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Enhance Learning through BrainDance Movements: An Empirical Study

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Abstract: The purpose of this study was to compare and associate BrainDance activity to a control group on reading scores as well as social, learning, and negative behavior. A total of 40 students in two classrooms participated in this study. A Likert scale and words per minute reading scores followed by quantitative analysis using a t-test to document and assess students' behaviors and reading scores. The findings indicated no significant difference in reading fluency, but the BrainDance group improved in four specific areas—focus, use of sense, multiple senses, and restlessness. There were positive correlations of social and learning behaviors, but negative correlations for learning and negative behaviors in addition to social and negative behaviors.

Keywords: *Brain dance, words per minute, reading fluency, social behavior, instructional practices.*

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Introduction

As educators look to new avenues, the advancement of technology and the sciences has opened new areas to explore as they better understand how the brain functions and the way people learn. The purpose of this study was to compare and associate BrainDance activity to a control group on reading scores as well as social, learning, and negative behavior. A total of 40 students in two second grade classrooms in Southern California participated in this study. A Likert scale and words per minute (WPM) reading scores followed by quantitative analysis was used to document and assess students' behaviors and reading scores. The hypotheses of this study are students' reading fluency will be improved after participating in the BrainDance physical activity; the students will use multiple senses in learning during and after the use of BrainDance physical activity, and, students' social and learning behavior will have positive impact after participating the BrainDance physical activity.

Literature Review

Physical activity and Cognition

The scientific investigation of the relation between cognition and physical activity started in the 1930s (Hillman, Erickson, & Kramer, January 2008). A recent study in neuroimaging techniques indicated that physical exercise leads to observable changes in brain structure and function (Booth & Lees, 2006). Furthermore, another study found students who learned using multiple senses had enhanced blood-oxygen levels, which is evidence of strengthening neural connections (James, 2010). Through mind, brain, and education science, which was applied to the classroom under the term brain-based learning, researchers are learning about, "how humans learn best in order to develop more effective teaching methods" (Tokuham-Espinoza, 2011, p. 14). In California's newly adopted Common Core Standards, the Department of Education calls for students to experience physical activities that are, "conductive to health and vigor of body and mind, for a total period." (California Department of Education, 2011, p. 296). Advocates of exploring brain-based learning techniques in the classroom believe that pattern seeking and connections are common in the mind. Providing activities that nourish and encourage this will help boost student performance and learning overall (Caine & Caine, 1990). A recent meta-analysis concluded a positive relation between physical activity and cognition performance of school-age children (ages 4-18 years) (Hillman, Erickson, & Kramer, 2008 January).

Research has also found that there is correspondence between improved reading skills and changes in brain activity in reading-deficient children (Shaywitz, Shaywitz, Blachman, Pugh, Fulbright, et al., 2004). Glomstad (2004) argued that in

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order to fully develop both motor and cognitive skills, the human brain has to internally digest a route (process) continuing feedback from all the senses, particularly visual-perceptual and proprioceptive. Another study also found a relationship between reading and loco motor skills among children with learning disabilities. Westendrop and her colleagues' study concluded that it is important to facilitate both motor and academic abilities to promote academic achievement (Westendrop, Hartman, Houwen, Smith, & Visscher, 2011). BrainDance activity, therefore, can be considered a strategy to enhance cognitive development.

BrainDance and Learning Behavior

Human dance has the potential to reveal the connection between cognition, action, and human interaction. Recent research began to investigate the behavioral and brain bases of human communication (Maas & Johansson, 1971 a & 1971 b). A study conducted by Opacic, Stevens and Tillmann (2009) suggested that dance movements are ruled by a non-verbal grammar or movements vocabulary that may regulate structure of movement sequences. Therefore, this dance movement may enhance the structured organization of learning.
BrainDance is a progressive and controlled series of physical movements that are based on the eight major movement patterns of infants' brain development and is designed to enhance learning by encouraging neurological re-patterning and encouraging body connectivity and alignment (Gilbert & Rossanno, 2006). It is a warm-up exercise combining both physical and mental activity. The brain does an enormous amount of growing during that first year of life. Brain cells become increasingly available and connections between cells and different parts of our brain begin to develop. Some learning challenges and disabilities are believed to be a result of lacking development in one or more of these movement patterns during infancy. BrainDance may help to correct any neurological imbalances that may have occurred during this time, as well as to encourage mind and body integration (Gilbert, 2000). The healthy eye tracking exercises that strengthen the eye muscles (Gilbert, 2000), therefore, can also enhance reading fluency.

Words per Minute (WPM)

In recent years several agencies, such as USAID, World Bank and RTI international emphasized the importance of fluent reading for education success. They have focused on the children's reading skills in their second or third year of school years (Graham & Ginkel, 2014). Words per minute (WPM) is an oral fluency reading assessment to measure how many words per minute a child can read. The total number of errors subtracted from the total numbers read providing the WPM count. Based on the number of WPM that the students can read correctly have been proposed as a basis for assessment and comparison. The WPM produced long term retention benefits for student meeting the fluent purpose. It also helps teachers to see which students need additional assistance (Kubina, Amato, Schwilk & Therrien, 2008). Therefore, WPM has been used as an indicator for school effectiveness (Schuh Moore, Destefano & Adelman, 2010).

Some studies were also conducted to prove the assumption that WPM can be used as an international benchmark to compare reading fluency scores from children's reading in different languages in different settings (Abadzi, 2011). However, since not every country's first language is English the interpretation of the WPM reading scores may be problematic (Trudell & Schroeder, 2007).

Methodology

This study used a quantitative method. SPSS 21.0 software was utilized to assess comparisons and then associations using correlations to assess the BrainDance and control group. After obtaining the approval to conduct this study from the Assistant Superintendent and the building principal, these researchers also obtained the approval from the Institutional Research Board (IRB) from the university where the researchers work. Parental consent was also obtained for participating students. Documents and literature relevant to brain-based learning is the framework for this inquiry. Research questions are: Is there a relationship between brain-based movement and reading fluency? How will the BrianDance movement affect students' social behavior? And, how will the BrianDance movement affect students' use of multiple senses when learning?

During the study process, one of these researchers did BrainDance movements with the experimental classroom teacher and students approximately five minutes daily. The control group did no BrainDance movement. These researchers observed and documented students' social and learning behaviors in the initial week to establish base-line data, and then observe students biweekly and document students' performance. The students' reading progress was assessed based on words per minute (WPM) reading assessment to investigate any changes in students' reading proficiency from both experimental and control groups.

Instruments were developed and used in this study including observation forms for both the researchers and the classroom teachers using a Likert scale. Biweekly record of words per minute forms were created to document the progress of students' reading fluency. Data collected during these six weeks were analyzed to compare the beginning

and ending of the data collection period. Data were analyzed using t-test to assess comparison and association statistics of the BrainDance and control group. In the case of correlations, experimental and control groups were isolated as BrainDance experimental groups and non-BrainDance control groups.

Findings

A t-test was used to compare the differences between a control group of twenty students and the BrainDance (experimental) group on 18 student observations (two students transferred to other schools and did not participate the whole cycle of this study). There were four significant differences. The BrainDance group (M = 3.38, SD = 1.155) scored significantly higher than the control group (M = 2.78, SD = 1.099) on "Focus on teacher and teacher instruction" (t (64) = -2.163, P = .034). The BrainDance group (M = 3.82, SD = .904) scored significantly higher than the control group (M = 3.13, SD = .336) on "Use of senses in learning" (t (64) = -4.112, P > .001). The BrainDance group (M = 2.61, SD = 2.853) scored significantly higher than the control group (M = 1.53, SD = 1.393) on "Restless" (t (55.55) = -2.050, P = .045). The "Restless" variable did not meet assumptions of normality using the Levene's Test for Equality of Variances statistic (F = 8.209, P = .006). Finally, the BrainDance group (M = 1.79, SD = 2.303) scored significantly higher than the control group (M = .84, SD = .847) on "Multiple Senses" (t (64) = -2.199, P = .031). Table 1 outlines the significant findings only. There were no significant differences on any other observations.

Another t-test was used to compare the differences between a control group and the BrainDance (experimental) group on three observations of Reading Scores. There were no significant differences found.

In assessing the correlation between learning, social, and negative behaviors Pearson correlation statistics were run. After isolating the BrainDance group participants and then isolating the control group, the BrainDance group showed a positive and significant correlation between learning and social behaviors (r = .582, P < .001). There was also a significant negative correlation between learning and negative behaviors (r = -.343, P = .047) and social and negative behaviors (r = -.346, P = .045). (See Table 2). When isolating for the control group (i.e., non-BrainDance group), there were no significant correlations found. (See Table 3).

Discussions and Conclusion

This study investigates how BrainDance movements affect sensory and cognitive development, which is essential for both physiological and emotional health (Jensen, 2006). Magee (1998) claimed that the BrainDancing technique opens up awareness to areas of new growth and learning. Related studies have shown that implementing the dance and creative movement increased understanding, improved behavior in the classroom, and enhanced attitudes toward school (Skoning, 2010). The successful cases were reported in the Language Arts (Pica, 2006), Math (Pica, 2006), Science (Kim, 1995), and Social Science (Nilges & Gallavan, 1998). The outcome of this study informs teachers that brain-based movement or, specifically, BrainDance can enhance students' abilities in some areas, but not all.

The findings in this study determined there were four significant differences at the single observation level: a) The BrainDance group scored significantly higher than the control group on "Focus on teacher and teacher instruction"; b) The BrainDance group scored significantly higher than the control group on "Use of senses in learning"; c) The BrainDance group scored significantly higher than the control group on "Restless"; d) the BrainDance group scored significantly higher than the control group on using "Multiple Senses". There were no significant differences on any other single observations. Following factor analysis and grouping single items into constructs of learning, social, and negative behaviors and assessing for reliability, the BrainDance and control groups were evaluated separately by isolating participants via filtering in SPSS. In essence, the following can be supported for the BrainDance group:

1. There is a positive significant relationship between social and learning behaviors in the BrainDance group.
2. There is a negative significant relationship between learning and negative behaviors in the BrainDance group.
3. There is a negative significant relationship between social and negative behaviors in the BrainDance group.
4. No significant results were found in the control (non-BrainDance) group.

Finally, the findings of this study indicated that there were no significant differences between the experiment and control groups in students' reading performance. Despite the significant associations when isolating for BrainDance and non-significant results for the control group, a t-test assessing the difference between the two groups on learning, social, and negative behaviors showed no significant differences.

The findings are mixed. These researchers concluded that BrainDance movement helped in the areas of focus, use of senses when learning, and using multiple senses. Surprisingly, BrainDance also appeared to increase restlessness. Referring to the embodied cognition (Wilson, 2002) that cognition is body based and rooted in sensorimotor

processing. The students' restless is a way in responding to the stimuli of BrainDance in responding to process information. Interestingly, when assessing only the BrainDance group the associations were positive and significant between learning and social behaviors. Additionally, there was a significant and negative association with learning and negative behaviors plus social and negative behaviors in the BrainDance group. Unfortunately, a t-test between the two isolated groups (BrainDance vs control) revealed no significant results to validate the correlations that BrainDance improved results in learning and social behaviors or reduced negative behaviors. Finally, BrainDance groups showed no significant improvement in reading assessments compared to the control group.

This study could be improved with further observation areas of negative behavior and a larger sample size which could improve reliability. Further research is recommended. For instance, using a different instrument to assess reading fluency, comparing reading scores from the standardized tests, involving the whole school in this study might increase the likelihood of changing the outcome of this study; breaking down the groups by gender, ethnicity, reading ability, student grades, and other demographic indicators could prove fruitful in determining where significant differences reside. Moreover, any potential positive effects of BrainDance on student reading, learning, social, and negative behaviors needs to be further investigated.

Table 1. T-test Comparing Control vs. Experimental Groups on Observations

	Group	Mean	SD	t	P
Focus on teacher and teacher instruction	Control	2.78	1.099	-2.163	.034*
	Experimental	3.38	1.155		
Volunteer to answer	Control	3.81	1.120	1.277	.206
	Experimental	3.44	1.236		
Neatness of work	Control	3.81	1.330	.650	.518
	Experimental	3.62	1.101		
Depth of work	Control	3.16	.920	-1.835	.071
	Experimental	3.59	.988		
Completes work in a timely manner	Control	3.16	1.547	-1.345	.184
	Experimental	3.62	1.231		
Reading proficiency	Control	3.66	1.285	-.451	.654
	Experimental	3.79	1.200		
Overall interest in learning	Control	3.72	.851	-1.435	.156
	Experimental	4.03	.904		
Use of all senses in learning	Control	3.13	.336	-4.112	>.001*
	Experimental	3.82	.904		
Prosocial Behavior	Control	3.50	.916	.651	.517
	Experimental	3.35	.917		
Get Along with peers	Control	3.78	.792	1.564	.123
	Experimental	3.44	.960		
Self-Monitoring	Control	3.28	1.170	-.257	.798
	Experimental	3.35	1.098		
Transition abilities	Control	3.34	1.035	-.548	.585
	Experimental	3.50	1.261		
Eyes Off Task	Control	1.56	1.865	-1.317	.192
	Experimental	2.21	2.195		
Restless	Control	1.53	1.391	-2.050	.045*
	Experimental	2.61	2.853		
Talk without permission	Control	1.03	1.356	-1.545	.127
	Experimental	1.82	2.587		
Out of seat	Control	.75	1.867	.835	.407
	Experimental	.47	.762		
Multiple Senses	Control	.84	.847	-2.199	.031*
	Experimental	1.79	2.303		
Student Volunteering	Control	2.47	.567	4.518	.000
	Experimental	1.79	.641		

*Significant at .05 or less

Table 2. Correlation Isolating for BrainDance Experimental Group

		Learning Behaviors	Social Behaviors	Negative Behaviors
Learning Behaviors	Pearson	1	.582**	-.343*
	Sig.		>.001	.047
	N	34	34	34
Social Behaviors	Pearson	.582**	1	-.346*
	Sig.	.000		.045
	N	34	34	34
Negative Behaviors	Pearson	-.343*	-.346*	1
	Sig.	.047	.045	
	N	34	34	38

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 3. Correlations Isolating for Non-BrainDance Control Group

		Learning Behaviors	Social Behaviors	Negative Behaviors
Learning Behaviors	Pearson	1	.338	.026
	Sig.		.058	.887
	N	32	32	32
Social Behaviors	Pearson	.338	1	.176
	Sig.	.058		.335
	N	32	32	32
Negative Behaviors	Pearson	.026	.176	1
	Sig.	.887	.335	
	N	32	32	34

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