



HOT TIPS

A Tip Sheet For Physical Educators

Feature Article

Physical Education, the Brain and Learning: Critical to Thinking!

The 1990's, termed the decade of the brain, have led to great advances in our understanding of the brain, its systems and workings. Researchers in the field of neuroscience have begun to unravel the mysteries of the most complex system in the universe...the human neurological system...in short...the **BRAIN**. The dawning of the new millennium finds the subject of brains increasingly in the media.

From the covers of popular magazines (Newsweek, Time, U.S. News and World Report) to scientific journals (National Geographic, Kids Discovery, Science). From television news shows (Dateline, 20/20), to kids' cartoons (P.B. and J. Otter and the "noodle dance"...), and television shows (Bill Nye the Science Guy and Beakman's World). From cartoon strips (Calvin and Hobbs "I can almost feel my neurotransmitters shutting down") to MTV and the Brainiacs singing "Whatta Brain." Brains are turning into big business! References to, and images of, brains can be seen in advertising (Wonder bread now builds strong bones and brains!) and toys and games (Cranium). Educational journals (Association for Supervision and Curriculum Development journal Educational Leadership, Phi Delta Kappan, NEA Today...) and the world wide web (Neuroscience for Kids, Brainconnection.com...) give access to the proliferation of information in the field of neuroscience. This issue of HOT TIPS will attempt to scratch the surface of neuroscience as it relates to the field of physical education.

Professionals in the fields of health and physical education have long been in the business of helping to build healthy bodies and minds, as well as develop healthful habits for a lifetime. There is a growing body of scientific evidence that indicates that movement, as well as many of the other good habits taught and practiced in physical education, are not only good for bodies, but **CRITICAL TO THINKING!** Let's begin by taking a look at the "gross anatomy" of the brain as it relates to movement.



Gross anatomy

The human brain, "...a three-pound, walnut-shaped mass of gray matter" (Kotuluk, 1997, p.6) "is not a static organ; it is a constantly changing mass of cell connections, that are deeply affected by experience and hold the key to human intelligence" (Kotuluk, 1997, p.13). Our brain was designed for survival, yet we have known little about how it works. The post World War II explosion of research related to head injuries has led to a new explosion of research in a relatively new field of knowledge known as **neuroscience**.

"The brain is organized into systems of connections which do increasingly complex jobs as they mature mainly from inside to outside and from back to front" (Healy, 1994, p.27). The brain stem, at the top of the spine, is responsible for reflexes and basic motor coordination.

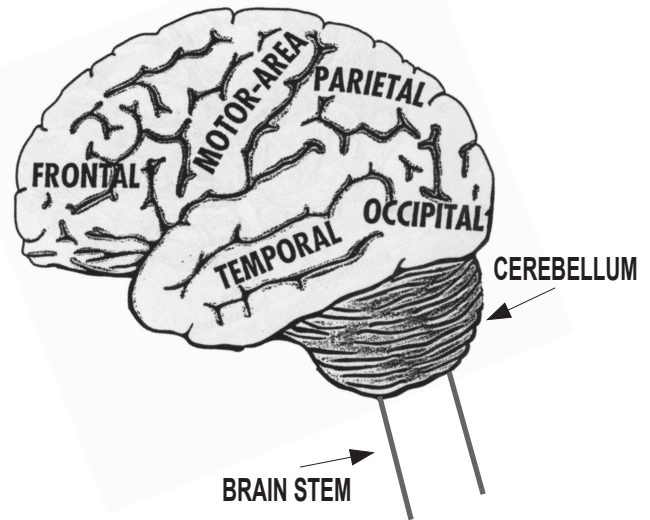
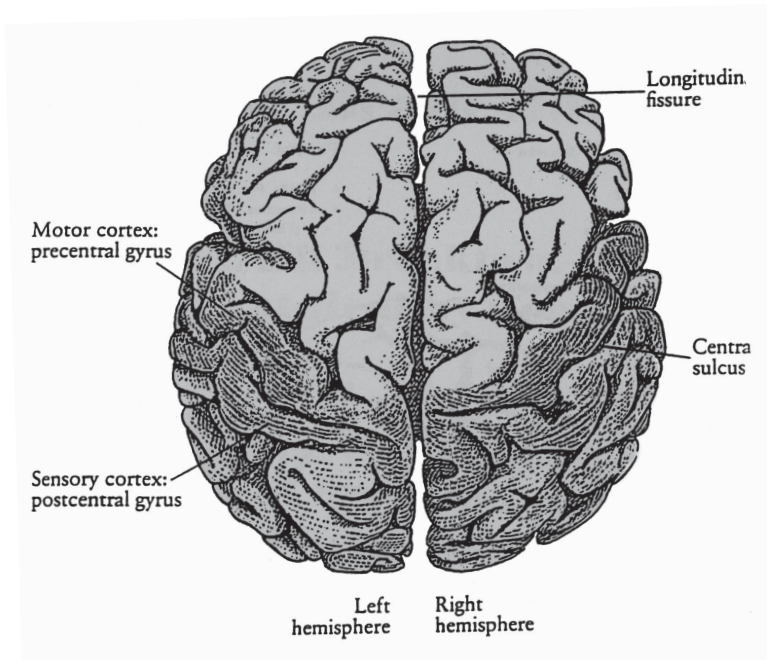


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Written by Ann Griffin. Published by the Adapted Physical Education Department, Grant Wood Area Education Agency, 4401 Sixth Street SW, Cedar Rapids, Iowa 52404. 319-399-6700 or 1-800-332-8488; TDD 319-399-6766. Additional copies are available upon request. Production by Grant Wood AEA Graphics & Printing Staff.

Feature Article cont.

The **neuroanatomy of movement...** brain structures primarily responsible for movement and supporting systems.

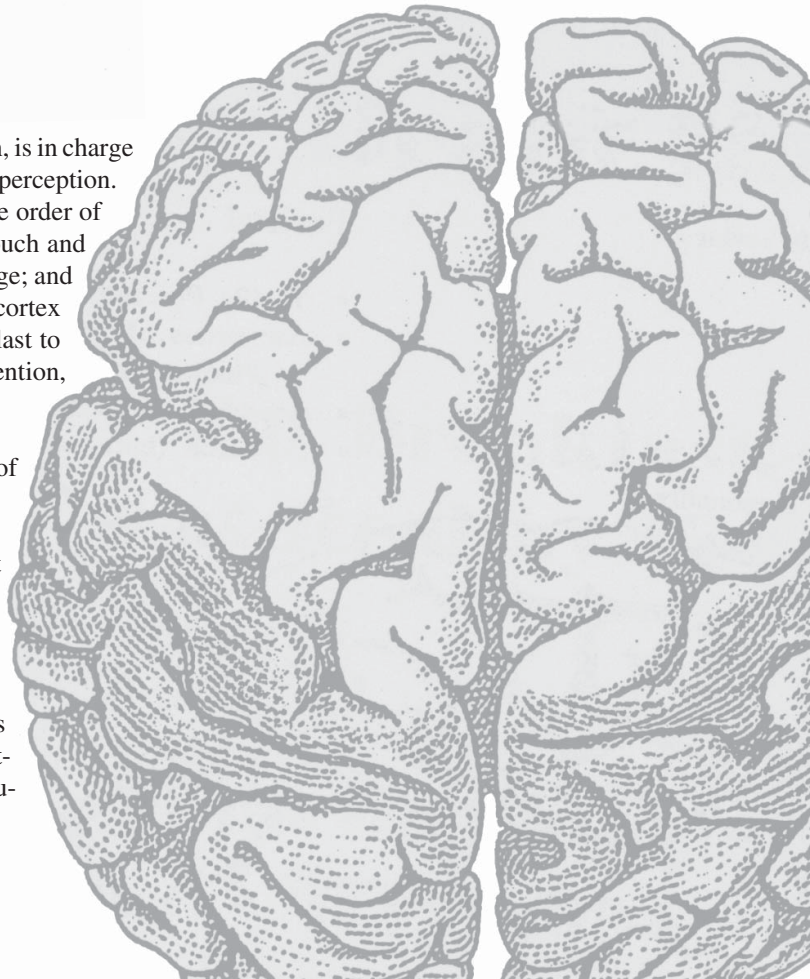


The **Cerebral cortex**, the outer layer of the brain, is in charge of thought, voluntary movement, language, reasoning and perception. The 4 major cortical areas or lobes are listed roughly in the order of their maturation: occipital lobe - vision; parietal lobe - touch and spatial understanding; temporal lobes - hearing and language; and frontal lobes (not fully mature until around age 30) - motor cortex - planning and regulating movement, prefrontal- cortex (last to develop) - in charge of reasoning, memory, self control, attention, planning and judgement.

The **Cerebellum** or “little brain” is in charge of movement, balance and posture.

The **Brain stem**, at the top of the spine, is the first area of the brain to develop. It supports reflexes and basic motor coordination as well as structures that regulate breathing, heart rate and blood pressure.

The **Hypothalamus**, (about the size of a pea), is located at the base of the brain and is responsible for regulating body temperature. The hypothalamus also helps to regulate emotions, hunger, thirst and sleep.



Feature Article cont.

Top 7 Habits of Highly Effective Learners

Daily Habits: Adopt them for yourself and teach them to students

As Abraham Lincoln said



“It is better to build children than repair adults.”

Children intuitively seek activities that help build and positively impact their neurological systems. Think of happy, young children singing, playing, creating, dancing, laughing and moving. It appears that they know what is good for their neurological systems. Here are some daily habits that help to build bodies and minds. There is a growing body of scientific evidence that tells us WHY this is so.

1. FOOD: Eat a balanced diet, eat breakfast, it's critical to thinking

Food for the body equals fuel for the brain. Although the brain is a small percentage of the total weight of the body (about 2% of the adult brain weight of 3.2 pounds), it uses about 20% of the body's fuel. The brain is very energy inefficient (Jensen, 1998, p.10). Brain fuel is oxygen and glucose.

Food supplies the nutrients necessary for learning and exercise helps supply the oxygen (Jensen, 1998, p.25).

“Suffice it to say that failure to consume a balanced diet will take its toll on brain function.” (Howard, 1994, p.81).

“Children who eat a school breakfast perform better on standardized tests, especially language-ability tests...” (Wolfe et.al., 2000, p.54).

“Research on the relationship between a healthful lifestyle and academic achievement supports this equation: good nutrition + exercise = optimal learning” (Wolfe et.al., 2000, p.54).

“Supporting the health of the whole child is clearly essential for optimal achievement” (Wolfe et.al., 54).

2. DRINK WATER, it's critical to thinking

Our bodies, like the world, are about two-thirds water. The brain is made up of a higher percentage of water than any other organ in the body. Allow your students free access to water. Here are some of the benefits to water intake.

“Water provides the electrolytic balance for proper functioning” (Jensen, 1998, p.24).

“Water is essential for supplying oxygen to the brain...Without sufficient oxygen levels, brain function is impaired” (Fahey, 2000, p.60).

“Water is necessary for biological, neurological, environmental, psychological and emotional wellness” (Fahey, 2000, p.61).

3. GET PLENTY OF SLEEP, it's critical to thinking

Researchers largely hold that humans need about 8 hours of sleep per night. Sleep allows the brain to recharge as well as sort the day's experiences and move the important ones to long term storage.

4. MUSIC, it's critical to thinking

Listen to it, sing it, incorporate it in your teaching. It makes moving more fun and has a powerful influence on learning and mood (Jensen, 220). Listening to Mozart or baroque music in and of itself will not make students smarter. Mozart and baroque music are wonderful types of music to use as a cool down, as their tempo is the same as the resting heart rate.

5. LAUGHTER, FUN, AND PLAY, A natural high and critical to thinking

Norman Cousins calls laughter “internal jogging.” Physical education should be full of fun, play and laughter! “Most of us believe that in order to learn something, we must work hard at it, and too many have forgotten that the process of meaningful learning is both fun and exciting” (Healy, 1994, p.41). Laughter is good for the neurological system and results in enhanced respiration (more oxygen for that hungry brain), an increased number of immune cells as well as immune cell growth, a decrease in cortisol (the chemical produced during stress) and an increase in endorphins (literally our morphine within...endorphins make us feel good) (Howard, 1994, p.p.170-171).

Feature Article cont.

In physical education we both teach and actively engage in play...the real work of children. Remember to keep the fun in the play. It is a powerful teaching tool:

*I tried to teach my child from books,
He gave me only puzzled looks,
I tried to teach my child with words,
They passed him by, 'oft unheard,
Despairingly I turned aside,
"How shall I teach this child?" I cried,
Inside my hand he placed the key,
"Come," he said, "Play with me."*

"Play with me" author unknown

6. MOVE AND EXERCISE, it's critical for thinking

From Aristotle who said "Life is movement" to Nike "Just Do It," "The contributions of physical activity to mental performance have been touted for years...But not until recently have research findings supported these claims" (Howard, 2000, p.155). What are we learning? Why are we looking to decrease the amount of time that students spend moving?

"Exciting new discoveries support the link between physical activity and improved learning. Research indicates that exercise increases blood flow to the brain, which allows more oxygen and glucose to flow through the brain (Hanaford 1995), and releases endorphins, which have a positive impact on mood" (Wolfe, et.al., 2000, p.56).

"Sedentary pastimes and high caloric snacking are causing an epidemic in obesity in young Americans: whereas 5 percent of children between six and seventeen were judged to be obese in the 1960's, that rate has climbed to 11 percent in the 1990's" (Diamond, 1998, p.207).

"In 1960, the average 2 year old spent an estimated 200 hours in a car. Today's 2 year old has spent an estimated 500 hours in a car seat!" (Jensen, 21).

"An astonishingly high 64 percent of K-12 American students do not participate in a daily physical education program" (Brink, 1995) (Jensen, 1998, p.85).

"Physical activity improves mental health, cognitive functioning, and academic performance" (Lambert, 2000, p.35).

"...In the same way that exercise shapes up the muscles, heart, lungs, and bones, it also strengthens the basal ganglia, cerebellum, and corpus callosum, all key areas of the brain" (Jensen, 1998, p.85).

"...physical activity is an enrichment for the motor cortex and other parts of the brain (not to mention the whole body), as long as the play is safe and fun" (Diamond, 208).

The evidence is piling up, movement and exercise are good for the body and critical for thinking. In fact, the brain is best suited for difficult mental tasks immediately following exercise. Exercise is also a wonderful way to help set new material in memory (Howard, 170). Advocate for physical education. Kids love it for good reason. It's good for the whole system.

7. SAFETY, Protect your brain from injury, it's critical to thinking

As Marian Diamond said, "...as long as the play is safe and fun"-that's the challenge. Teach your students about the magic of their brains that makes them the unique people they are. Teach and model safe play. Use and make available protective equipment in physical education and play situations. If you are involved in coaching athletics, be sure to check current information relating to sports injuries. The Journal of the American Medical Association, (1999, Vol. 282, pp. 958-963), has documented the incidence of traumatic brain injury in high school athletes. The results may surprise you. The only cure is prevention! Protect your brain, it makes you who you are. Brain injury changes that for life.

Learn about your brain and teach students about their's. As educators who have been teaching those 3 pound universes for years, the more we learn about the complexities of the system, the better able we are to prepare students today for a happy, healthy lifestyle.



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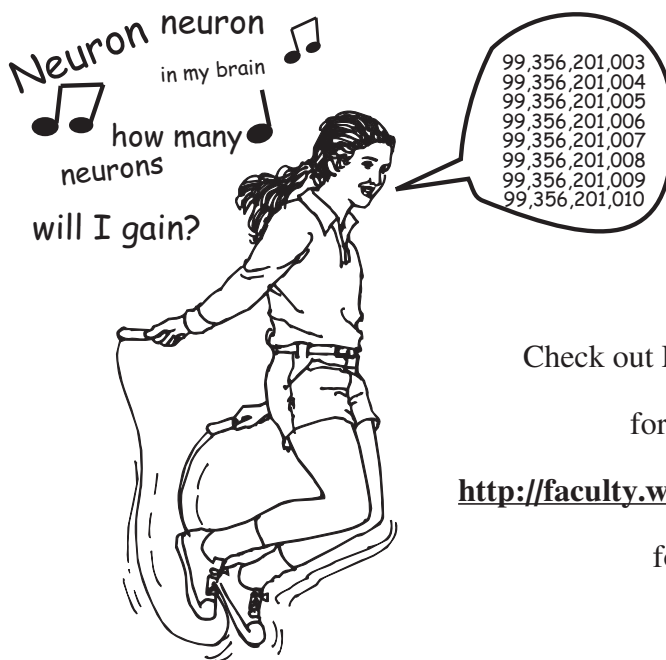
Feature Activity



When teaching students about the brain and neurological systems, vocabulary and concepts can be taught and reinforced through movement (a very brain friendly technique!). Try a rousing game of “synaptic tag” (Chudler, 2000, outside games) where “neurotransmitters” attempt to run across the synaptic cleft from the axon to the dendrite without being caught (reabsorbed) by an enzyme.



Try counting to 100,000,000,000 (the number of neurons in our brain) while jumping rope to the rhyme “Neuron, neuron in my brain, how many neurons will I gain?”



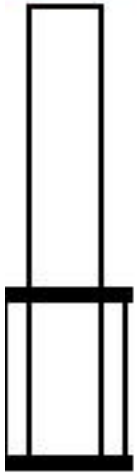
Check out Eric Chudler’s web site Neuroscience for Kids under outside games at

http://faculty.washington.edu/chudler_outside.html#tag

for more detailed directions.

Ideas and Resources

1. Tag stick



Use the tag stick for any tag game. Kids who use wheelchairs can safely tag classmates. Kids who have trouble “catching” their peers, have more success. Kids who have trouble with the force of their tag, can no longer hurt anyone. Everyone knows who’s it!

Materials:

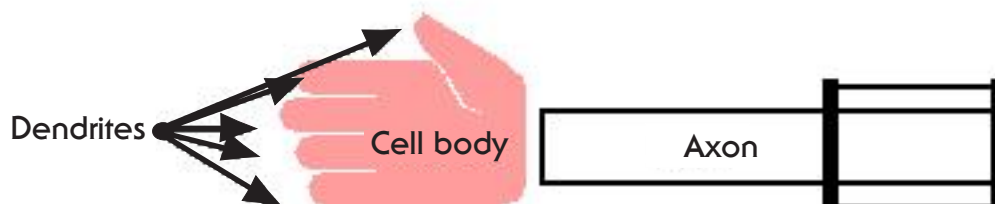
- 1 small glove stuffed with polyfill
- 1/2” foam pipe insulation (comes in 36” lengths)
- hot glue gun
- duct tape

To Make:

- Cut 12” from the end of the pipe insulation tube
- Stuff the longer tube with plastic grocery bags or polyfill
- Hot glue the stuffed glove to one end of the longer tube
- Cut the shorter tube in half length-wise
- Duct tape these two pieces on either side of the longer tube to make a handle on the non-glove end

THE TAG STICK CAN DOUBLE AS A MODEL OF NEURON AS WELL!

Neuron Model



Ideas and Resources cont.

2. A Professional Shot in the Arm!

Professional Assistance online

pe-talk and adapt-talk

Online professional internet community of physical educators. These are e-mail based message systems of questions, responses and comments. Professional content.

To subscribe to pe-talk

via the web: go to <http://www.sportime.com/pe-talk>, click "Subscribe," enter your e-mail address in the box, click "Subscribe" again.

via e-mail: Send the message "Subscribe" (without quotes), to pe-talk-digest-request@lists.sportime.com.

To subscribe to adapt-talk:

via the web: go to <http://www.sportime.com/adapt-talk/> and click "subscribe," enter your e-mail address in the box, click "Subscribe" again.

via e-mail: send the message "Subscribe" (without quotes), to adapt-talk-digest-request@lists2.sportime.com.

3. Brain information web sites:

Teaching and learning: www.brainconnection.com

Neuroscience for Kids: <http://faculty.washington.edu/chudler>



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Sioux Center, IA 51250

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Price Lab School
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