physical activity has been shown to delay or prevent the memory loss associated with aging. Although the type of physical activity changes throughout the lifespan, the need for regular physical activity to ensure a fully developed and functioning brain does not. From preschool through high school, children would clearly benefit from aerobic physical activities on a regular basis (i.e., 3-4 times per week).

Health Data

-Over half the deaths in the U.S. annually are related to lifestyle **[CDC]**

Over 900,000 will die annually from CVD (stroke, heart attack)

One million more will survive heart attacks **[AHA]**

-Inactivity and diet cause over 300,000 deaths a year **[CDC]**

-30% of All Americans are obese **[CDC]**

-“Obesity appears to lessen life expectancy markedly, especially among younger adults.

[Journal of the American Medical Association (JAMA) Jan 8, 2003]

-Inactivity has the same effect on length of life as smoking

-12% of all deaths result from lack of regular exercise **[JAMA Feb 1, 1995]**

-62% of elementary children have at least one CHD/CAD (coronary heart disease/coronary arterial disease) risk factor and 21% had three or more

-The number (15%) of obese children has tripled in the last 20 years

[Washington Post, 9/30/2003]

-27% of overweight 1-5 year olds, 43% of overweight 3-9 year olds,
86% of overweight 10-13 year olds become overweight adults

[American Journal of Public Health].

-32% of California 9th graders are overweight (Naperville, Ill. Central HS – 3%)

Brain Facts

Neurogenesis occurs daily in the form of undifferentiated stem cells in the hippocampus (area responsible for memory and learning)

- Most stem cells die (28 days & learning required for neuron survival)
- For a stem cell to become a neuron it must fire its axon (becomes plugged in to a network – a sign of learning)
- Vigorous aerobic exercise significantly increases the number of stem cells – creating a greater number of surviving cells
- Aerobic exercise increases neurotransmitters, chief among them is BDNF which has been termed *Miracle Gro* for brains
- BDNF thickens myelin sheaf, causes new dendrite growth, is instrumental in cell growth
- Aerobic exercise promotes the growth of capillaries which supply fuel and oxygen to the brain.
- Exercise cause elevated levels of mood elevating endorphins

In 2001, the Maryland Physical Education Study Group reported a positive relationship between physical activity, brain development and cognitive performance. **The study demonstrated that regular aerobic exercise produced an increase in the number of capillaries serving tissues and organs, including the brain.** Increased capillary density in the brain results in greater capillary exchange of nutrients and waste products. More oxygen and glucose are delivered to the brain and more waste products, such as carbon dioxide, are removed. This maximizes learning and academic performance, *which would mean that some form of regular aerobic exercise should be an important component of any student's curriculum.* Also, many studies in Sweden, Germany and Australia have supported the correlation between being physically active and improved cognitive ability.

Fred H. Gage & Henriette Van Praag Study, 1999

- Explored the question: whether the BDNF that exercising animals produced has similar effects on neurons in their brains.

1999 a study of two groups of mice:

- One group had a running wheels
- One group did not.
 - Mice with wheels ran 4 to 5 kilometers every night.

Findings:

- The runners had twice as many new brain neurons as the sedentary mice did.
- They discovered that neurons taken from the runners showed greater signs of strength and connections and cellular learning.

Gage, 2004

- Gage's team did it again this time with rats
- On average the runners voluntarily racked up 48 km per day over several weeks. (11 rats **averaging** 29 miles/day)
- The runners had more new neurons and stronger connectivity: this is key evidence for learning and that was not evident in the rats brains that had no wheel.
- Messenger RNA of both groups, an indicator gene expression, found that the running rats had consistently high activity in the gene that codes for BDNF than the non runners did.

Making new nerve cells with exercise:

Recent evidence has suggested that over 9000 new cells are produced in the hippocampal DG of adult laboratory animals every day (Cameron and McKay, 2001). This process can also be dramatically enhanced by exposing animals to environmental enrichment (Kempermann et al., 1997) or allowing them access to voluntary exercise (Eadie et al., 2005; Farmer et al., 2004; van Praag et al., 1999).

- Glutamate- NMDA
- Serotonin
- BDNF Brain-derived Neurotrophic Factor
- GDNF Glial-derived Neurotrophic Factor
- VEGF Vascular endothelial factor
- IGF-1 Insulin-like Growth Factor
- FGF-2 Fibroblast growth factor

Testimonials

Date: Mon, 18 May 2009 23:24:57 -0400

Subject: FW: Thank You!

From: john@johnratey.com

To: bigfish344@hotmail.com; pziertarski@naperville203.org; plawler@pe4life.org

Hey Phil, Paul, and Joe,

You can send this out to the troops if you think this is appropriate. I took the man's name off to preserve his identity. This just came in tonight. I am readying a huge firestorm for everyone and very soon it will appear on the horizon. I am learning more and more everyday how vastly under rated real PE teachers are and we will get that message out.

John

Date: Mon, 18 May 2009 16:59:50 -0400

To: John Ratey <john@johnratey.com>

Subject: Thank You!

Hey John,

We met you last summer waiting to catch a shuttle after the ADHD conference in Minneapolis. Not sure I ever told you how much I enjoyed sharing the beer and learning about your book Spark. I've put several of your methods to work since then and have had excellent results.

1) My wife and I called our my son Patrick's school counselor and had her change his schedule so he had gym class first hour the whole year. Instead of one semester at 6th hour He now carries a 3.65 in the 8th grade.

2) I talked w/ my daughter's special needs teachers in about your book and they have implemented a daily gym class for her high school group

- a. Last year they only had gym class 2x a week for one semester
- b. Her speech has made a significant improvement
- c. She's lost weight and hasn't been sick enough to be admitted into the hospital this school year – typically 2+ admissions per school year
- d. Real snowball of collateral benefits

3) I walk 2x a day almost every day at work and switched my office chair for an exercise ball

- a. I quit taking the meds
- b. Have much better focus and endless energy
- c. Increased my sales by 32% in a tough economy.
- d. I've learned 2 fairly hard web development programs and plow thru text books like never before

My friends and family have asked me what was the change. I tell them about "Spark" and laugh to myself how important your books have been to me.

I've dealt with a wicked case of ADD for 43 years, I've said more than my share of "I'm sorry"s, left kids

at hockey rinks, taken the wrong cars from valets, missed appointments, birthdays, been in divorce court...etc (I chuckle the list goes on and on)

I read "Delivered from distraction" which summed up my whole life in the first 50 pages. Realized I'm not that bad of a person and have incredible gifts when in the correct environment. Begged my soon to be x-wife to read Delivered, which ultimately was what stopped our divorce in it's tracks. Then I read "Spark" with the knowledge that my ADD isn't as much of weakness as a gift, the consistent exercise has super-charged my strengths, real life changer. Still have my moments, but it's so nice to understand why and where they are coming from, very comforting.

Your work is incredible

I say this with the biggest smile, Thank you!!

The attachment below can be viewed at: http://www.trib.com/news/local/article_66ca3802-22f2-5465-955a-9981a370d216.html



Roosevelt High School

Mike Pickett, Principal
140 East K Street
Casper, Wyoming 82601

Telephone 1-307-253-1400
FAX 1-307-253-1450

March 18, 2010

John J. Ratey, MD
328 Broadway
Cambridge, MA-02139

Dear Dr. Ratey,

I want to take this opportunity to thank you and your staff for researching and for writing SPARK. Additionally, I would like to up-date you as to what has transpired this year at Roosevelt High School.

Last September I had the opportunity to view a film clip off the net titled, "Movement and the Brain". Needless to say I was most impressed at what I saw. I played the same clip for my staff and something wonderful began to happen. As an alternative high school we are always looking for ways to help our students be successful in the academic arena. As a staff, we felt SPARK was designed for us and our students.

Our first task was to make some adjustments in our 1st period block schedule so the physical education instructor could team with our reading teacher to build a program for our lowest readers (students reading on the 2nd, 3rd, and 4th grade levels). Having accomplished phase I, we immediately moved to phase II which was to acquire the exercise equipment for our students to use to maintain their heart rate within the prescribed target zone for 20 minutes three times a week. With a little forward thinking and using equipment on hand we made it work. We began the SPARK program during the 3rd week of September. Of course there was some team building and data gathering prior to starting the program.

Our students have been engaged in SPARK for the last 22 weeks and the students are showing some phenomenal growth in their reading scores, comprehension, attendance, and improved behavior. We have students moving up anywhere from 2 to 4 grade levels; unbelievable.

When I introduced SPARK to my school board I purchased each board member and my superintendent a copy of your book. Consequently, the board was so impressed with our data and SPARK they gave Roosevelt \$40,000 to purchase equipment so all our students can take advantage of the SPARK program. Once again, thank you for connecting the dots.

Sincerely,

A handwritten signature in black ink, appearing to read "Mike Pickett". The signature is fluid and cursive, written over a light blue horizontal line.

Mike Pickett
Principal, Roosevelt High School

Attachment:



Nutrition

Health

Good Diet, Exercise Keep Brain Healthy

By [LiveScience Staff](#)

posted: 09 July 2008 02:52 pm ET

[Buzz up!](#)

[Comments \(2\)](#) | [Recommend \(7\)](#)

A balanced diet and regular exercise can protect the brain and ward off mental disorders, a new review of research states.

"Food is like a pharmaceutical compound that affects the brain," said Fernando Gómez-Pinilla, a UCLA professor of neurosurgery and physiological science, who has spent years studying the [effects of food](#), exercise and sleep on the brain. His round-up of the scientific truth behind the brain-food connection confirms a lot of what has been suggested before.

"Diet, exercise and sleep have the potential to alter our brain health and mental function," he said. "This raises the exciting possibility that changes in diet are a viable strategy for enhancing cognitive abilities, protecting the brain from damage, and counteracting the [effects of aging](#)."

Gómez-Pinilla analyzed more than 160 studies about food's affect on the brain, an analysis published in the July issue of the journal Nature Reviews Neuroscience.

Omega-3s and mental health

Omega-3 fatty acids — [found in salmon](#), walnuts and kiwi fruit — provide many benefits, including improving learning and memory and helping to fight against such mental disorders as depression and mood disorders, schizophrenia, and dementia, said Gómez-Pinilla, a member of UCLA's Brain Research Institute and the Brain Injury Research Center.

Synapses in [the brain](#) connect neurons, and provide critical functions; much learning and memory occur at synapses, Gómez-Pinilla said.

"Omega-3 fatty acids support synaptic plasticity and seem to positively affect the expression of several molecules related to learning and memory that are found on synapses," Gómez-Pinilla said. "Omega-3 fatty acids are essential for normal brain function."

"Dietary deficiency of omega-3 fatty acids in humans has been associated with increased risk of several mental disorders, including attention-deficit disorder, dyslexia, dementia, depression,

bipolar disorder and schizophrenia," Gómez-Pinilla said. "A deficiency of omega-3 fatty acids in rodents results in impaired learning and memory."

Children and omega-3s

Children who had increased amounts of omega-3 fatty acids performed better in school, in reading, spelling, and behavior, he said.

Improvement in [school performance](#) was observed in a group of students receiving omega-3 fatty acids, according to preliminary results from a study in England. In another study, 396 children in Australia, ages 6 to 12, who were given a drink with omega-3 fatty acids and other nutrients (iron, zinc, folic acid, and vitamins A, B6, B12 and C) showed higher scores on tests that measured verbal intelligence and learning and memory after six months and one year than a control group of students who did not receive the nutritional drink. This study was also conducted with 394 children in Indonesia. The results showed higher test scores in both boys and girls in Australia, but in only girls in Indonesia.

Getting omega-3 fatty acids from food rather than from capsule supplements can be more beneficial, providing additional nutrients, Gómez-Pinilla said.

Scientists are learning which components of omega-3 fatty acids seem to be especially important. One is DHA (docosahexaenoic acid), which is abundant in salmon. DHA, which reduces oxidative stress and enhances synaptic plasticity and learning and memory, is the most abundant omega-3 fatty acid in cell membranes in the brain.

Calorie restriction

Controlled meal skipping or intermittent [caloric restriction](#) might provide health benefits, he said.

Excess calories can reduce the flexibility of synapses and increase the vulnerability of cells to damage by causing the formation of free-radicals. Moderate caloric restriction could protect the brain by reducing oxidative damage to cellular proteins, lipids and nucleic acids, Gómez-Pinilla said.

The brain is highly susceptible to oxidative damage. Blueberries have been shown to have strong antioxidant capacity, he noted. And smaller food portions with the appropriate nutrients seem to be beneficial for the brain's molecules, he said.

Junk food, junk brain

In contrast to the healthy effects of diets that are rich in omega-3 fatty acids, diets with high contents of trans fats and saturated fats adversely affect cognition, studies indicate.

"Junk food" and [fast food](#) negatively affect the brain's synapses, said Gómez-Pinilla, who eats fast food less often since conducting this research.

Brain synapses and several molecules related to learning and memory are adversely affected by unhealthy diets, said Gómez-Pinilla.

Emerging research indicates that when the effects of diet on the brain are combined with the effects from exercise and a good night's sleep, you can strengthen the brain's synapses and provide other cognitive benefits, he added.

He noted that while some people have extremely good genes, most of us are not so lucky, and need a balanced diet, regular exercise and a good night's sleep.

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