

Original Paper

Increasing Reading Fluency through the Use of Physical Movement and Affirming Parallel Concepts

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Abstract

Sixteen 6th grade middle school students, who were all classified as struggling readers, volunteered to participate in a study examining the impact of daily physical movement and singing (Affirming Parallel Concepts) on reading fluency, as measured by words read per minute. Half of the participants received instruction on learning new songs to sing in class while simultaneously learning new sight words over a six-week period. The other eight students served as a control group and received standard reading instruction on learning new sight words. The experimental group incorporated movement into their singing by clapping their hands and thighs, stomping their feet, and moving around the classroom while singing. Students in the experimental group significantly improved their reading fluency (14% improvement) versus those students in the control group (5% improvement) over the six-week instruction period as measured by Fountas and Pinnell reading assessments.

Keywords

reading, singing, movement

1. Introduction

There is considerable research indicating that academic performance among grade school students can be significantly improved by pairing a core academic area with some type of physical activity (e.g., Mead, Roark, Larive, Percle, & Auenson, 2013). The study of this beneficial effect has consistently been investigated over the last several decades. In a noteworthy example, Hillman, Pontifex, Raine, Castelli, Hall and Kramer (2009) observed the effects of an exercise session among preadolescents

using two different versions of the Wide Range Achievement Test 3rd Edition (WRAT3), an assessment of reading, spelling, and arithmetic. Significant improvements on the reading comprehension section of the WRAT3 were found following an exercise session. The researchers also noticed improvements in information processing when measuring event-related brain potentials with an electroencephalogram. When examining how physical activity can indirectly improve academics, Chomitz et al. (2009) found a positive linear relationship with math scores on the Massachusetts Comprehensive Assessment System when correlated with fitness levels of elementary and middle school students. A weaker relationship was also observed between fitness levels and English performance.

Coe, Pivarnik, Womack, Reeves and Malina (2006) didn't just examine physical fitness impact on academics but also looked at physical activity levels. In this study, six-graders were split into two groups, group one had physical education the first semester along with four core classes (math, science, English, and world studies), while the other had physical education the second semester of the year with the four core classes. Academic achievement was measured on a numerical scale representing grades (A=5, B=4, C=3, D=2, F=1). Student's daily activity levels were also recorded. There was no significant difference in academic achievement between the groups, but students who regularly met the recommended physical activity guidelines (Healthy People, 2010) had higher academic scores in both semesters regardless of whether or not they were enrolled in a physical education class.

On-task behaviors increase when physical activity breaks are integrated into grade school classrooms. Mahar et al. (2006) implemented 10-minute classroom-based physical activities during academic instruction over a twelve-week program on kindergarten through fourth graders. Classrooms that received the physical activity intervention took 782 more steps on average than the control group and on-task behavior increased by 8%, which was significant. Mead et al., however, found that physical activity breaks in 6th grade math did not improve standardized test scores when compared to a math classroom that received no exercise intervention.

In addition to exercise impacting reading proficiency, research has also explored the potential impact that music can have on improving reading fluency. The examination of this possible effect also has been measured over the last several decades and the published results are mixed. Legette (2002) split fourth grade students into two groups, a control group and a group that received 50 minutes of technology-assisted music instruction once a week for 17 months. Before the testing began, student's academic achievement was noted based on report cards and the Comprehensive Assessment Program (CAP), a standardized test for reading, language, and math. There were significant differences in language grades on report cards which favored the experimental group at the end of the study. However, no significant differences were found between the groups in the CAP scores.

Much of the early research on this issue remains in unpublished doctoral dissertations. Reading improvements following integration of music activities were monitored by Lauder (1976). In this dissertation work, first graders were observed to determine if music activities affected reading across

eight separate areas of reading achievement. Study results did not support a positive association between music activities and reading performance. Conversely, Gordon (1979) assessed the impact of contingent music instruction among fourth graders who were a year behind in reading levels. He found that music instruction was an effective reinforcer for reading instruction as measured by the Metropolitan Reading Test (MRT). Babbitt (1976) found that music instruction in second grade classrooms significantly improved reading performance on the Metropolitan Achievement Tests when students were taught by a music specialist when compared to a traditional elementary school teacher.

Three additional doctoral dissertations hypothesized that music instruction can improve reading vocabulary and comprehension because both disciplines involve similar auditory and visual skills necessary to comprehend. Thus, the skills gained in music education could transfer to reading education. Movsesian (1967) found improvements in child reading skills while concurrently taught music skills but only for children in 1st and 2nd grade, not 3rd grade. Maze (1967) examined the relationship between reading and music success to determine if skills in each mimicked each other and found positive correlations between the two disciplines. Nicholson (1971) observed the effects music can have on slow learners in the development of reading readiness skills. She found significant improvements in reading skills following 60 minutes of music instruction each week. She concluded that music instruction improved the ability of students to combat interference and distractions and be more attentive to the task. Both music and language skills rely on auditory processing for decoding and understanding natural rhythms of speech that guides attention and facilitates processing meaning and syntax (Pitt & Samuel, 1990). Slater et al. (2014) conducted a longitudinal study with 42 Spanish-English bilingual elementary school children (mean age 8.3). The Test of Word Reading Efficiency and the Comprehensive Test of Phonological Processing were administered before to test reading ability. The experimental group took music classes that included ensemble, vocal, and instrumental instruction. There was a small but significant effect of music training on reading performance as the musically-trained intervention group maintained their level of reading ability but the control group deteriorated. Auditory perception and memory are key components of both music and reading and suggests that performance of one may enhance performance of the other.

Butzlaff (2000) performed a meta-analysis of studies that related music to academic achievement in reading to investigate if music could be an aid in acquiring reading skills because both have the same written notations, involve phonological distinctions, and have lyrics or words to engage reading skills. Eighty percent of studies cited in the study had positive correlations between the music involvement and reading scores. The author noted that children who do better on reading tests may pursue music because they are better equipped to learn music or reading may enhance interest in music. The author stated most study results were unreliable because of size, low effect sizes, and minimal relationships observed between using music to improve reading. To further explore Butzlaff's conclusions, Fisher (2001) tested eighty kindergarten through 1st grade students who all spoke Spanish at home on their

reading achievement. Of the four classrooms, two of them heavily integrated music in the literacy block of teaching time. The music involved classrooms outperformed students in the classes that did not integrate music on various reading assessments over two years of testing.

Much of the research testing music and reading comprehension effects has involved early learning readers in the general education population. Register, Darrow, Swedberg, and Standley (2007) conducted a study that had second-grade students with specific learning disabilities receive intensive short-term music curriculum specially designed to target reading comprehension and vocabulary skills. The Gates-MacGinitie Reading Test was administered before and after the treatment. Students receiving music instruction made significantly greater gains in the word decoding, word knowledge, and reading comprehension sections of the test than students not receiving intensive music instruction.

Young, Valadez, and Candara (2016) also studied the impact of singing on reading performance. Three second-grade classes were studied: one control, one that participated in Rock and Read, and the other participated in Readers Theater and Rock and Read. Rock and Read was similar to karaoke where students read off a screen and sing along to popular music. The students were introduced to the songs gradually and practiced them over a few days, and at the end they would sing the songs. Readers Theater involved learning and reciting poems. Reading achievement tests were taken before and after the interventions. Pretest to posttest reading achievement scores were statistically significant in both treatment groups but not in the control group for phrasing, expression, and pace of reading. Overall, this study demonstrated that music and poetic involvement can increase reading fluency greater than no intervention.

In a study of 18 first grade students reading skills, Iwaski, Rasinski, Yildirim, and Zimmerman (2013) integrated singing into the classroom. Students learned one or two new songs every week over the course of one academic year and were instructed to track words while singing. The students began daily singing at the beginning of the school year and were assessed by the Developmental Reading Assessment (DRA). By the end of the school year, students were reassessed and the results concluded that all but one of the students made at least a year's growth in reading and several students exhibited greater than average growth. The songs used for the study were selected because they were embedded with rhyme, assonance, and alliteration to encourage repeated reading.

Biggs, Homan, Dedrick, Minick, & Rasinski (2008) investigated the impact of repeated reading and singing of songs on reading achievement using software (Carry-a-Tune) that teaches rhythm and pitch. Middle-school students who were considered "struggling" were compared to a control group who did not use the software for 9 weeks. The Florida Comprehensive Assessment Test was administered before and after the testing period. Findings supported the use of singing to improve reading levels and comprehension. This may have been due to the repetitive nature of the system, immediate feedback from the system, or the motivation and extra engagement that came with music and singing. Students using the software increased their reading grade level by 1.37 in only nine weeks, a feat that normally

took more than seven months at the school.

Little research has explored whether a singing method can be used to improve academics. Affirming Parallel Concepts (APC) is defined as “cross-training the brain by practicing reading and math skills through singing folk songs and playing singing games” (Olson, 2003). The APC methodology emphasizes a strategy that students likely already enjoy which is singing and has been shown to improve literacy skills in struggling readers. APC strategies may help students improve their reading fluency and rhythm through practicing their sight words, reading song lyrics or singing chants. “Affirming reading and mathematics, while teaching music, involves building sequential patterns so that students become aware of conceptual similarities between like events in music and reading or mathematics” (Olson, 2003). A beat is the fixed speed or tempo of a piece of music, and by keeping a beat while singing, students are practicing fluency. Fluency is a pillar of learning how to read. Fluency can be defined as a reader that reads with correct word recognition, proper decoding, and the ability to blend sounds together (Torgesen & Hudson, 2006). Fluent readers read with proper inflection in their voice and make meaning as they read. Rhythm is the configuration of how the notes or words in music move. Practicing the rhythm of a song is similar to students practicing syllables. APC methodology involves teaching musical concepts of a beat and rhythm while connecting students learning to related literacy concepts, such as fluency or syllables.

The purpose of this study was to determine if APC can improve struggling reader’s fluency when the learning process also integrates physical movement. Previous studies that have examined the association between singing and physical movements separately and reading achievement are encouraging. This study is the first study to investigate the effect of singing and exercise together on reading ability.

2. Method

2.1 Participants

This research occurred in a sixth grade Language Arts classroom in Minneapolis, Minnesota. The school was third through eighth grade. Fifty-two percent of the students qualified for free or reduced lunch, and approximately seventeen percent of the students were English Language Learners. The school was 4% Asian, 23% Black, 4% Native American, 15% Hispanic and 54% White. There were three sixth grade classes that rotated classes for each of the four subject areas and there were seventy-seven students in sixth grade. In the classroom where eight participants were selected to receive the intervention, there were five English language learners, three students with autism, and eleven students with other special needs. The student demographics for the control group consisted of 4 White students, 2 Black students and 2 Hispanic students. The student demographics for the experimental group consisted of 4 White students, 1 Somali student, 1 Black student and 2 Hispanic students. All students provided child and parental consent. The research was approved by the

Minneapolis Public Schools Research Office. Students attended class for 52 minutes, five times a week. All of the participants began sixth grade with low reading fluency levels. It was decided by the teacher that students needed to improve their reading fluency through reading Just Right (JR) books. JR books are texts that students are able to read by themselves while making less than five errors when reading the first page. Using JR books helped student's practice reading at their level, as well as reviewing the first one hundred sight words that make up about half of all written material. Sight words are common words that children are encouraged to memorize by sight. By using JR books, students were able to practice reading fluency and less time was spent decoding unfamiliar words they encountered in texts.

2.2 Instrument

Student reading performance data was collected through individual assessments on Fountas and Pinnell reading assessments. The Fountas and Pinnell Benchmark Assessment Systems are designed to provide accurate and reliable tools to identify the instructional and independent reading levels of all students. This assessment also documents student progress through one-on-one formative and summative assessments. Teachers are able to observe and quantify students' reading behaviors, engage students in comprehension conversations that go beyond retelling and make informed decisions that connect assessments to responsive teaching. Words Read Per Minute (WPM) is defined by total number of words read per minute minus errors, which gives words correct per minute.

2.3 Procedure

In order to identify the students with low reading and fluency levels, the researchers administered a Fountas and Pinnell reading assessment to one language arts class at the beginning of the school year. The researchers then gave this assessment to students in two other 6th grade classes to find a similar reading ability control group. For analysis, participants were paired with another student with similar baseline performance scores who did not receive the intervention. The Fountas and Pinnell Benchmark Assessment System (FPBAS) was used because it was the standard measure used by teachers in Minneapolis Public School to identify students' reading level and is an accurate and reliable resource to measure student reading levels. Scores on the assessments are based on Text Letter Gradients that reflect students' instructional and independent reading levels. Students are expected to progress from "A" to "Z" during K-12 school (see Table 1). The student's letter score is based on his/her ability to decode and make meaning of text based on the assessment tools and texts provided by the FPBAS. Based on the FPBAS, all of the students in the study were not fluent in reading and read one to three grade levels below sixth grade (FPBAS letter score O to S). These students struggled in comprehension and ability to recognize common sight words which impacted their reading fluency. Students were reading less than 140 words per minutes so at these levels, all students in the study needed intervention on recognizing sight words to increase reading fluency.

Table 1. Fountas and Pinnell Grade Level Expectations for Reading

	Beginning of Year (Aug.-Sept.)	1st Interval of Year (Nov.-Dec.)	2nd Interval of Year (Feb.-Mar.)	End of Year (May-June)
Grade K		C+	D+	E+
		B	C	D
		A	B	C
				Below C
Grade 1	E+	G+	I+	K+
	D	F	H	J
	C	E	G	I
	Below C	Below E	Below G	Below I
Grade 2	K+	L+	M+	N+
	J	K	L	M
	I	J	K	L
	Below I	Below J	Below K	Below L
Grade 3	N+	O+	P+	Q+
	M	N	O	P
	L	M	N	O
	Below L	Below M	Below N	Below O
Grade 4	Q+	R+	S+	T+
	P	Q	R	S
	O	P	Q	R
	Below O	Below P	Below Q	Below R
Grade 5	T+	U+	V+	W+
	S	T	U	V
	R	S	T	U
	Below R	Below S	Below T	Below U
Grade 6	W+	X+	Y+	Z
	V	W	X	Y
	U	V	W	X
	Below U	Below V	Below W	Below X

Exceeds Expectations

Meets Expectations

Approaches Expectations—short term intervention needed

Does Not Meet Expectations—long term intervention needed

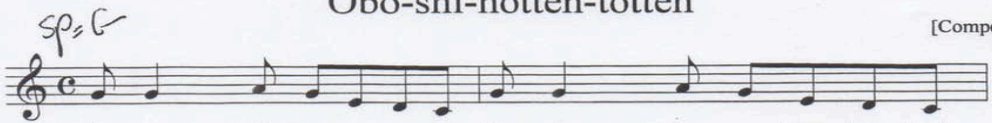
At the beginning of the school year, students practiced sight words during their guided reading group work time and independent work time. During the 6-week testing period, all 6th grade students practiced the sight words through a spelling list each week and by using flashcards with a partner. Students were also reading JR leveled text and using sight words from the list of Fry's First 100 Instant Words. New JR leveled texts were introduced every Monday to students in small-guided reading groups while new words were introduced every two weeks. For two weeks, the new words were used as the center focus of different songs and movements with the songs. At the end of every two weeks, students would use personal whiteboards to take an informal "spelling test" to review the words so the teacher could assess student progress. Students would also partake in reading fluency practice where the teacher read the passage first to the students and the students would in turn read the same passage back.

Students in the experiment learned three folk songs that incorporated chanting, hand gestures, moving around the classroom, and daily singing using sight words (see Table 2). These songs were developmentally appropriate for sixth grade and permitted adaptations to practice reading fluency and sight word recognition. Each song was modified to incorporate reading practice.

Table 2. Songs Integrated with the Practice of Reading

Obo-shi-notten-totten

[Composer]



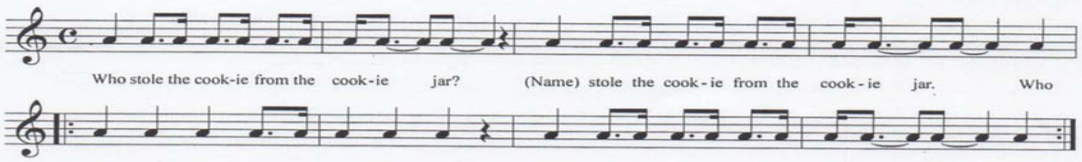
O - bo - shi - not - ten - tot - ten, Nay, nay, Aye am boom, boom, boom.

Itty bitty otten-totten, Obo-shi-notten-totten,
Obo-shi-notten-totten, Boom! One, two, three, four, five!

Group stands in a circle with palms facing up. Slide left hand under right hands of neighbor.
Leader starts beat around. At end of speaking part on "five," person who gets tapped with the beat is out unless he/she
pulls hand away. Then the person who was "four" is out.
Play continues until one person wins.
Those who are "out" can start another circle where they are never "out."

Who Stole the Cookie?

African American Chant




Who stole the cook-ie from the cook-ie jar? (Name) stole the cook-ie from the cook-ie jar. Who

me? Yes, you! Could - n't be. Then, who? (Name) stole the cook-ie from the cook-ie jar. Who...

Sitting in a circle, start a pattern of pat-clap-pat-clap, etc. Leader starts chant and names a person in the circle: "____ stole the cookie from the cookie jar." Named person asks, "Who me?" and everyone responds, "Yes. You!" Named person says, "Couldn't be." Group asks, "Then, who?" Named person names another person in the circle, "____ stole the cookie from the cookie jar."

Obwisini San African (Ghana?)



Ob - wi - si - ni - san - na - na, ob - wi - si - ni - san.

Ob - wi - si - ni - san - na - na, Ob - wi - si - ni - san.

2. Stone fell on my hand, ma, stone fell on my hand (repeat).

Group sits cross-legged in a circle with a rock for each person. Each person places a rock by their left knee. On first beat of song (Ob-wi), each person picks up their rock with their right hand. They pass it to the person on their right on the second beat (si-ni), placing it on the floor by their neighbor's left knee. Then, they pick up the new rock by their own left knee and continue the passing. For the second verse, everyone can switch to the left hand, and re-pick up the rock just left by their neighbor's knee, and pass to their left.

In weeks 1-2, the song “Obo-shi-notten-totten” was introduced. The game was modified by replacing “One, two, three, four, five” with spelling a target sight word and saying the word. The song “Who Stole the Cookie?” (weeks 3-4) was modified by replacing the word “cookie” with target sight words. For example, “Who stole the cookie from the cookie jar?” was replaced by, “Who Stole the (sight word) from the cookie jar?” and “(name) stole the cookie from the cookie jar!” was replaced by “(name) stole the (sight word) from the cookie jar!” For this song, sight word cards or “cookies” were also made. When a student’s name was called they picked up the named sight word card or “cookie” from the middle of the circle and brought it back to their seat in the circle. Instead of passing a rock with their hands in “Obwisini San” (weeks 5-6), students passed sight word cards around the circle. When the song ended, each student read their sight word on their card. Other students repeated the word. The two-week schedule for learning new songs, physical movements (clapping, patting legs, moving around classroom), and sight words is described below:

- Day 1 & 2. New sight words introduced, students practice reciting, spelling and reading passages containing sight word.
- Day 3. A new APC song is taught along with physical movements during singing, sight words are repeated and used in sentences, students practice singing the new song.
- Day 4. Practice new APC song while students seated a circle, sight words are reviewed, recited, and used in sentences, students practice singing and moving during new song.
- Day 5: Teacher introduces modification using new sight words and students practice the new song with sight word variation and individually partake in reading fluency activity with all of the words from the sight word list.
- Days 6-9: Students continue to sing new song daily with the sight word variations and physical movements.
- Day 10: Students review the sight words on a whiteboard and read a short passage containing all the sight words. Teacher reads the word aloud

and gives an example sentence, students record the sight word on their whiteboard.

3. Result

Reading fluency and reading level were measured at baseline and at the end of the six week experimentation. Students were given an identification letter or a number to keep all students anonymous. Figures 1 and 2 reflect pre and post changes in Fountas and Pinnell reading fluency for both experimental and control groups. The baseline data showed that all students were reading less than 160 words per minute. Figures 3 and 4 reflect pre and post Fountas and Pinnell ratings of reading level for both experimental and control groups. For analysis purposes, reading levels were converted into corresponding numbers in the alphabet (e.g., O=15). In order to be at grade level at the start of sixth grade, students should have been reading at a level V, or a “22” on the graph. To be at grade level at the end of experimentation, all students should have been reading at level W, or a “23” on the graph.

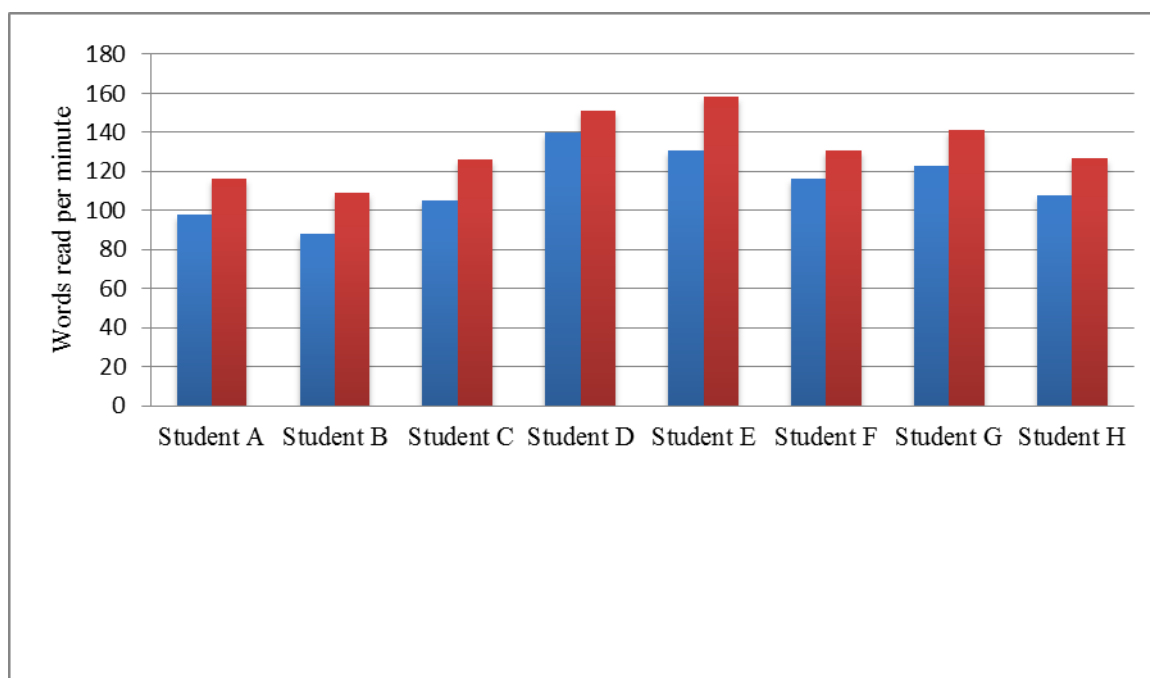


Figure 1. Pre-post Reading Fluency Levels (WPM) for Experimental Group (Pre-Post)

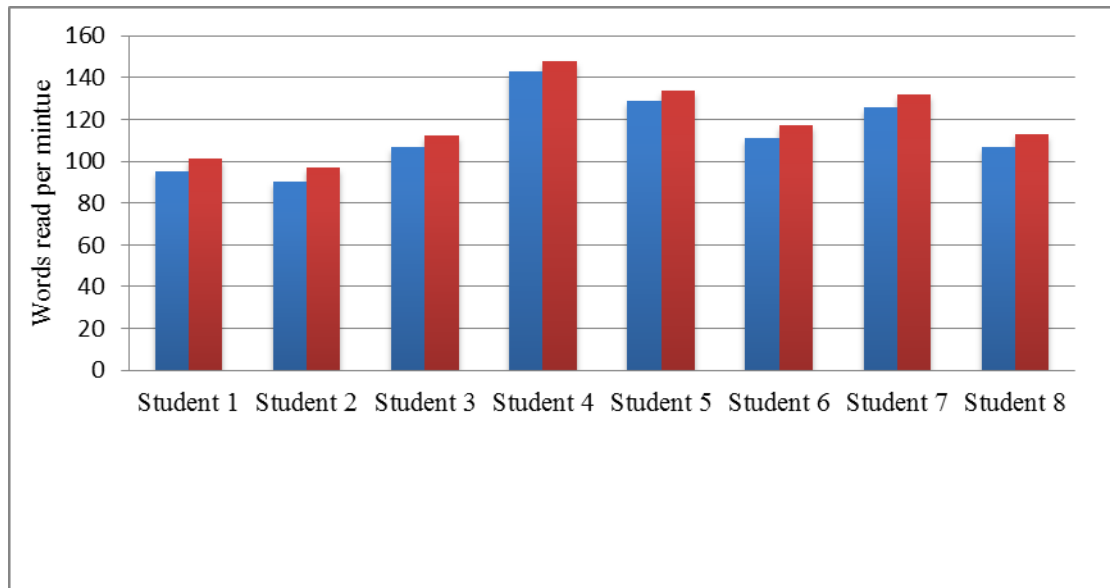


Figure 2. Pre-post Reading Fluency Levels (WPM) for Control Group (Pre-Post)

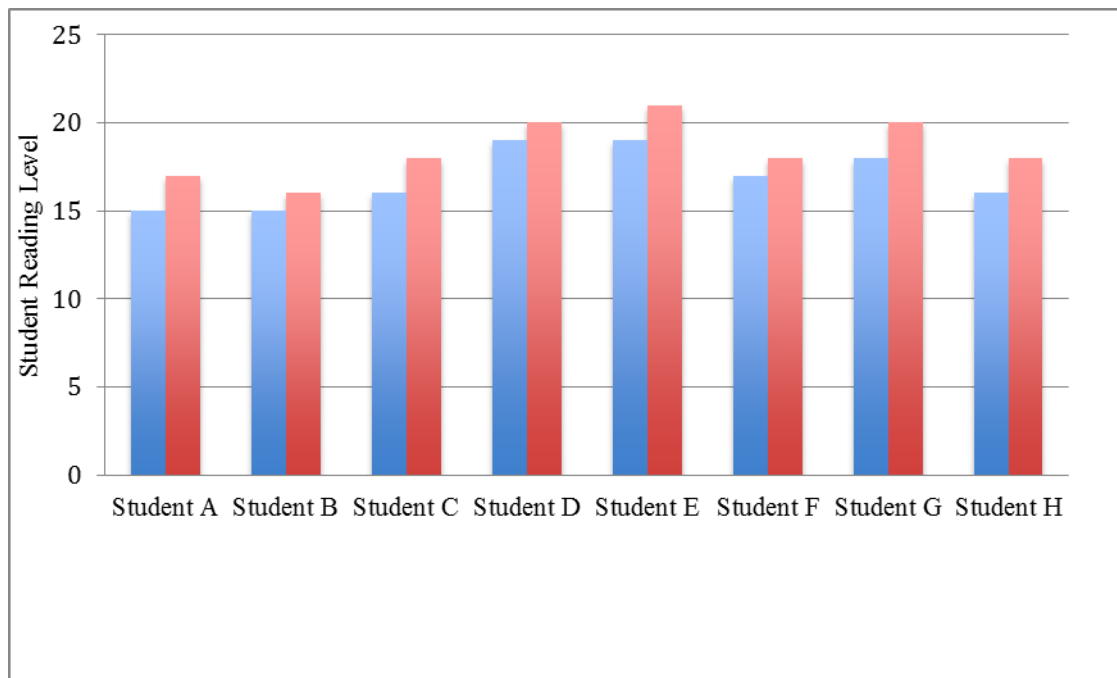


Figure 3. Student Reading Levels for Experimental Group (Pre-Post)

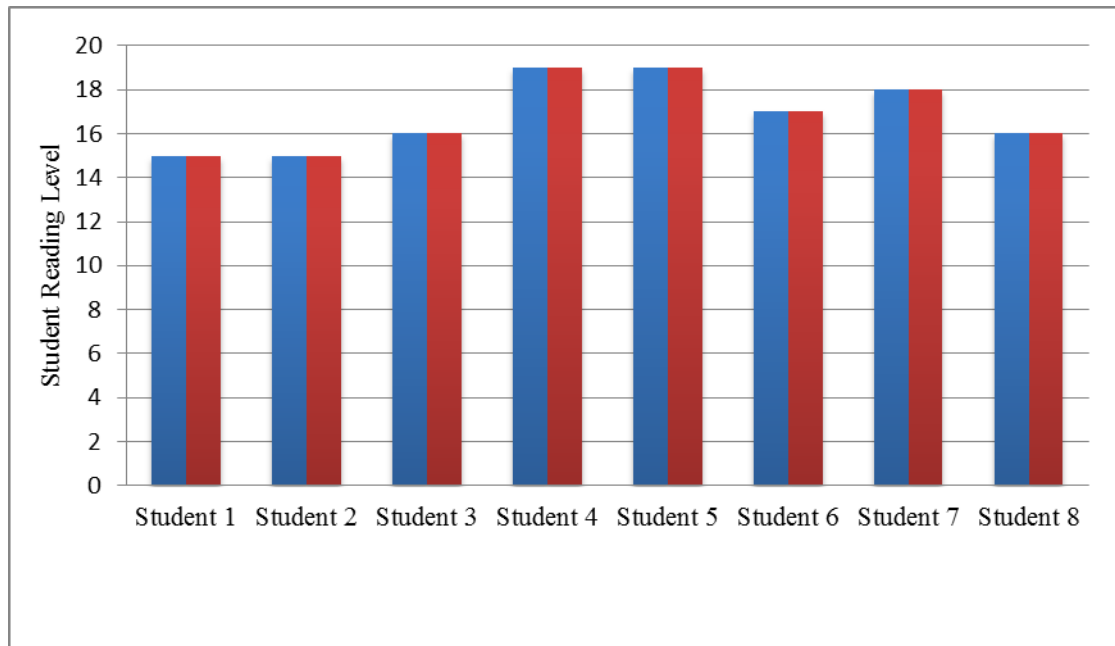


Figure 4. Student Reading Levels for Control Group (Pre-Post)

To determine if students improved reading fluency following intervention, a 2 (control v. experimental) x 2 (pre v. post) within subjects ANOVA was computed using SPSS version 25. Tests of within subjects indicated a significant difference between pre and post scores, $F(1,14)=214.1$, $p<.001$. Within subject test of pre post scores by experimental condition also were significant $F(1,14)=60.3$, $p<.001$. Both treatment baseline WPM ($M=113.6$, $SD=17.3$) and control WPM baseline ($M=113.5$, $SD=17.9$) significantly improved their WPM over six weeks (treatment= 132.4 , $SD=16.7$ /control= 119.3 , $SD=17.4$). When comparing gain scores, the experimental group (18.8 WPM, $SD=4.7$) significantly outperformed the control group (5.8 WPM, $SD=.7$), $t(14)=7.8$, $p=.031$.

4. Discussion

Based on the results of the post-data, struggling readers who incorporated movement and daily singing made more gains in their reading fluency and reading levels than the struggling reading students who did not receive the treatment. The results confirm many previous studies that found singing is an additional method for students to use to learn fluency, word vocabulary, and comprehension. The findings also confirm numerous previous studies that found physical movement can assist in learning new words and increase reading ability. This study was somewhat novel in the investigation of the interaction of moving and singing and its impact on reading performance of struggling readers. The comparison of gain scores clearly shows a benefit as evidenced by a significant t-score, even among a relatively small sample size in this study.

The scope of this research was not to determine what is occurring internally in the brain but what we can do as educators to improve reading skills of struggling readers. The authors can only speculate that singing alongside moving may activate additional areas of the brain during reading development and/or provide better focus for students to stay on the particular reading task (Mahar et al., 2006; Nicholson, 1971). Singing and moving may also activate and prime the nervous system to learn new words and better understand reading content. This integration of singing and moving could thus be a more cost effective means of improving reading performance of struggling readers when compared to time consuming and costly reading interventions.

An area of agreement in much of the previous research on this topic is that singing and reading both involve similar auditory information processing needed to decode content and create meaning (e.g., Fetzler, 1974; Pitt & Samuel, 1990). The use of singing may force the auditory sensory system to block out other sensory distractors and assist in effectively regulating and modulating new aural reading input. This may assist with learning the rhythm involved in singing and reading words thereby improving reading fluency and comprehension.

There is no reason to believe that students who were not classified as struggling readers would yield different gain scores following APC. The use of physical movement to facilitate reading education is compelling but this study only examined students who were not proficient readers. However, research that uses large sample sizes that compares struggling with non-struggling readers who incorporate movement into learning is not available. Therefore, it is unknown if movement can stimulate learning processes that differ between students with varying reading abilities which could affect learning acquisition differently.

As mentioned, the sample size was not large and not all students' data from the experimental classroom was included in the results due to difficulty of obtaining consent. A larger sample would also strengthen the results along with comparison groups where one group receives physical movement only, another receives singing only, a third group receives both, and the fourth group serves as a control. This type of research model would be a good direction for future study. Perhaps functional MRI testing would also advance our knowledge of what occurs in the brain across varying reading proficiencies as students sing, move, and develop reading skills.

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