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Nurturing the Body and Mind in Physical Education with Mozart

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Introduction to the Mozart Effect

Society, local communities and school districts want to see test scores improve to a higher level. To everyone's surprise, we all do, teachers, administrators and of course the students. However, everyone cannot get the scores to rise without qualified educators, administrators and innovative strategies. Scholars are continuously seeking that magical answer to make students improve their intellect. So how do we uncover the magical answer to boost test scores. As educators, we must utilize sensible data to substantiate an imaginative proposal. Educationalists enjoy various successful teaching strategies to increase student's intellect abilities. Teachers depend on thorough instructive credentials, experiences and insight to establish an encouraging learning environment. An environment that the physical and emotional threat is minimal and the learning challenges are considerable.

I truly believe that to develop a revolutionary intelligence strategy, one must establish an environment that encourages learning. Secondly, once the optimum learning environment is established, knowing how the child's brain learns. Studying the brain's basic functions must be taking into account, to include a variety of methods to maximize the learner's potential. Therefore the goal of this study is to nurture the body and mind through physical activities along with background music, can motivate and educate the student simultaneously. By reviewing this study, you will be familiar with neural connections and how the brain transforms sound into electrical messages. You will also understand how specific neurotransmitters (chemical stimulus) are cultivated through physical exercise together with setting a musical environmental that stimulates "The Mozart Effect" can improve learning. Together with physical activities and music, educators can develop strategies that can extend instructional strategies by deciphering new learning paradigms with the mind and the human body.

In support of this idea, Leslie Hart, feels that teaching without an awareness of how the brain learns is like designing a glove with no sense of what a hand looks like, its shape and how it moves. Even if you are limited to understanding how the brain functions, reading this study you will be to develop and design instructional settings that focuses on the brain. Brain base compatible strategies with a positive learning environment are the fundamentals to boost learning. Ron Brandt former executive editor of Education Leadership stated that brain science could be translated into strategies for effective teaching.

Brandt believes the thriving research of neuroscience can present educators with an awareness of new

teaching strategies and attitudes that mesh with the mechanism of the biological brain. Understanding basic brain functions and strategies from various researches, the reader can discover useful ideas and activities that bring education to a superior level.

Reante Nummela Caine and Geoffrey Caine synthesized research related to the brain and learning and developed a list of twelve brain/mind learning principles. These principles can function as a theoretical foundation for brain-based learning and offer guidelines and a framework for teaching and learning. Caine and Caine identified three interactive and mutually supportive elements that should be present in order of complex learning to occur. Relaxed alertness is one. This consists of an environment of low threat and high challenge. Orchestrated immersion implies that the teacher becomes the conductor or the architect designing experience that will lead students to make meaningful connections. And finally, active processing of the experiences, which is the basis for making a meaningful, learning event. Reante Caine commented that emotions drives these three elements. By providing meaningfulness to the subject at hand, the student starts learning.

To harmonize an encouraging learning environment along with stimulating learning, research has found a relationship that joins these two with ease, music. Yes, music is a common bond between the two. Music may excite and strengthen these complex patterns in some way and prime the brain for the performance of other higher brain functions". Other benefits, of a more general sense, include the enhancement of self-confidence, growth in physical co-ordination and poise, increase in the ability to concentrate. Alfred Tomatis, a French physician who devoted his career to the physiological effects of sound. Tomatis wrote, "Mozart has a liberating, curative, even heal power. With him, we become what we are." Campbell has stated that playing recording music your child enjoys can create positive physiological effects, including decreased heart rate, less rapid breathing, and lower levels of the stress hormone, cortisol. Music can also distract your child from his/her stressful environment and create a private room of sound that can enclose healing warmth. By aligning physically and emotionally with serene rhythms of Mozart of other classical music, your child may also be able to speed up recovery.

Studies Regarding The Mozart Effect

Briefly, Wolfgang Amadeus Mozart born in 1756 was a child prodigy. He composed more than six hundred major compositions, including operas, symphonies, piano concertos, piano sonatas, and music of other instruments. Mozart's music was remarkable for clarity and efficiency. The rhythms melodies and high frequencies stimulates and charges the creative and motivation regions of the brain. Tomatis found that Mozart, over other musical compositions, calms the listener, improves spatial perception, and allows the listeners to express themselves more clearly.

In 1993, Frances Rausher, Gordon Shaw and Katherine Ky published a brief paper stating whether exposure to certain music could increase a cognitive ability. All thirty-six college students spent ten minutes in each of the three conditions: listening to (1) piano sonata by Mozart (sonata for two pianos in D, K448), (2) a tape of relaxation instructions or (3) silence to see if these conditions improved spatial performance. . Immediately after, they were tested on spatial/temporal reasoning. The measurements of spatial/temporal reasoning were obtained using subtests from a standard intelligence battery of tests, the Stanford-Binet Test. The subtest was a paper folding and cutting task. The subject has to imagine that a single sheet of paper has been folded several times and when various cutouts are made with scissors. The task is to correctly predict the pattern of

cutouts when the paper is unfolded. The researchers found significantly higher scores for the Mozart group than for the relaxation or the silence groups. This study established the term "The Mozart Effect". To further support the idea of using music as a form to promote intelligence, Professors Xiaodan Leng and Gordon Shaw at the University of California at Irvine suggest that "the brain starts out with a certain connective pattern or circuitry in its cells, called neurons, which is highly structured in time and space. Music may "excite" and strengthen these neural patterns in some way and prepare the brain for executing higher brain functions.

Another study explored spatial intelligence with the use of various musical scores while viewing sixteen abstract figures on an overhead screen for one minute each. The exercise tested whether seventy-nine students, could tell how the items would look when they were unfolded. Music selected for this study came from Mozart, Phillip Glass, a dance piece, mixed sounds, an audiotape story and finally silence. The findings were remarkable. The researchers found that listening to Mozart achieved the highest scores. This suggests that listening to Mozart helps organize the firing patterns of neurons in the cerebral cortex, especially strengthening creative right brain processes associated with spatial-temporal reasoning. In other words listening to Mozart can improve your concentration and thus enhance your talent to produce intuitive leaps. The difference translated into spatial IQ scores for the Mozart group there eight to nine points higher than that of the other two groups. However, the positive effect was only brief. The increase of IQ did not last beyond ten to fifteen minutes. To achieve similar successful results when testing the Mozart Effect, even the primary researchers, Rauscher and Shaw (1998) admitted that certain factors must be the same as their original study.

Other researchers have tried to change the variable in order to test the boundaries of the Mozart Effect with few successful results. Of several studies on the Mozart effect, Dr. Kenneth Steele wrote is findings. In an attempt to replicate the Mozart Effect, researchers at Appalachian State University went to great lengths to adhere to the exact procedures of earlier studies. Dr. K. Steele and his associates were unable to prove that listening to Mozart had any effect on spatial reasoning. The group stated, "There is little evidence to support basing intellectual intervention on the existence of the Mozart Effect" .

Changing Auditory Sounds into Neural Messages

To recognize how a combination of mechanical movements to physiological processes, this method of hearing allows humans to interact with a complex environment and communicate, one must be knowledgeable how the brain hears. Sound vibrations enter the ear canal and contact the tympanic membrane producing it to vibrate. These vibrations in turn pass through three bones assembled together called ossicles. The first bone called the malleus is connects directly to the tympanic membrane. The malleus is coupled with the incus, the second bone that in such a way that moves the last bone called the stapes, which is then connected to the cochlea.

For sound to be transduced into neural patterns, the pushing and pulling of the stapes causes pressure to increase and decrease inside the cochlea. These changes in pressure deform the membranes inside the cochlea, which can then stimulate the organ of Corti. The organ of Corti has receptor cells that are cilia (hair like) protrusions. When vibrations travel through the ear, the mechanical movements are transformed into electrical signals, which stimulate the auditory nerve. The auditory neurons of the inferior colliculus project their axons to the thalamus, which in turn relay the information to the primary auditory cortex. Other areas include the secondary auditory cortex, the posterior auditory field and the anterior field. Additionally other

important areas are Wernicke's (area 22) and Broca's (area 44), which is associated with the interpretation and production of language.

Neural Communications

Your brain sends communicative signals through neurons. "The human brain is made up of billions and billions of neurons sending signals to one another in a form of electrical impulses. The sums of their communications combine to form our intellect, feelings, consciousness and thoughts". Highly specialized, neurons are constantly sending signals to one another in a form of chemical impulses to electrical signals and back again. The body and brain respond and adjust to changes or stimuli in the environment. These stimuli, physical or emotional set off impulses. Every time you feel something to include the effects of neurons "firing" to and from one another, messages are passed to connected neurons in the form of chemicals called neurotransmitters. Neurons consist of a cell body, dendrites and axons. While dendrites have many extensions, each neuron has only one axon. Dendrites pass along messages towards the cell body, while the axons sends messages away from the cell body.

However, dendrites and axons are not directly connected to each other. In order to keep from decaying or getting lost, axons are insolated and protected by specialized cells called "Schwann cells", which are covered with myelin. This fatty substance forms around well-used axons and not only speeds up electrical transmissions, (Twelve times as fast), but reduces interference from other nearby reactions. Some axons have gaps between Schwann cells called "nodes of Ranvier". They serve as points along the axon to accelerate messages by leaping from node to node called action potential, traveling hundreds of times faster than messages traveling along the surface of the axon. This action is called "Saltatory conduction". Between dendrites and axons there is a gap called the "synaptic gap". Here is where messages are carried inside a neuron by electrical impulses and then is it transmitted across the synaptic gap from one neuron to another by chemicals stored in the ends of the axons called neurotransmitters.

When the cell body sends an electrical discharge outward, it stimulates the release of stored neurotransmitters into the synaptic gap. Once in the gap, chemical reactions prompt new electrical energy in the receptors to other dendrites. Eventually, this repeated stimulation excites nearby cells, in time the neuron's ability to get excited is developed. Neurons have the ability to excite or inhibit signals from being forwarded. By constructing an environment that can prompt synaptic connections, learning is facilitated. The key to getting smarter is growing more synaptic connections between brain cells and not losing existing connections. It's the connections that allow us to solve problems and figure things out.

How Neural Transmitters Effect Learning

However, certain variables such as different musical formats and different tasks have been found that Mozart and other musical compositions can have a positive effect on emotions, attention and relaxation. Neurobiologist James McGaugh at the University of California at Irvine says that intense emotions triggers the release of neurotransmitters that are fuel for thinking, planning, feeling good and taking action. These excitable chemicals are: adrenaline (stimulates release of glucose), dopamine (produces positive moods),

norepinephrine, peptide (messengers for moods and thinking), serotonin (relaxing/mood regulator) and vasopressin (stress related hormone). . These chemicals can be released in response to exercise.

A neurotransmitter inhibiter called gamma - amino butyric acid or commonly known as GABA, prevents the electrical impulse from moving down the axon. Other inhibitors are mood altering drugs and neurotoxins that change the properties of neurotransmitters and there actions. This inactivation of neurotransmitters is sometimes called "enzymatic degradation".

Physical movements like walking, swimming running increase dopamine production, which is one of the brain's reward chemicals, and modulate our serotonin levels, a mood stabilizer. J. A. Hobson in 1994 stated that when students are drowsy, norepinephrine levels are low or "out of it". As a result, if you stimulate the body to increase stimulating chemical levels, you then can have the brain primed to learn. Teachers ought to recognize that emotional stimuli enhance memory. These concepts can establish the position of exciting the brain by causing the neuron to increase connections with other neurons, which will increase transmission of information.

Approaches to Promote the Brain's Arousal Systems

Physical education teachers by way of this new teaching paradigm can augment the academics by improving brain performance through increasing arousal. With increased physical movement, the hear rate increased and subsequent circulation, as a result arousal. Furthermore, with increased heart rate, it intensifies the circulation of blood to the brain, as a result nourishes key brain areas with oxygen. In conjunction with increased oxygen to key brain areas, stretching also provides an opportunity for the eyes and muscular-skeletal system to relax. By nourishing the brain with neurotropins to enhance growth and greater neural connections between neurons. Researchers James Pollatschek and Frank Hagen Stated "Children engaged in daily physical education show superior motor fitness, academic performance and attitude toward school as compared to their counterparts who do not participate in daily physical education". This increased arousal tends to narrow attention to target tasks. Music has been reported to aid runners in improving performances, increasing focus and reducing stress. Because of our nation's emphasis standards and assessments, physical educators can help by integrating brain related strategies with there our activities to provide worthy alternatives to learning. Dr. John J. Rately, a clinical associate professor of psychiatry at Harvard Medical School presented some of the latest findings. Dr. Rately stated, "physical exercise increases cerebral blood flow and levels of brain cell growth hormone, BDNF" . In at recent discovery at the University of California at Irvine, exercise triggers the release of BDNF, a brain derived neurotrophic factor. This natural substance enhances cognition by boosting the ability of neurons to communicate with each other. At Scripps College in Claremont, California. Two groups of 62 subjects were divided equally into an exercise and a non-exercise group. Those who exercised 75 minutes a week demonstrated quicker reactions, thought better and remembered more. In another note, chronic stress can also accelerate bone loss, impair spatial memory, weaken muscles, elevate blood pressure, impair short term memory destroy neurons in the hippocampus and harden arteries. With sufficient physical exercise you can reduce stress, thus adding another fringe benefit to the body and mind through physical activities.

Van Praag in 1999 conducted animal studies that suggest running and other aerobic activities promote brain cell regeneration and growth . Also, the endorphins that relax us into a state of cortical alertness and reduce symptoms of depression are released through aerobic activity.

Enriching the learning Environment

At the University of Illinois, William Greenough's experimented with enriched environments with rats. Rats that exercised in an enriched environment had a greater number of connections among neurons than those who didn't. The rats also had more capillaries around the brain's neurons than those of sedentary rats. Just as exercise tones muscles, it strengthens basal ganglia, cerebellum, and corpus callosum. By employing background music in the gymnasium, we can create a force multiplier (stimulating neurotransmitters) to supplement the students learning. Physical educators can easily use background music to encourage motivation by intensifying student's emotions. Additionally, initiating non-threatening, highly challenging surroundings created by melodies and physical exercise, the student is in a position to collaborate learning.

Emotions can also affect the learning environment. When emotional pain or negative occurrence can obscure our point of view and thinking. Children have a difficult time in dealing with negative emotions or stressful situations. When children are overwhelmed with these conditions, children desire structured games and positive "time - outs" which helps the child regroup so to speak on their self - esteem. The body is consistently seeking homeostasis to overcome stress and emotional overload. Movement is the body's natural reward. Physical activity causes the body/brain to naturally balance its innate homeostasis. Teachers can also accomplish this by employing music in their classrooms are capable of relaxing children and reducing anger, anxiety and stress levels. With this strategy, teachers can have their students realize their capabilities.

Effects of Musical Scores on Emotions and Moods that Stimulate the learning Environment

Music is one of numerous approaches to influence emotion and moods. Music is a technique to generate an emotional experience that may provide a form to communicate emotions or moods that cannot be captured in words. Music exists because of the need for expression, particularly of emotions, that can only crudely be measured or described in words." Music can rapidly and powerfully set moods and emotions so rapidly than other means. Furthermore, music can envelop a larger environment more rapidly thus, establishing moods and emotions faster than words. You see this occur in major department stores, private health clubs and hospitals. There are various musical arrangements that can be used to arouse. D. E. Berlyne hypothesized that when we listen to music, we unconsciously take account of things such as its complexity, familiarity and novelty. Suggesting, that these variables affects our preferences for music by altering basic brain processes that control our general level of excitability or arousal. Meaning, that any piece of music has an "arousal potential" for an individual. Mr. Berlyne found a link between the extent to which people like a piece of music and how much that music excites them. His findings revealed that a given piece of music evoke to some level of psych-biological arousal.

North and Hargreaves studied music and arousal potential. They found that music evoke emotional reactions by initiating feelings of like/dislike and increasing the level of excitement or arousal. Additionally, commenting that these factors by itself result in a particular emotion, but somehow together they yield actual emotions. Moreover, the study found that listening to the same musical excerpt could produce different emotions in the same person at different times.

In 1994, a study was done to investigate if music can suggest particular emotions or moods to its listeners.

Knowledgeable musicians pre-selected musical compositions to evoke various emotions, such as happiness, sadness, anger and fear. The study examined children between the ages of nine and ten and adults. The listeners would rate the mood or emotion to the music being presented. Results shown that upbeat music generated positive moods or emotions while sad music produced negative feelings. In other words, music is a genuine approach to emotional arousal. Professor Taniguchi of Kyoto University developed a study to investigate if selected background music would aid in the memory of words. He played either happy or sad music while subjects studied words that would reflect emotional arousal. Results show that retention of words that reflected positive or negative feelings better when listening to music associated with that feeling. Therefore, music induced moods and the affective meaning of language enhances memory compared to rote memory.

Rosalie Pratt and her fellow colleagues did a study involving nineteen students with attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD). These disorders are characterized by selective inattention and impulse control problems. The study involved the subjects listening to Mozart as background music at least three times a week. The experimental group shown evidence of improved focus, mood control and social skills. Furthering the success of the study, seventy percent of the experimental group maintained the improvements after six months, implying long-term positive effects.

Dr. Robert Thayer, an expert on mood management wrote a book on what behaviors would you use to reduce nervousness, tension, or anxiety? The college students he interviewed responded with situations such as talking to others, listening to music, positive self-talk to name a few mood enhancers. Of the twenty-one potential mood regulators presented in his survey, music ranked third, only six percent difference between the top ranked mood modulator - talking to others. Apparently the brain can respond to music the same way calming words or a safe environment can achieve. In a study with twenty male Alzheimer's patients, they listened to a thirty-minute music session five times a week for one month. This study shown an increase of norepinephrine and epinephrine during the music therapy. However this success was short lived. These neurotransmitters returned to pre-therapy levels at the end of the study.

Using music as an arousal for the brain can occur, however, you as the producer have the ability to control some variables. The best type of music suited to bring about positive moods and emotions are classical music. Classical music is the most soothing, stimulating, and tranquil. The least effective type of music to use is with lyrics of hate and despair. Heavy metal music and certain rap songs tend to encourage negative moods and poorer arousals. When selecting types of music, find musical scores with only instrumental sonatas. If selecting lyrical music, find ones with positive reflections. These findings may guide future strategies to evoke positive emotions and calmness. Understanding of how music can inspire new learning approaches, present endless possibilities. Using distinctive music such as Mozart and other types to amplify motivation which as a result will stimulate certain chemicals in the body that heighten learning and blood flow. This way I believe educators can recognize the value of utilizing music in promoting a positive learning environment. This approach of student nurturing of the body and mind can be presented through physical activities that will explain brain functions and the learning process.

Educational Relevance

Even so, I believe the brain benefits from music and physical activities by rousing the neural connections to enhance intellectual growth. Marian Diamond, a University of California at Berkeley neuroanatomist, commented on one of her studies "when we enrich the environment, we got brains with a thicker cortex, more dentritic branching, more growth spines and larger cell bodies. Neural connections and synaptic growth varies depending on activity given. Exercise from repeated motor learning, the brain develops greater density of blood vessels. Fredrick Goodwin, former director of the Institute of Mental Health stated, " there is now increasing understanding that the environment can affect you. You can't make a 70 IQ person into a 150 IQ person, but you can change their IQ measure in different ways, perhaps as much as 20 points up or down based on the environment".

Using distinctive music such as Mozart and other types to amplify motivation which as a result will stimulate certain chemicals in the body that heighten learning and blood flow. By making music as a primer to become encouraged to learn, these conditions should be established for greater success. There must be a purpose or assignment in mind. Secondly, the student should be exposed to a specific piece of music for at least ten minutes. And lastly, the assignment must be performed within five minutes of listening to the musical score. If you use a piece of music that makes you feel better, that's arousal. If you hear a piece of music before attempting a task and you perform subsequently better, that's the priming effect. It is worth experimenting with various types of music that may have a greater influence in enriching the learning environment Educators can then be able to recognize the value of utilizing music in promoting a positive learning environment.

This approach of student nurturing of the body and mind can be presented through physical activities that will explain brain functions and the learning process. Selecting physical activities that include vocabulary words relating to the neural connections and the brain, along with selected music that promotes arousal. In this way educators, can present a nurturing atmosphere second to none. Our educational process must continue to investigate new learning strategies so that educators can review innovative teaching approaches and utilize them to their field of expertise. If compelling evidence encourages the use of music throughout educational subjects, then it is imperative to share its value. The majority of educators lack knowledge about the brain and how neurotransmitters levels can be increased through music; therefore they lack the ability to articulate the possible connection of music and the value of the "Mozart Effect". This study presents new teaching strategies that incorporate music that creates a real paradigm shift of expanding learning. Educators with this new insight of brain research can augment their field of expertise. Not only physical educators will be able to present music in their classroom, but all educators else as well. By constructing a learning environment that can support learning, educators will nurture a child's growth.

Lesson Plan 1 "Neural Connections"

Objectives:

a. Students will learn the basic concept of chemical transmissions at the synapse.

b. Students will learn the key names of neurons and neurotransmitters.
c. Students will understand how psychoactive drugs affect neural signals.
d. Students will develop eye hand coordination and teamwork skills through relay race activities.

Materials:

Tape Player

Selection of the following songs composed by Mozart:

1. Eine Kleine Nachtmusik, K525
2. Divertimento in D Major, K 136
3. Allegro con spirito from the Sonata in D Major for Two pianos, K 448
4. Allegro from the Sonata in F Major, K 376
5. Andante from Symphony #13 in F Major, K 112

Anticipatory Set:

At warm - ups begin playing musical scores and discuss how the brain sends messages throughout the body. During warm -ups explain to the class the Mozart Effect and the possible causes of its influence.

Main Activity:

To model the chemical process of the neurotransmitters at the synapse, each student can be a neuron. One arm is the dendrite, the body is the cell body and the other arm is the axon. By arranging students in a circle, "neural connections" can be created. Each student will hold an object: ball, beanbag, or a container of water acting as a neurotransmitter. Students begin passing the neurotransmitter from one student to the next, simulating transmission of information through the neural chain. Here you can discuss the types of chemicals being transmitted and their actions to include myelin, node of Ranvier, and Saltatory Conduction.

The effects of psychoactive drugs or inhibiting neurotransmitters can be discussed when a ball or object is blocked or dropped as it is passed. At the conclusion of this activity students will become aware of the chemical process of neural connections, which sends messages throughout the body.

Homework select one of three handouts in appendix A.

Lesson Plan 2 "Synaptic Tag"

Objectives:

a. Students will learn the names of various neurotransmitters.
b. Students will understand how neurotransmitter inhibitors affect chemical messages.
c. Students will learn the basic process of neural signals.
d. Students will develop their agility and speed while performing this game.

Materials:

Tape Player

Selection of the following songs composed by Mozart:

1. Symphony # 27 in G Major K. 199
2. Symphony # 31 in D Major K. 297
3. Symphony # 39 in E- Flat K 543
4. Andante from the Serenade in D Major K. 250

Anticipatory Set:

Explain to students the components of neurons and how neurotransmitters are important for the transmission of information within the nervous system from one neuron to another. During warm - ups play musical scores and ask for suggestions of other types of music students may want to hear.

Main Activity:

In synaptic tag, the object of the game is to get from one end of the gym (axon) to the other end (dendrites), without getting caught by a neurotransmitter inhibitor (GABA). GABA will be trying to tag or inhibit the exciting neurotransmitters from running across the gym. The teacher will pick one to three players as the "Inhibitors" and the rest of the class will be divided up into "Exciters". The exciters will be divided up into names of exciters, i.e.: dopamine, peptides, adrenaline, etc. When the teacher calls out the name of a specific neural transmitter, those students run to the dendrite side. If GABA tags a runner, they must go back to the axon side of the gym and try again. Give everyone a chance to be an inhibitor and exciter.

GABA's (inhibitor's start in the middle of the Gym)

(figure available in print form)

Homework select one of three handouts in appendix A.

Lesson Plan 3 "Saltatory Conduction"

Objectives:

a. Students will learn the process of Saltatory Conduction.
b. Students will learn about the Schwann cells and the nodes of Ravier.
c. Students will develop eye hand coordination and teamwork while performing group activities.

Materials:

Tape player

Selecting musical scores from the following:

1. Allegretto from the Divertimento in D Major K. 131
2. Divertimento in F K. 138
3. Symphony #33 in B Flat K. 319

Anticipatory Set:

Explain to the students the process of neural signals and how they can "jump" from one node to another, thus increasing the speed of neural transmissions. During warm - ups play various musical scores and have students reflect on which ones that enjoyed and recommendations for future classes.

Main Activity:

To model salutatory conduction; divide class into two or three equal teams. Each player lines up with the next player behind about three feet from each other. Each player represents a Schwann cells and their arms nodes of Ravier. The first player in line is given a ball, which represents the neural signal or action potential. On go, the first player begins passing the ball to the next person in line, until it gets to the end of the line. For variation, have students pass the ball under their legs, or every other person to demonstrate the speed of

neural signals. An additional variation is to have multiple lines work together on the number of balls, (signals can be transmitted) at one time.

Homework select one of three handouts in appendix A.

APPENDIX A

"YOU AND YOUR BRAIN"

Name_____

Brain Jobs

Your brain has many different jobs. Name at least three jobs of your brain.

1.

2.

3.

Keeping Your Brain Healthy

Your brain is the most important organ in your body and it is up to you to keep it healthy. What can you do to keep your brain in top condition?

"NEURONAL CONNECTIONS"

Name_____

The Brain's Workers: Neurons (Nerve Cells)

There are 100 billion nerve cells or "neurons" in the brain. Neurons are like little batteries that send, store and receive information. Draw a picture of a neuron and label its parts (axon, dendrites, cell body, synaptic terminal). For more information see website:

http://faculty.washington.edu/chudler/cells.

(figure available in print form)
"THE BRAIN WHEEL"

Name_____

The brain is made up of 100 billion nerve cells ("neurons"). A neuron has special parts: the cell body, the axon, the axon terminal and the __ __ __ __ __ __ __ __. To find out what this last part of the neuron is, fill in the spaces below this picture with every other letter on this wheel. Start with the letter "D" (it is already filled in) and go around the wheel in the direction of the arrow.

(figure available in print form)

Teacher Resources

Eric Jenson *Introduction to Brain Compatible learning* The Brain Store Inc. 1998

Eric Jenson *Music with the Brain in Mind* The Brain Store Inc. 2000

Eric Jenson *Brain Compatible Strategies* The Brain Store 1997

Eric Jenson *Teaching with the Brain in Mind* Association for supervision and Curriculum Development 1998

Paul Dennison Ph D. Gail Dennison *Brain Gym* Edu-kinesthetics Inc. 1998

Eric Ballinger *The Learning Gym* Edu-Kinesthetics Inc. 1992

Lisa Chipongian "Can Music Education Really Enhance Brain Functioning and Academic Learning?" http://www.BrainConnection.com May 2000

N.M. Weinberger " Threads of Music in the Tapestry of Memory", MuSICA Research Notes: V IV, I http://musica.uci.edu/mrn Spring 1997

Cathie Summerford, *PE-4-ME Teaching Lifelong Health and Fitness* , Human Kinetics, 2000

Parent Resources

Sharlene Habermeyer *Good Music, Brighter Children* Prima Publishing 1999

Don Campbell *The Mozart Effect for Children* William Morrow 2000

Don Campbell *The Mozart Effect* Avon Books 1997

Student Resources

Rebecca Treays, *Understanding Your Brain* ,SBORNE 1996

Pete Rowan Dr. *Big Head a book about your brain and your head* , Alfred A. Knopf, New York 1998

Kate Barnes and Steve Weston, *How it Works, The Human Body* , Barnes & Noble Books, New York 1997

Electronic Resources

1.http://faculty.washington.edu/chudler/neurok.html Neuroscience for Kids has been created for all students and teachers who would like to learn more about the nervous system. Enjoy the activities and experiments on your way to learning more about the brain and spinal cord.

2. http://www.brainconnection.com/ BrainConnection.com is a Web resource from Scientific Learning

3. http://www.musicintheclassroom.com/ Musician Gary Lamb creates musical melodies with 60 Beats per minute for educators and administrators to incorporate in their schools.

4. http://www.pelinks4u.org/ Physical educators, coaches and athletic directors will find this site with numerous articles and information.

5. http://www.brainplace.com Various topics relating to the brain.

Music Resources

Wolfgang Mozart "Eine Kliene Nachtmusik" K.525, *Mozart For Your Morning Workout* Phillips Music Group 1999 5:25 Track 1

Wolfgang Mozart "Symphony No.27 in G", K.199, *Mozart For Your Morning Workout* Phillips Music Group 1999 4:37 Track 5

Wolfgang Mozart "Symphony No.33 in B Flat", K.319, *Mozart For Your Morning Workout* Phillip Music Group 1999 3:26 Track 14

Wolfgang Mozart "Allegro Con Sprinto from the Sonata in D Major for two pianos", K.448 *Music For The Mozart Effect* " Spring Hill Music 2000Disc A Track 8 8:37

Wolfgang Mozart "Romance From Concerto #20 in D Minor", K. 466, *Music For The Mozart Effect* Spring Hill music 2000 Disc B Track 6 9:01

Wolfgang Mozart "Divertimento in D Major", K 136, *Mozart For Your Morning Workout* Phillips Music Group 1999 4:37 Track 8 2:44

Wolfgang Mozart "Allegro from the Sonata in F Major", K 376, *Music For The Mozart Effect* Spring Hill music 2000 Disc A Track 3 4:47

Wolfgang Mozart "Andante from Symphony #13 in F Major", K 112, *Music For The Mozart Effect* Spring Hill music 2000 Disc A Track 2 4:37

Wolfgang Mozart "Symphony # 27 in G Major", K. 199, *Mozart For Your Morning Workout* Phillips Music Group 1999 Track 13 4:38

Wolfgang Mozart Symphony # 31 in D Major K. 297 "Paris", *Mozart For Your Morning Workout* Phillips Music Group 1999 Track 6 3:30

Wolfgang Mozart "Symphony # 39 in E- Flat", K 543, *Mozart For Your Morning Workout* Phillips Music Group 1999 Track 7 5:28

Wolfgang Mozart "Andante from the Serenade in D Major", K. 250 *Music For The Mozart Effect* Spring Hill music 2000 Disc B Track 5 7:31

Wolfgang Mozart "Allegretto from the Divertimento in D Major", K. 131250 *Music For The Mozart Effect* Spring Hill music 2000 Disc B

Track 7 3:06

Wolfgang Mozart "Divertimento in F Major", K. 138, *Mozart For Your Morning Workout* Phillips Music Group 1999 Track 12 2:23

Wolfgang Mozart "Symphony #33 in B Flat", K. 319, *Mozart For Your Morning Workout* Phillips Music Group 1999 Track 14 3:26