THE EFFECTS OF MOVEMENT BASED INTERVENTION PROGRAMS ON LEARNING IN GRADES K-12

by

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Abstract

Brain Gym and Orton-Gillingham are commonly implemented intervention programs incorporating physical movement. Studies involving physical activities effects on the brain, Brain Gym research, and Orton-Gillingham's effectiveness are discussed. The studies of the intervention programs were geared toward K-12 grade students with mixed abilities. While brain research and learning theory supports the use of physical movement to improve learning, empirical evidence to support the intervention programs is lacking.

Chapter I: Introduction

The benefits of physical exercise for health and fitness are seldom questioned. Effects of movement on academic performance and cognitive development are often controversial and underrated. Physical education improves health, self-esteem, builds interpersonal relationships, responsible behavior, and independence (Polar, 2003). A growing body of research suggests that physical activity is integral to keeping cognitive processes sharp and that the brain can be changed by certain kinds of stimuli, including movement. Intervention programs that use physical activity, like Brain Gym or Orton-Gillingham, are gaining wider acceptance among educators.

Statement of the Problem

The Delta-Schoolcraft Intermediate School District encourages the use of movement based intervention programs to enhance skill acquisition in reading. In No Child Left Behind the focus of the law requires individual schools and school districts to use research-based reading remediation programs so that all students will be reading at grade level or above by the end of grade 3 (Wright, 2009). In a time when accountability is a high priority it seems feasible to ensure that teaching practices are research based and not deemed anecdotally successful.

Research Question(s)

To what extent should intervention programs, such as Brain Gym and Orton-Gillingham, that incorporate physical movement, be used as an instructional tool to enhance academic achievement?

Does scientific research support the use of Brain Gym and Orton-Gillingham as acceptable remediation programs for compliance with No Child Left Behind?

Definition of Terms

Research-Based Interventions: Include empirical examination and professional insight (Burns, 2008).

Kinesiology: the science or study of movement (Wikipedia, 2009).

Chapter II: Review of Literature

The purpose of the following review is to (a) summarize and describe brain research about physical activity, (b) describe a well recognized learning theory that accepts physical ability as a form of intelligence, (c) summarize research on the effects of Brain Gym, (d) summarize research on the effects of Orton-Gillingham.

Movement and Brain Function

The cerebrum is the largest part of the human brain. This is the most visible structure in the brain and is often associated as the brain when viewed in specimens. The cerebrum has two halves or hemispheres, right and left. These hemispheres, connected by nerve bundles, are divided into four lobes. This portion of the brain contains the frontal lobe, parietal lobe, temporal lobe, and occipital lobe, responsible for language and communication, movement, sense of smell, and memory (Reedy, 1999).

Located behind the cerebrum is the cerebellum, or little brain. The cerebellum plays an important role in sensory perception and motor movement. Sensory perception is the process of acquiring, interpreting, and organizing information received from the five senses. The cerebellum is connected by neural pathways to the motor cortex, located in the cerebrum, responsible for sending signals to muscles throughout the body causing movement (Reedy, 1999).

Physical activity was shown to contribute to the development of the cerebellum in several studies involving animal models. In a 2004 study by Hillman et al., involving 32 Caucasian participants, high and moderately physically active older adults displayed an increase in cognitive control when compared to inactive adults their age or younger. Researchers believe the cerebellum affects spatial perception, memory, attention, language, information processing, and decision making (Reedy, 1999). The cerebellum is also involved in the process by which novel tasks, when practiced, can become automatic. Sequences of movements practiced over time, improve motor performance through greater speed and accuracy. The cerebellum is connected to regions of the brain that perform mental and sensory tasks and can automatize mental and sensory skills, too (Leiner, 1997).

Skills involved in human communication require motor and mental activity. Motor activity dictates gesture and mental activity organizes what is to be said and retrieves vocabulary from the brain. When practiced, these skills can be performed without attention to detail, or automatically by the cerebellum. Automaticity in language and math acquisition is a key sub skill in cognitive development. When new knowledge is practiced and becomes automatic it frees up cognitive “desk space” for other processing to occur (Leiner, 1997).

Connected to the brain and spinal cord is the brain stem. The brain stem is the lowest part of the brain that sends and receives information through the spinal cord. The brain and body work as an integral unit due to the central nervous system, which starts at the brain and extends through the whole body. Different parts of the brain and body receive information through nerve cells and nerve fibers or axons.

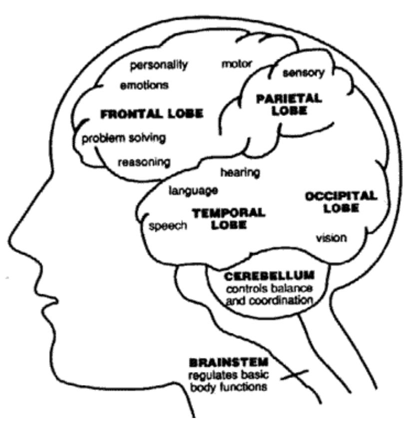

Figure 1. *Parts of the Brain* (Courtesy of Wikipedia Online Encyclopedia)

Nerve cells or neurons are excitable cells that process and send information. Nerve cells contain three parts, the cell body, dendrite tree, and axon, necessary for communication via chemical and electrical synapses between nerve cells. Through the process of myelinization, neural pathways across the brain begin to develop (Sorgen, 1998). Myelin, a fatty insulating substance covering axons, controls the conduction of signals along nerves and increases the rate at which information is sent along the axon. The process of myelinization allows children to develop motor function. Nerve cells modify their properties under the influence of external stimuli. This plasticity is the basis for learning and adaptation. Movement, as a sensory-motor event, helps process understanding of the physical world in which all learning derives (Fredericks, n.d.).

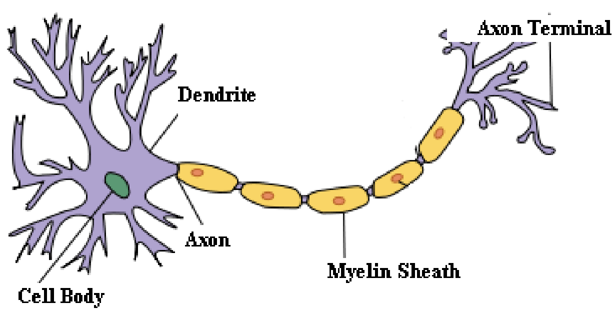

Figure 2. *Nerve cell* (Courtesy of Wikipedia Online Encyclopedia, but changed for use)

The brain uses 20% of the body's oxygen to survive. The oxygen is carried throughout the brain by capillaries. Without oxygen, nerve cells in the brain begin to die. Research involving regular aerobic activity concludes that physical activity increased the number of capillaries in the brain, which aide in the absorption of nutrients and elimination of waste (Pangrazi, 2003). Researchers from the McKnight Brain Institute of the University of Florida found that lifelong exercise decreased cellular aging in the brain. The research showed that moderately active rats have more hearty brain cells than sedentary rats, leading researchers to believe that regular, mild, aerobic exercise can prevent brain deterioration in humans too (Flora, 2005).

The hippocampi, commonly known as the hippocampus, are located on each side of the medial temporal lobe in the cerebrum. It plays an important role in memory and spatial navigation. Damage to the hippocampus can start due to oxygen starvation and symptoms include memory loss and disorientation, commonly found in Alzheimer’s patients. An animal study at the Salk Institute suggested that running benefited the hippocampus, important for memory and spatial orientation. The sedentary, control mice showed lowered performance on spatial learning tasks than active mice (Gabriel, 2001).

Gardner’s Multiple Intelligence Theory

About one hundred twenty years ago, physicians interested in promoting health through exercise founded the field of physical education in the United States. In the early twentieth century, sports and athletics gained wide social acceptance. Early theorists believed that movement caused neural organization and is necessary for children’s optimal functioning and development (Fredericks, n.d.).

The theory that there are several aspects to human learning is as old as the ancient Greeks. Plato was one of the first philosophers to accept multiple intellectual aspects in the human mind. The Greek educational system was based on nine muses that embraced predispositions. Polimnia, Erato, and Calliope represented literature in the form of rhetoric, lyric, and poetry. The muse of music was Euterpe. Terpsicore represented athletic ability. Urania, the muse of astronomy, brought mathematics forth. Clio signified logic through history, and Melpomene and Talia, the muses of comedy and tragedy, represented personal intelligence (Calvin-Campbell, 1998). Educational curriculum has changed throughout history focusing on linguistic and mathematic ability solely. During the psychometric and behaviorist eras, it was believed that human beings began as a blank slate and could be trained to learn anything. Howard Gardner questioned intelligence as a single entity, resulting from a single factor that can be measured via IQ tests.

Gardner presented his theory of Multiple Intelligences in 1983, in his book *Frames of Mind*. Believing that the western definition of intelligence was too narrow, he studied a wide variety of individuals and challenged the long believed notion that intelligence was static and did not change with age or experience. These participants included prodigies, gifted individuals, brain-damaged patients, normal children and adults, experts in the work field, and individuals from diverse cultures. Gardner based his belief on evidence that human abilities can be destroyed or spared in individuals with brain damage, indicating that the nervous system allows certain kinds of intelligence to persist.

Gardner isolated several specific areas of human intelligence, calling these multiple intelligences. Originally seven intelligences were defined by Gardener as linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. He added naturalist intelligence in 1999 and is looking at spiritual, existential, and moral intelligence (Smith, 2002). Gardner understood that none of the intelligences work independently of the other, but that certain individuals display varying degrees of strength in certain areas. The multiple intelligences are briefly defined in Table 1.

Eight Intelligences of Gardner's Multiple Intelligence Theory

Logical-mathematical	Individuals are good at reasoning, logic, and numbers. It ties strongly to the traditional concept of intelligence or "IQ".
Linguistic	Typically good at reading, writing, and telling stories. Learn best by reading, taking notes, and listening to lectures.
Musical	Sensitivity to sounds, rhythms, tones, and music. Auditory learners that may use songs to memorize information.
Spatial	Can visualize and mentally manipulate objects, with a strong visual memory and are often artistic.
Bodily-kinesthetic	Individuals learn better involving muscle movement and are generally good at sports or dance.
Interpersonal	Learn best working in groups and enjoy discussion or debate. These individuals are generally characterized by their sensitivity towards others.
Intrapersonal	Typically like to work alone and are introspective. They are typically perfectionists.
Naturalist	Good at recognizing and classifying things in nature. They must connect prior knowledge to a new experience in order to learn.

Table 1: *Gardner's Multiple Intelligences* (Gardner, 1999)

While empirical evidence should support Gardner's theory, due to a lack of tests to measure the different intelligences, he recognized that it had not been subjected to strong experimental tests. In the field of psychology, Gardener's theory was not widely embraced, however the field of education has tried to implement it into practice. Project Zero researched this impact in 1992 by interviewing principals from eleven schools that have integrated the theory and making site visits of schools. The researchers, using interviews and site visits, found that embracing the multiple intelligences gave teachers a better vocabulary in describing students' strengths, validated differentiated instruction, encouraged teachers to work together, and gave children from different cultures rich experiences.

Brain research suggests that a variety of experiences, or stimulations, changes the structure and adaptability of the brain. In a 2008 quantitative study, by Douglas, Burton, & Reese-Durham, fifty-seven eighth grade students were split into two groups, an experimental group with 28 students and a control group of 29 students. One classroom was taught utilizing activities to enhance learning through the use of multiple intelligences and the other received direct instruction. The timeline was one semester and the participating teachers used the same instructional materials in each class. Data was collected using student performance on a standardized mathematic test, administered before and after instruction, and other forms of assessment including surveys, journals, and observations. The test was comprised of state content expectations and accounted for the different learning levels in the classroom. The students whose teachers incorporated activities to learn through multiple intelligences scored 25.48 points higher on the mathematic post-test and expressed better interest in the subject matter, compared to students taught using direct instruction gaining 17.25 points. The results of this study indicate that multiple intelligences as a teaching strategy can improve scores on standardized achievement tests and enhance the learning experience. The body, as a sensory response system, facilitates learning and aides the brain in organizing information. Bodily-kinesthetic learning activates the wiring in the brain and makes the whole body an instrument of learning (Fredericks, n.d.).

Brain Gym

Dr. Paul Dennison and Gail Dennison developed Brain Gym, also known as Educational Kinesiology, in the 1970s (“Official Brain Gym Web Site”, 2008). The Dennisons’ view of learning through movement aligns well with Howard Gardner’s bodily-kinesthetic intelligence. Dr. Paul Dennison collaborated with chiropractor Richard Tyler known for practicing alternative medicine and applied kinesiology. Applied kinesiology, a diagnostic tool that measures muscle strength, has long been criticized on empirical grounds and is considered a pseudoscience by practitioners (Wikipedia, 2009). Dennison trademarked his Brain Gym tool as learning through movement, otherwise known as educational kinesthetics, and incorporated yoga and acupressure into the program. The Brain Gym program consists of twenty-six physical activities that are supposed to activate the brain, foster neurological repatterning, and contribute to whole brain learning (Hyatt, 2007). The program was based on the assumption that learning problems occur when different sections of the brain and body do not work in a corresponding way, hindering the ability to learn, an idea that was also embraced years earlier by Dr. Samuel Orton (Hyatt, 2007).

Laterality, focusing, and centering are the theoretical basis on which brain functioning is conceptualized, according to Dennison and Dennison ("Official Brain Gym Web Site", 2008). Laterality is responsible for coordinating the right and left-brain hemispheres, which is important for reading, writing, listening, and the ability to simultaneously think and move. Focusing is the ability to coordinate thinking between the front and back portion of the brain and is used for comprehension and attention. Centering seeks to coordinate the bottom and top halves of the brain and balances rational thought with emotional well-being.

Neurological repatterning is based on the Doman-Delacato theory of development. This theory suggests that to achieve proper neurological development, the individual must acquire certain prerequisite motor skills before cognitive development can occur. If any of the motor skills in a developmental stage are skipped than learning ability is hindered (Hyatt, 2007). For example, a child who walked prior to crawling would have missed a necessary developmental skill and will later have problems with reading ability. Teaching the child to crawl would properly repattern the neurons. Once the motor skill is mastered, the child is ready to acquire academic skills. Unfortunately, the Doman-Delacto theory of development has undergone limited empirical testing by the American Academy of Pediatrics and the relationship between repatterning and increased learning was inconclusive (Hyatt, 2007).

Brain gym literature suggests that the brain can be partitioned into different sections, and that simple movement activities can improve neurological development and learning. Developers of Brain Gym own the copyright for the movement activities, so none will be described in detail. Some movement activities included are crawling, drawing, tracing symbols in the air, yawning, and drinking water. None of the Brain Gym activities include academic instruction as a component, but are necessary to get the student ready to learn. Brain Gym does not offer an assessment regime to determine which of the three dimensions of the brain require attention or which movement is more appropriate.

Brain Gym materials have fostered the notions of whole brain learning and exercises to activate the brain, but offer no scientific support for these foundations. While brain research has provided information on the formation of neurons and synapses, it has not provided a means to translate this into educational practice. In spite of the lack of research supporting the foundations of Brain Gym, some research has been conducted regarding the use of Brain Gym.. These studies failed to report that Brain Gym supports academic learning. The majority of the studies listed were not published in peer-reviewed journals available through academic libraries (Hyatt, 2007). Many are sold by Brain Gym to promote the treatment or published in the Brain Gym Journal. Due to the lack of empirical research and quality of the methodology in current research, Brain Gym cannot be considered a research-based intervention program. Table 1 contains a summary of this research.

Reference	Study Design	Sample Size	Intervention	Summary of Results	Test Method
Maskell, B., Shapiro, D., & Ridley, C. (2004)	Randomized, Controlled Study	42 - 1st Grade Students	16 lessons to develop an overhand throw outlined over a 5-week period using 6 Brain Gym midline crossing movements	Brain Gym had no effect on the process of learning overhand throws for 1st grade students.	Test of Gross Motor Development 2nd Edition Skills practice time was measured
De los Santos, G. (2002)	School 1: Experimental Group School 2: Control Group	Experimental Group: 390 students Control Group: 596 students ages preK-Grade 5	Experimental Group: played classical music and did Brain Gym for 20 minutes per day Control Group: regular instruction 1 year intervention	The role of Brain Gym used for academic gain for students in grades preK-5 is unclear.	Increase in mean scores on an academic test
Witcher, S. (2001)	Randomized, Controlled Study	126 Kindergarten Students	Brain Gym exercises used for 8-10 minutes per day for one school year.	The benefits of Brain Gym may be gender specific when considered with socioeconomic status.	Phonological Awareness Literacy Screening Test
Templeton, R. & Jenson, R. (1996)	Cohort Study Treatment group served as own control	28 - 4th Graders	Brain Gym exercises two times a day for 7 weeks.	Brain Gym provides movement and choices.	Inventories, Observation, Structured Interviews
Cammisa, K. (1994)	Cohort Study Treatment group served as own control	19 boys, 6 girls identified as learning disabled, mixed ages from 7-17	Unspecified Brain Gym movements provided by a certified instructor for 1 year.	Brain Gym may provide beneficial for improving perceptual skills in learning disabled children. The role of Brain Gym in academic skills is unclear.	Pre- and posttest for perceptual and academic tests Paired *r* tests
Carter, T., Caricato, S., & Thatcher, B. (1993)	Cohort Study Treatment group served as own control	10 - 2nd Grade students with and without learning disabilities	Personalized Brain Gym activities for each student.	No statistical analysis to assess the probability that the treatment effect occurred by chance. The role of Brain Gym in academic skills is unclear.	Piers-Harris Self Concept Scale, Kuhn Twenty Statement Self-Concept Scale, SRA Achievement Test
Caricato, S., Thatcher, B., & Carter, T. (1992)	Cohort Study Control group consisted of Kindergarten and 1st grade students	23 - 2nd Grade students with and without learning disabilities	Daily personalized Brain Gym movement routine Classes participated in a group speech/language group for speaking & listening once a week 1 year intervention	No statistical analysis to assess the probability that the treatment effect occurred by chance. The role of Brain Gym in relation to academic skills is unclear.	Piers-Harris Self Concept Scale, Inferred Self-Concept Test, Class Listening Assessment, Achievement testing in reading, writing, and math

Table 1: *Overview of Brain Gym Research* (Feller & Hyatt, 2007)

Orton-Gillingham Reading Instruction

Orton-Gillingham is a systematic, multisensory approach to phonics instruction. The approach utilizes visual, auditory, and kinesthetic/tactile learning pathways, often referred to as the Language Triangle. In the early part of the 20th Century, Dr. Samuel Orton, a child neurologist, estimated that 10% of the school population had reading disabilities. He formed a hypothesis as to the causes of dyslexia, which were the twisting of symbols and lack of brain hemisphere dominance resulting in mirror images (i.e. letter reversals such as, b for d). In 1960 Anna Gillingham and Bessie Stillman developed a curriculum based on Orton's instructional approach.

This curriculum contained movement activities including tracing, finger spelling, and arm spelling. Tracing is used to improve reading errors. Students use the first two fingers on their writing hand to trace letters, in the air, on a textured surface, or in a sand tray, and simultaneously say the sounds. The finger spelling technique, used for spelling errors, separates the sounds in a word by subsequently lifting one finger as the sounds are said. Arm spelling separates the sounds in the word by having the student start at the shoulder, opposite the writing hand, and tap out the sounds in the word, moving down the arm. When all the sounds are tapped, the hand is placed back up to the shoulder and slides down the arm, while the student blends the word.

Orton-Gillingham techniques have been used for almost five decades as a reading intervention strategy for children with reading difficulties. The Florida Center for Reading Research reported in 2006 that it was unable to identify empirical research to support the approach used in the Orton-Gillingham Reading Program. A variety of studies incorporated

Orton-Gillingham in combination with other techniques, so the effects of Orton-Gillingham on reading achievement were unclear.

Only a dozen studies, with inconsistent results and methodological flaws, are reported for the Orton-Gillingham approach and other reading methods derived from Orton-Gillingham, such as Alphabetic Phonics or Project Read (Ritchey, 2006). Current research is inadequate, due to the number of studies published in peer-reviewed journals and the quality of the research, to suggest that Orton-Gillingham is a scientifically based program. Table 2 contains a summary of this research.

Reference	Study Design	Sample Size	Intervention	Summary of Results	Test Method
Joshi, R., Dahlgren, M., & Boulware-Gooden, R. (2002)	Quasi-experimental	56- 1st Grade Students	Experimental Group: Language Basics (based on Alphabetic Phonics) Control Group: regular instruction	OG based program outperformed the basal instruction for phonics, word attack, & comprehension.	Test of Phonological Awareness, Wide Range Achievement Test (word attack), & Gates MacGinitie Reading Test (comprehension)
Hook, P., Macaruso, P., Jones, S. (2001)	Quasi-experimental	31- 7-12 year olds	Experimental Group: OG Control Group: Fast For Word Intervention at summer clinic	OG outperformed Fast For Word Program in word identification & word attack. Both programs showed significant growth on the Lindamood Auditory Conceptualization Test.	Wide Range Achievement Test (word attack & word identification) & Lindamood Auditory Conceptualization Test
Foorman et. al. (1997)	Quasi-experimental	114- 2nd and 3rd Grade students with reading disabilities	Experimental Group: Alphabetic Phonics (based on OG) Control Group: Analytic phonics instruction & Sight word reading instruction Intervention in Resource classroom	Alphabetic Phonics significantly outperformed Analytic phonics in phonological processing, orthographic processing, & word reading; Alphabetic Phonics significantly outperformed Sight word reading instruction in phonological processing & word reading. When covariates were controlled for there were no longer significant differences among the programs.	Phonological Processing, Orthographic Processing, & Woodcock Johnson Psycho-Educational Battery-Revised
Dooley, B. (1994) unpublished	Quasi-experimental	151- 7th Grade remedial reading students	Experimental Group: Alphabetic Phonics (based on OG) and cooperative learning groups Control Group: regular instruction	Alphabetic phonics & cooperative learning groups outperformed traditional instruction in all areas, except general vocabulary	Stanford Diagnostic Reading Test (reading rate & word attack), Test of Reading Comprehension (general vocabulary, syntactic similarities, paragraph reading, & sentence sequencing), & Test of Written Language (thematic maturity & contextual style)
Westrich-Bond, A. (1993) unpublished	Quasi-experimental	72- 6-12 yr. Olds with learning disabilities	Experimental Group: OG, Control Group: regular instruction	No significant differences for type of reading instruction	Woodcock Reading Mastery Test (word identification & word attack)
Simpson, S., Swanson, J., & Kunkel, K. (1992)	Quasi-experimental	63- 13-18 yr. old boys	Experimental Group: OG, Control Group: Remedial English Instruction	OG outperformed Remedial English Instruction, students receiving more than 50 hours of instruction made more growth	Woodcock Reading Mastery Test

OG = Orton-Gillingham Instruction

Table 2: Overview of Orton-Gillingham Research (Ritchey, 2006)

Chapter III: Results and Analysis Relative to Problem

Physical activity improves health and overall fitness. Brain research shows that movement promotes the health and production of nerve cells, benefits the hippocampus, and provides oxygen to the brain. Brain research does not carryover to educational practice. Gardener's Theory of Multiple Intelligences includes bodily/kinesthetic intelligence, but no study confirms that movement for these learners improves academic performance. This review also highlights the inconsistency between research and educational practice.

For decades researchers have lamented the "research to practice gap", or reluctance of educators to incorporate practices that have been developed and validated by research (Ritchey, 2006). In the case of these intervention programs, it appears that the opposite has occurred. Despite the use of Brain Gym and Orton-Gillingham by teachers for a variety of purposes over a number of decades, neither intervention program has enough solid, empirical evidence that is reported in peer-reviewed journals.

The Dennison's marketed their product as a new approach to learning with poor evidence to support their claims that Brain Gym would help students learn faster, perform better, sustain focus, overcome learning challenges, and execute assignments with ease ("Official Brain Gym Web Site", 2008). Unfortunately, much of the research has been inadequate. One study only had four participants, including the author of the study. Three others were published in journals that require the author to pay for inclusion in the journal.

Brain Gym International, owned by the Educational Kinesiology Foundation, has a listing of research done to support the program. The studies listed have been published in the Brain Gym journal and do not appear to have been replicated. Copies of the studies are available at a cost of $25 and all support the use of Brain Gym to make learning easier. Several of the studies posted include children with learning disabilities that developed better balance. While the studies claim to help repattern the brain, the authors never mention using medical equipment to see if any changes in the brain actually occur. Brain Gym offers seventeen courses to gain licensure into the program, tuition information was not available on the website. It would appear that the Dennison’s utilized the use of terminology to impress and “sell” their product as credible and the education world is trying to buy in.

Chapter IV: Recommendations and Conclusion

Recommendation

Based on the research in this review of literature, it is not appropriate to consider use of bodily-kinesthetic learning styles, Brain Gym, or the Orton-Gillingham program as scientifically based intervention programs. Educators are encouraged to become informed consumers of research and to avoid implementation of a program for which there is no credible theoretical or sound research basis. As a solution for teachers having difficulty getting all students to read by grade 3 it's no wonder that interest would be piqued, especially when the ISD's are providing training in movement techniques. The results of this study suggest that administrators responsible for curriculum and staff development should steer teachers away from implementing this program as a research based intervention strategy. Administrators should focus on programs that satisfy the need for high levels of accountability for student achievement in a challenging fiscal time. While there may be no monetary cost to the school district for teachers who utilize these programs there is a definite opportunity cost involved.

Areas for Further Research

The benefits of Brain Gym and Orton-Gillingham have only succeeded in the anecdotal realm. Claims made by supporters of these programs need to be scrutinized with quantitative research. Studies that would help inform educators of the effectiveness of the programs should include large samples of students from similar schools, children in grades 1 and 2, of different gender, and socioeconomic status. Consideration should also be given to the quality of teacher effectiveness in delivery of the program.

Data should be based on surveys from teachers and students, performance of the students based on standardized assessments, and formal observation. The study should track the students for two years with a pretest at the beginning of each year. A new teacher should be with the students each year, minimizing the variable of teacher effectiveness. Data analysis should be based on statistical significance on posttest information between the control group, which would not receive any form of the tested program, and the group of students be taught using Brain Gym or Orton-Gillingham. Difficulties associated with conducting a study include teacher training, teacher competency, and the amount of student exposure. Research is the key to making rational decisions between effective practice and faddish, inferior programs.

Conclusion

Research is lacking, both in the number of studies and the quality of the current research, to consider these programs scientifically-based intervention programs. While movement may be a needed break for some children it should not intrude upon regular instruction. Evidence does not yet substantiate that physical movement improves acquisition of skills in reading for K-12 graders. While the appeal of these programs may be tempting for educators in search of solutions, the lack of empirical research does not support their practice as an intervention tool. This study serves as a reminder that delivering a quality curriculum has less to do with attractive packaging and more to do with substance and strong evidence through research.

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