

The Impact of a Therapy Dog Program on Children's Reading: Follow-up and Extension to ELL Students

Jean Kirnan¹  · Nina E. Ventresco² · Thomas Gardner¹

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Abstract An initiative in which therapy dogs were integrated into a school-wide reading curriculum was analyzed to determine the effect on student reading in the program's second year. Prior research on the first year of this specific program (Kirnan et al. in *Early Child Educ J* 44(6):637–651) demonstrated improvement in reading scores only for kindergarten students, while interview data revealed increases in positive attitudes and enthusiasm for reading across all grades. In the current study, a series of independent t-tests were conducted for each grade, comparing the second year of the program to a control group. There was a significant difference for kindergarten in the second year, as reading scores were higher for program students compared to those in the control group. Unlike the first year of the program, in the second year there was also a significant mean difference in first grade. For both grades, an analysis of covariance controlling for reading scores prior to program implementation still resulted in a significant

main effect for the reading program. Combining the first 2 years of the program yielded a large enough sample for a comparison of ELL students with non-ELL students in kindergarten. These data showed significantly higher reading scores for students enrolled in the dog program relative to the control for both ELL and non-ELL students, again accounting for earlier reading scores. These findings demonstrate the need to analyze at-risk subgroups as well as the need to apply a longitudinal lens in researching both dog-assisted literacy programs and participant progress.

Keywords Reading · Therapy dogs · Animal-assisted reading program · Elementary school · ELL · Program evaluation

Introduction

Despite the recent accountability movement in education (e.g., Common Core Standards Initiative), national data reveal alarming trends with respect to student literacy. A majority of fourth grade students (64%) are unable to read at the “proficient” level, a statistic no different from what was reported in 2013 (Nation's Report Card NRC 2015). Older students are actually performing slightly worse than in 2013; a mere 34% of eighth graders, and 37% of twelfth graders, now read at or above proficiency (NRC 2015). Low levels of reading achievement may very well persist in the coming years due to factors such as increased technology use among youth. The average child's daily mobile media use (e.g., smartphones, tablets) has as much as tripled in recent years, with a majority of children accessing these devices to play games, use apps, and watch videos, rather than for educational purposes (Rideout 2013). Another important consideration is the rapidly growing

This article is dedicated to the memory of Bailey, who volunteered in the elementary school for 5 years, since the inception of the program.

Thank you for making so many children excited about reading.

✉ Jean Kirnan
jkirnan@tcnj.edu
Nina E. Ventresco
nev215@lehigh.edu
Thomas Gardner
Gardnet1@tcnj.edu

¹ The College of New Jersey, 2000 Pennington Road, Ewing, NJ 08628-0718, USA

² Lehigh University, 111 Research Drive, Bethlehem, PA 18015-4732, USA

immigrant (foreign-born) population (Zeigler and Camarota 2015) and accompanying influx of young English Language Learners (ELLs),¹ for whom reading can understandably present a challenge.

The importance of a strong, early reading foundation is far ranging, as reading skills build cumulatively over time (e.g., letter recognition becomes word recognition), and readers who fall behind their peers tend to lose the interest and motivation necessary to make meaningful gains (Guthrie and Davis 2003). As children advance through the grades, strong reading skills become critical for every school subject, and reading achievement is associated with overall school success and likelihood of high school graduation (Fiester 2013). In an effort to boost low literacy levels among elementary school students, numerous programs have been developed, many of which are designed exclusively to promote skill development and align closely with national educational standards (e.g., *Ready Reading, Journeys*, and *Reading A–Z*). What many of these programs fail to do, however, is adequately motivate, engage, and encourage young readers, who may feel uninspired by or anxious about reading. Thus, the ideal program would—in addition to promoting skill development—appeal deeply to children given that attitudes towards reading in elementary school are closely linked with reading achievement (Petscher 2010). This article extends research reported in an earlier study on an innovative, therapy dog-assisted reading program (Kirnan et al. 2016) by analyzing a second year of data from that program as well as investigating the program's impact on ELL students in kindergarten. It should be noted that dog-assisted reading programs are not stand alone educational initiatives but are used in conjunction with a school's language arts curriculum, thus complementing skill development programs by adding an attitudinal component.

Animal-Assisted Programs

Trained therapy dogs, calm and obedient in nature, have long been utilized in medical and therapeutic settings, and are shown to lower patient blood pressure (Odendaal 2000), while decreasing feelings of stress, anxiety, and loneliness (Jalongo et al. 2004; Pet Partners 2015). Dogs are employed in both Animal-Assisted Activities (AAA) and Animal-Assisted Therapy (AAT), with the distinction being that AAT is more structured, intensive, and individualized

based upon a client's specific needs and goals. It is also typically administered by a trained professional (e.g., weekly therapy sessions for a client with Post-Traumatic Stress Disorder). AAAs, by contrast, are more casual and are typically designed to achieve broader goals. For example, a volunteer may bring their certified therapy dog to an assisted living facility with the goal of providing residents with companionship. A trained professional, such as a licensed psychologist, is not required for an AAA (Altschiller 2011). More recently, a designation of AAE, Animal-Assisted Education, has been added to the list of animal and human interventions. AAE is defined as “a planned and structured intervention directed and/or delivered by educational and related service professional with specific academic or educational goals” (American Veterinary Medical Foundation 2017). As the discussion below suggests, educational interventions, AAEs, have characteristics of both AAA and AAT, and thus fall somewhere in the middle of the AAA/T spectrum.

An initiative that is gaining in popularity employs registered therapy dogs in school and library settings in an effort to improve student literacy skills and generate enthusiasm for reading. Within these dog-assisted literacy programs (DLPs), students practice reading aloud to dogs, with the rationale being that: (a) reading aloud represents an anxiety-provoking and emotionally charged event for many children (Jalongo and Hirsh 2010); and (b) therapy dogs, viewed as nonjudgmental listeners unable to criticize or correct, have the potential to alleviate some of this anxiety (Jalongo 2005). And indeed, prior research has shown that children may actually experience physiological changes (i.e., quickened pulse, increased blood pressure) when asked to read aloud in public (Lynch 2000), but that the presence of therapy dogs aids in the body's return to homeostasis (Jalongo 2005). Because DLPs vary greatly in terms of structure, setting, goals, and population served, Kirnan et al. (2016) recommend considering where each of these programs fall on an AAA/T spectrum, rather than attempting to classify them dichotomously. Important to note, however, is that because DLPs often utilize volunteers, rather than trained professionals, they cannot be considered AAT in the purest sense (Kirnan et al. 2016).

In library settings, DLPs are typically less formal (relative to school based programs) and may be offered on a “drop in” basis to all students within a given community. Thus, library based DLPs often align more closely with the AAA model. One of the very first library based DLPs, R.E.A.D. (Reading Education Assistance Dogs), began offering weekly “drop in” programming to young readers in the Salt Lake City area in 1999; each reader received a 30-min time slot to practice with a canine partner. Since then, the R.E.A.D. model has been replicated in every U.S. state, as well as abroad (for a comprehensive list of

¹ For the purposes of this article, students whose native language is not English will be referred to as English Language Learners, or ELLs. ELL is the most current term used to describe this population of students, whereas *ESL* is now more commonly used to describe the teachers, courses, and programs aimed at educating ELL students (Ferlazzo and Sypniewski 2012).

R.E.A.D. programs, see Intermountain Therapy Animals (2016a), and similar, additional programs have also been founded (e.g., Tail Waggin' Tutors [Therapy Dogs International], Reading with Rover). These programs are said to create a fun and non-threatening environment in which children can gain confidence in their abilities and develop positive schemas around reading and visiting the library (Hughes 2002).

Relative to library based programs, school based DLPs offer more structure in that sessions are regularly scheduled, occur consistently, and may be integrated into other classroom activities and aspects of the existing curriculum. Further, these programs may be offered to specific classes (e.g., special education) or groups of students (e.g., struggling readers), rather than universally. The positive effects associated with these programs, however, largely complement those reported in library based programs. For example, Smith (2009) studied the highly structured "Sit Stay Read" (SSR) program implemented in low-income Chicago elementary schools, in which small groups of second grade students participated in weekly hour-long sessions, each of which followed a five step reading instructional process. At the program's conclusion, participants had significantly improved their oral reading fluency skills, relative to a control group. Also reported was an increased motivation to read, improved behavior, and excitement among program participants (Smith 2009). Despite the lack of a trained professional, the SSR program can be said to align more with the AAT model due to its high degree of structure.

Evaluation of Current Research

While increasing in use and popularity, evidence for DLPs is just beginning to be collected and analyzed in a scientific manner. Early studies uniformly reported student improvements in attitudes, confidence, and reading skill - most often measured via interview or observation. However, recent research with more rigorous methodologies (control groups, standardized reading measures, or control of pre-existing reading differences) provides mixed results in reading ability improvement. Paradise (2007) and Booten (2011) failed to show statistically significant differences, while Kirnan et al. (2016), Le Roux et al. (2014), Smith (2009, 2010), and Walsh (2014) found full or partial support as evidenced by gains on various reading measures.

Given variations in methodologies and findings, DLPs have reached a point where rigorous scientific studies with appropriate controls and measurement are needed. Hall et al. (2016) conducted a systematic review of the published literature. Of the 48 articles they examined, well over half (27) lacked any experimental structure and instead, derived evidence of reading improvement on the basis of anecdotal information obtained mostly from interview or observation

of teachers and/or dog handlers. Thirteen of the articles either used standardized measures or incorporated a control condition (either a pre-measure or a control group), but did not use both, leaving the findings open to alternative explanations for observed improvement. The remaining eight articles all used standardized measures and some level of control, but only one of the eight (Le Roux et al. 2014) employed a methodology in which participants were randomly assigned to the DLP or control group(s).

Despite the lack of overall scientific rigor, Hall et al. (2016) concluded that DLPs are effective. However, controlled research studies using standardized measures, larger samples, and a longitudinal lens are needed to fully understand the underlying mechanisms as to why these programs are effective and to develop best practices for implementation. Due to the fact that many programs are short-lived or of an experimental nature, few studies have been able to investigate long-term effects. Indeed the duration of the programs themselves is quite variable. Table 1 presents information on program structure and session duration for several studies on dog-assisted literacy. The duration of the programs varies from a low of five sessions in Lenihan et al.'s (2016) small study of second grade students to a high of 28+ sessions in Friesen and Delisle's (2012) analysis of five programs in Canadian elementary schools. Programs with a small number of sessions raise concerns about the strength of the intervention: Can a program be effective given such limited exposure?

In addition to the number of sessions, the duration and session structure are likely influential. Whereas the aforementioned SSR program evaluated by Smith (2009) only met for eight sessions, those sessions lasted a full hour and consisted of a highly structured mix of one-on-one and small group reading activities. In addition to length of exposure, consideration should be given to the timing of outcomes measurement. Even if a program is effective, will the reading scores or attitudinal measures immediately reflect that influence? From a longitudinal perspective, will gains observed early be maintained? It is possible that gains are influenced by the novelty of having dogs in a classroom or represent a self-fulfilling prophecy. Such discrepancies in program features may explain much of the variation in findings, but also confirm Hall et al.'s (2016) contention of the need for ongoing rigorous study.

Longitudinal Lens

Whereas some studies report on long-running programs at a given school, it is not always clear if student participation extended over several years or was limited to 1 year. In Martin's (2001) documentation of the early R.E.A.D. pilot program in Utah, she noted the progress of one student whose reading grade level increased from 3.4 to 6.8

Table 1 Comparison of session frequency and duration of dog-assisted reading programs in elementary schools

Researcher	Grade/age	Inclusion criteria	Program characteristics	Session characteristics			
				Length (mins)	Meetings per week	Number of weeks	Total sessions
Martin (2001)	5–9 years	<Reading level	1–1 reading to dog	20	1	Multi-year	–
Kaymen (2005)	3rd	Remedial readers	1–1 reading to dog	10	–	–	–
Heyer (2007, as cited in Shaw 2013)	2nd–4th	<Reading level	1–1 reading to dog	20	1	16	16
Paradise (2007)	1st–5th	Struggling readers	1–1 reading to dog	30–50	–	Multi-year	–
Smith (2009)	2nd	All students (disadvantaged)	1–1 and small group	60	1	8	8
Smith (2010)	3rd	Home schooled	1–1 reading to dog	30	1	6	6
Griese (2010)	4th–5th	Reading deficit and learning disabled	1–1 reading to dog	20	3	3	9
Booten (2011)	5th	All students	Unclear 1–1 or small group	–	–	18	–
Friesen (2012)	2nd	All students	1–1 and small group	20	2	10	20
Friesen and Delisle (2012)	1–3, 5	<reading level	1–1 and small group	30	1–2	28–32	28–64
Shaw (2013)	K–5th	–	1–1 reading to dog	–	–	1 year	–
Le Roux et al. (2014)	3rd	<Reading level	1–1 reading to dog	20	1	10	10
Walsh (2014)	2nd	<Reading level	1–1 reading to dog	10	3	6	18
Kirnan et al. (2016)	K–4th	All students	Small group	10	1	20	20
Lenihan et al. (2016)	2nd	Optional summer program	1–1 reading to dog	30	1	5	5

Note “–” indicates the information was not reported by the study author(s)

in 15 months. Other references (Jalongo 2005) to this same program refer to different groups of students starting the program in consecutive academic years. Because most reading programs target struggling readers, it seems likely that in an ongoing school program, students will participate for varying amounts of time depending on their individual needs and progress.

The year-long R.E.A.D. program that Shaw (2013) cites had been in place for 5 years at the time she reported on its progress. From her description, it would appear that students were enrolled for one academic year and it was the program itself that enjoyed longevity at the school. No longitudinal data on student progress past the one year in which they engaged in the program were provided. Paradise (2007) reports on C.A.R.E., a similar multi-year program, implemented at an elementary school in Florida. However, it is unclear if students participated in more than one year, as the data presented appear to be cross-sectional, not longitudinal, in nature.

Many established programs provide annual reports on their websites (Intermountain Therapy Animals 2016b; Sit Stay Read 2013; Tales of Joy 2015). These cross-sectional analyses provide support for the success of the programs for multiple cohorts, but do not follow program participants beyond the first year. While some of these reports include

pre-measures of reading ability, proper statistical controls of pre-existing reading ability and control groups are not employed.

One replication study using more rigorous controls can be found in a recent collaborative project between the SSR program in Chicago and Loyola University (Schriberg 2013). In 2009, Smith reported on the SSR program focusing on a single year, used a control group, and adjusted for pre-existing reading ability. Schriberg’s team confirmed Smith’s findings in a 2012–13 cohort of second graders, again using a control group and statistically accounting for pre-existing reading test scores. Replicating Smith’s (2009) findings, second graders enrolled in the program showed significantly greater gains in oral reading fluency relative to a control group. However, no differences in reading comprehension or writing were found. In addition, Schriberg evaluated the long-term effects of the program by following a sub-sample of participants to the third grade. While these data did not include standardized reading measures as was done in second grade, the researchers did find differences in attitudinal scales and interview data, supporting more positive attitudes in third graders who participated in SSR relative to a control group.

Le Roux et al.’s (2014) study did not follow students to a subsequent year, but did re-test participants eight weeks

after the DLP ended; thus, participants were measured at three times: pre-program, immediate post program, and delayed post program. This highly controlled study randomly assigned participants to one of four groups: reading to a dog in the presence of an adult, reading to a stuffed animal in the presence of an adult, reading to an adult, or control; and examined oral fluency (reading rate, accuracy) and reading comprehension outcomes. Additionally, the authors controlled for pre-measures of student ability. The main effect for reading rate was not strong, as the dog group only differed from the group that read to a stuffed animal. However, in reading accuracy and reading comprehension, the dog group outperformed the three others. The group and time interaction was significant for reading comprehension, supporting a sustained improvement, as the experimental group differed from all three controls both immediately after the DLP ended and 8 weeks later.

Many of the programs in the cited literature are short-lived or of an experimental nature and thus are not conducive to an analysis of long-term effects. Nevertheless, there are many schools that do maintain ongoing programs and produce annual reports. Most of the annual reports posted on program websites lack methodological controls such as pre-existing reading skill and a control group, however, and few have analyzed data with a longitudinal lens. Longitudinal research, with proper controls, would be a welcome addition to the literature on DLPs.

English Language Learners (ELL)

In addition to the need for longitudinal studies, the DLP literature could also benefit from empirical studies which explore the impact of such programs on select groups of students. This type of analysis has thus far been difficult given the small sample sizes characteristic of the extant literature. Access to multi-year programs, however, provides the possibility of combining data across several years, yielding large enough samples to analyze outcomes for specific student groups. Because ELLs tend to struggle with oral reading tasks (Millett 2011) and experience reading anxiety in the classroom (Allen and Franklin 2002), they may represent one specific group who stands to benefit from DLPs. While the extant research has examined outcomes for “struggling readers,” and it is reasonable to assume that ELL students have been included within those samples, outcomes for this population have not yet been explicitly studied. Thus, the existing literature would benefit from the purposeful inclusion of ELL students, who continue to enter U.S. schools in high numbers and for whom reading (in English) understandably can present a challenge.

During the 2013–14 school year, approximately 9% of all students enrolled in U.S. public schools were ELLs, the

vast majority (76.5%) of whom were Spanish-speaking (National Center for Education Statistics [NCES] 2016a). In the coming years, this population of students is expected to increase sharply; by 2060, the U.S. Census Bureau projects that Hispanic Americans will comprise approximately one-third of the entire population (Colby and Ortman 2015). The grade currently containing the most ELL students is kindergarten, which is unsurprising given the fact that the youngest students most often have the least exposure to the English language. This lack of exposure to English naturally leads to challenges in the classroom. In 2015, for example, ELL students in the fourth and eighth grades scored an average of 37 and 45 points, respectively, lower than non-ELL students on the National Assessment of Educational Progress (NAEP) reading assessment, a statistic which remains largely unchanged over time (NCES 2016b).

Many ELL students experience similar obstacles when it comes to achievement in reading. Some of these obstacles include: vocabulary knowledge, syntactic awareness (Lovett et al. 2008), comprehension, phonemic awareness, oral fluency (Millett 2011), and depleting anxiety (Paradise 2007). Issues surrounding oral fluency and anxiety in ELL students are especially pertinent given that DLPs are designed to directly combat these specific reading concerns.

ELL students and oral fluency

Oral fluency, or the ability to read a text quickly and accurately aloud while using proper expression, is used as a measure of ongoing student progress in many school districts across the U.S. Most often, students are given a never before seen reading passage which matches their ability level and are asked to read aloud to their teacher. The student is assessed for rate and accuracy (i.e., how many words are read correctly in a certain amount of time). The teacher then asks the student questions pertaining to the text to evaluate comprehension of the passage (Ford 2015; Rasinski 2004).

In order to read fluently aloud, young readers must be able to group and gain meaning from words as they progress. This task is difficult for any child learning to read but for a child who is an ELL, the process can be particularly arduous. When ELL students read aloud, they are given the task of recognizing, decoding, and comprehending text written in a language with which they are not entirely comfortable. Once they have decoded the text, they must derive meaning for the words by translating what they have read into their native language. The ELL student must also focus on using proper verbal cues, pronunciation, and expression while reading—and all within a limited window of time or risk sounding choppy or discordant. Also present is the enduring anxiety and stress associated with feelings

of intimidation, vulnerability, and inadequacy which often come with reading aloud to peers and teachers. Taking all of these obstacles into account, it is no surprise that ELL students struggle in the area of oral fluency (Millett 2011).

One intervention strategy which has been used to improve the oral fluency of ELL students is to incorporate computer programs equipped with self-voice listening and oral diction outputs. For example, Ruffu (2012) utilized such programs with 20 ELL high school students over the course of a 4-week summer program. Using the computer program, students were asked to perform a number of tasks pertaining to reading fluency and reading comprehension, such as listening to and reading passages, dictating and correcting individual sentences using the speech recognition function, and recording themselves reading and then listening to their own voice (Ruffu 2012). Over the course of the program, students improved in oral accuracy and oral reading rate as well as in their general attitude toward school.

The success of this program can perhaps be attributed to the students' perception of less pressure and stress in the absence of teachers and peer observers. With performance anxiety lowered, the ELL students were able to focus on their learning with fewer distractions, and their rate of growth improved accordingly. Important to note, however, was that enthusiasm for the program began to wane over the course of the 4 weeks. If this same program were put into place throughout the course of an entire school year, such a negative perception could begin to affect outcomes. It is essential that students feel engaged in their reading interventions or the growth of their reading fluency could be stunted. This is especially true in regard to younger students who may be more likely to feel bored with reading and reading interventions quicker relative to high school students.

ELL students and reading anxiety

Reading anxiety is a common occurrence for all struggling readers but ELL students may be particularly affected due to their limited understanding of the English language. Paradise (2007) notes that debilitating anxiety creates excessive worry and self-doubt resulting in reduced participation in the classroom. Debilitating anxiety often manifests itself in the form of performance anxiety, which can hinder a student's ability to deliver oral reports, read aloud, and perform other interactive activities (Paradise 2007). Recurring negative frustrating experiences in reading (e.g., snickering from classmates) may contribute to debilitating anxiety and ultimately, lead to an avoidance of language use altogether. This avoidance of language severely impedes ELL student progress, as free experimentation with language through trial and error is considered essential for growth.

A number of intervention strategies have been utilized to help alleviate the negative effects of reading anxiety for ELL students. One popular tactic involves the use of cooperative learning between students in the classroom. Allen and Franklin (2002) reported on a classroom strategy that grouped bilingual students with students who are still mastering the English language. In this scenario, a student who is not yet comfortable sharing answers in English can give their answer to a bilingual student in Spanish who then recites the answer to the class in English. This strategy allows the ELL student to gain confidence and reduce anxiety over time until they eventually feel prepared to give their answers to the class themselves. Paradise (2007) also encourages the implementation of groups for ELL students due to the benefits associated with lower performance anxiety and increasing interactions and understanding between students.

Although there is limited research on the effects of AAA or AAT on ELL students, Binfet, Trotman, Henstock and Silas (2016) conducted a study in which seven international students from a Canadian university attended five canine therapy sessions as part of a campus initiative to reduce stress and homesickness. Participants reported less stress, an increased sense of belongingness on campus, and the dog's role as a social catalyst initiating interactions and conversation with others on campus. These positive outcomes of stress reduction and increased social integration could directly combat some of the negative side effects of performance anxiety which ELL students often endure in the classroom.

The Present Study

A study by Kirnan et al. (2016) analyzed data from a school-wide initiative in which certified therapy dogs were introduced into every classroom (grades kindergarten through fifth). Comparing reading scores after the first year of the DLP with scores from a control cohort revealed a significant positive effect for the program but only in kindergarten. The effect was retained after controlling for pre-existing reading skill. This program has continued at the elementary school and provides the opportunity for both a replication to a second cohort and a longitudinal analysis by examining reading scores from participants at the end of the second year. Second year data provide an opportunity to determine if the: (1) program is effective for a second kindergarten cohort, (2) gains observed in kindergarten in the first year of the program are maintained in Year 2, and (3) higher grades (second through fourth) differ from the control group in the second year of the program. The authors hypothesize that:

Table 2 Grade distribution and demographic profiles by cohort group for grades K through 4

Demographic	Cohort group	
	Control (2010–2011)	Program year 2 (2012–2013)
Grade (number of students)		
K	32	30
1st	30	27
2nd	24	38
3rd	37	35
4th	29	27
Gender		
Male	52.50%	50.34%
Female	47.50	49.67
Ethnicity		
Caucasian	83.33	73.47
African American	0.00	0.00
Asian	3.33	6.12
Hawaiian/Pacific Islander	0.00	0.68
Hispanic	10.00	16.33
Other/multiracial	3.33	3.40
ELL		
No	91.67	83.35
Yes	8.33	15.65

H₁ Results from Year 2 of the program will replicate the findings in the first year in that kindergarten will show higher reader scores for the DLP compared to the control cohort.

H₂ Unlike the first year of the program, students in upper grades (first through fourth) who have participated for 2 years in the DLP will show higher reader scores compared to the control cohort.

The ability to access 2 years of data also yielded sufficient sample sizes for a subgroup analysis. In the study by Kirnan et al., all students in the school participated in the program regardless of reading ability. While significant improvements in reading test scores were only observed in kindergarten, follow-up interviews with teachers, teaching aides, and dog owners suggested that all students enjoyed the program and that select groups gained even more. Both teaching staff and dog owners identified ELL students or children from another country with a language barrier as one of the groups that especially benefitted. One educator was quoted as saying that ELL students “are easily embarrassed because they don’t know the language as well as others. With the dog, they are able to be proud of their reading ability” (Kirnan et al. 2016, p. 649). Thus, given these

anecdotal reports and the need for high quality reading interventions for ELL students, the research team felt it was important to analyze reading outcomes for ELL students.

With a second year of program data, a sufficient sample of ELL students was obtained by combining the first 2 years and comparing to the control. Only data for kindergarten could be analyzed as an examination of Year 1 and Year 2 in the upper grades would confound students with 1 year or 2 years in the DLP. It is hypothesized that:

H₃ An analysis of 2 years of combined kindergarten data will reveal that ELL students show similar improvements as non-ELL when compared with the control cohort.

Method

Participants

Students at a suburban elementary school in central New Jersey from 2010 to 2013 were included in the study. The DLP was implemented in February 2012; therefore, student scores from the 2010–11 school year comprised the control group while student scores from the 2011–12 and 2012–13 academic years constituted the experimental groups. Whereas all grades in the school participated in the reading program during these years, data for the fifth grade was removed as their control group data were not available in school archives. As a result, the students analyzed for this study ranged in grade level from kindergarten through fourth grade. When analyzing the second year of the program, only students who had also participated in the first year were retained. This was done to avoid combining students with varying levels of exposure to the program, which would have likely distorted the findings. Thus, the second year of the program represents a cumulative exposure over 2 years. The samples are equivalent in terms of gender and are predominantly Caucasian with Hispanic being the second largest ethnic group. Cohort sizes and demographic information appear in Table 2.

Materials

The elementary school used the Northwest Evaluation Association’s (NWEA) Measures of Academic Progress (MAP) to assess students’ reading ability at the time of this study. Developed in 1997, the MAP assessment is administered three times per academic year (fall, winter, and spring) in a computer adaptive format. Spring, or year-end, reading scores were used to measure the impact of the reading program as the dogs were introduced to the classrooms mid-year. It was important to control for pre-existing reading level, as the research design was quasi-experimental

with a separate cohort constituting the control group rather than randomly assigning students to a control or experimental condition. The MAP assessment had recently been introduced to the school district and not all grades had completed the Fall 2010 assessment. For this reason, winter (mid-year) reading scores were used as a measure of control for pre-existing differences in reading ability.

The publishers of the MAP report acceptable reliability and validity. Reliability coefficients were reported as ranging from the low 0.80 s to the low 0.90 s. Validity was demonstrated via strong correlations (0.66–0.87) of MAP reading scores with other measures of general academic ability (NWEA 2004). Additionally, test item content was compared to the content of the reading curriculum in a demonstration of validity. While there are many potential methods for measuring reading ability, the use of a standardized, objective test was deemed ideal as this removed potential positive bias in favor of the DLP that may have resulted from teacher ratings, or other more subjective, local measures.

Procedure

Reading Program Description

The program assessed in the current study differed from the majority of DLPs in that the entire school was involved, rather than select struggling readers, as is reported in most of the literature. Dog owners were recruited through local chapters of national certification programs and further screened in an interview process. In the second year of the program, returning dog owners were required to provide proof of annual re-certification. These screenings ensured that all dogs had passed basic obedience and sociability assessments and were healthy and up-to-date with vaccinations. Unlike the similar school-wide program reported on by Smith (2009), there was no formal training for the dog owners; rather, individual classroom teachers developed the format that best fit their students and grade level.

Prior to the start of the program, several steps were taken in preparation. A note was sent home with each student describing the program and requesting parental permission. Parent concerns and questions were addressed by the school's principal. For example, a student with a severe allergy was able to participate remotely by using an iPad. Teachers reviewed proper behavior when interacting with the dogs and these guidelines were continually reinforced by both the teacher and the dog owner throughout the program. Children who were afraid of dogs began their participation at the periphery of the reading center (typically the dog was in the center with the dog owner while the children formed a reading circle around them). It was noted that by the end of the program, these students were fully

participatory having “inched” closer with each week, until they also were petting and reading to the dog.

Once a week, the dog owners visited their assigned classroom for about an hour where students read to the dogs in small groups (4–6 students) formed on the basis of reading level. Thus, each group read to the dog for about 10–15 min. There were 14 classroom visits per week comprised of 13 dogs and 11 owners. Some owners had more than one dog and alternated them weekly, while others visited more than one classroom each week. All classes had a writing component that incorporated the dog reading program experience. These activities ranged from writing a few sentences in kindergarten, to journaling and creating a newspaper in an upper grade. Kindergarten incorporated the dog program into four language arts centers of reading to the dogs, writing about the dogs, illustrating student writing, and participating in games with a dog theme (e.g., sorting words written on bones into dog houses). Beginning readers in kindergarten would incorporate the dog into activities involving letter recognition and letter sounds until they progressed into reading. Students in a Special Education classroom read to the dogs individually and did not include a writing component related to the dogs.

Finally, the research team's role in this project was one of a collaborator with the school. The school initiated and supervised the DLP and administered the reading tests as part of routine district-wide testing. The research team obtained IRB and local school board approvals to receive and analyze archived data.

Results

A series of *t*-tests were conducted to determine if the spring (year-end) reading scores differed for the control group relative to the second year of the dog reading program. The analyses found a statistically significant difference in kindergarten for the second year of the program in support of Hypothesis 1 with a higher mean reading score for the reading group of ($M=173.20$, $SD=11.86$) relative to the control ($M=160.34$, $SD=11.96$), $t(50)=3.78$, $p<.001$. Hypothesis 2 gained partial support as the dog reading group in first grade ended the year with significantly higher reading scores ($M=188.70$, $SD=12.68$) than the control ($M=176.73$, $SD=12.44$), $t(55)=3.59$, $p=.001$. However, no mean differences were found for grades 2, 3, or 4. See Table 3.

Due to the fact that the research design was quasi-experimental, differences in pre-existing reading ability in the control and reading program groups needed to be assessed. Winter scores were selected rather than fall scores to control for pre-existing reading ability for two reasons: (1) the reading test was not administered to the control group in the

Table 3 Descriptive statistics and t-test results of year-end reading scores by cohort group

Grade	Cohort group		
	Control (2010–2011)	Program year 1 ^a (2011–2012)	Program year 2 (2012– 2013)
1st	176.73	179.92	188.70*
	(12.44)	(15.74)	(12.68)
	30	39	27
2nd	193.88	193.69	193.89
	(15.75)	(13.30)	(15.51)
	24	35	38
3rd	205.89	200.67	206.54
	(14.84)	(15.06)	(9.95)
	37	27	35
4th	213.17	212.48 ^b	208.37
	(7.78)	(15.39)	(13.77)
	29	40	27

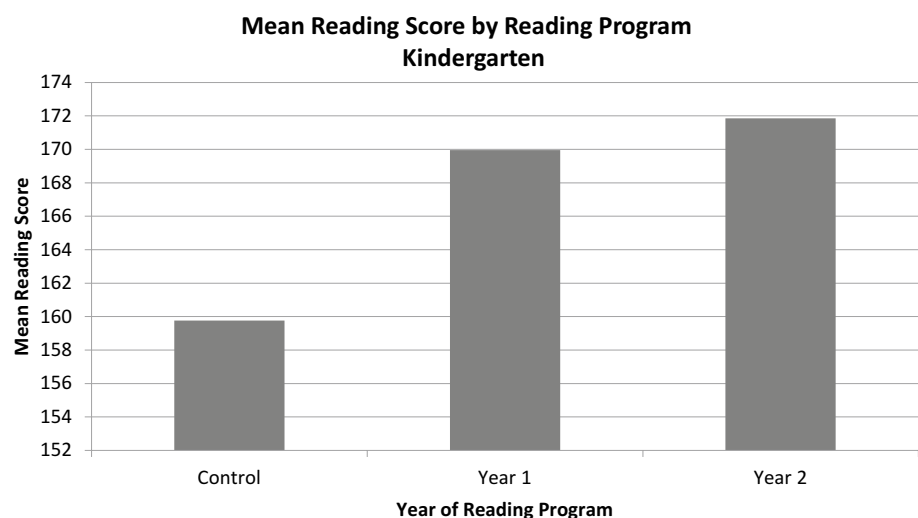
Note Means appear first with standard deviations below in parentheses followed by sample size

* $p < .01$

^aData for Program Year 1 obtained from Kirnan et al. (2016)

^bEqual variances not assumed. For all other *t*-tests, equal variances assumed

Fig. 1 Mean reading scores in Year 2 were significantly higher than the control cohort group confirming findings from the earlier study which analyzed Year 1. Data for Program Year 1 obtained from Kirnan et al. (2016)



fall; and (2) the DLP did not begin until mid-year. *T*-tests of winter reading scores revealed significant differences only for the first grade suggesting the need for an analysis of covariance. All assumptions of the ANCOVA procedure were tested and met. After controlling for pre-existing reading levels in kindergarten, the program effect remained for first grade with $F(1,53)=5.15$, $p=.027$, $\eta^2 = 0.09$, based on adjusted mean spring reading scores of 179.71 for the control group and 185.33 for the dog reading program. As an added step, an ANCOVA was also conducted for the

kindergarten controlling for winter reading scores and confirming the main effect for reading program after controlling for winter reading score with $F(1,49)=18.42$, $p=.001$, $\eta^2 = 0.27$, based on adjusted mean spring reading scores of 161.63 for the control group and 171.15 for the dog reading program.

Mean score differences in spring reading scores are presented visually in Figs. 1 and 2. Figure 1 displays scores for kindergarten only and also includes the reading scores for the first year of the program. Figure 2 presents mean scores for grades 1 through 4 with data from the first year added for comparison. Unlike kindergarten, the second year in the reading program for the higher grades represents the cumulative effect of 2 years in the DLP.

The availability of a second year of data from the program allowed the researchers to combine data from the 2 years, increasing sample size for ELL students in an analysis of this group relative to the control. The ELL analysis was conducted for kindergarten only. The combination of years was not possible for the other grades as this would confound students with varying years of experience in the program: those from the first year, 2011–12, would have only 1 year; while those from the second year, 2012–13, would have 2 years. Given expected differences in winter reading scores across ELL and non-ELL students, a 2×2 ,

Reading Program by ELL Status, analysis of covariance was employed. The assumptions for ANCOVA were tested and all but one were met. Levene's test for homogeneity of variance was violated but only when considering the variance between ELL and non-ELL students. This violation was not considered to invalidate the statistics as with beginning readers, there may be a natural floor to any reading test such that poor readers cluster at the lower scores which would result in lower variance especially for a group that

Fig. 2 Data for Program Year 1 obtained from Kirnan et al. (2016) revealed no mean differences in reading score for grades 1st through 4th in Year 1. However, the current study shows mean score differences in first grade for Year 2 of the reading program, suggesting a cumulative effect

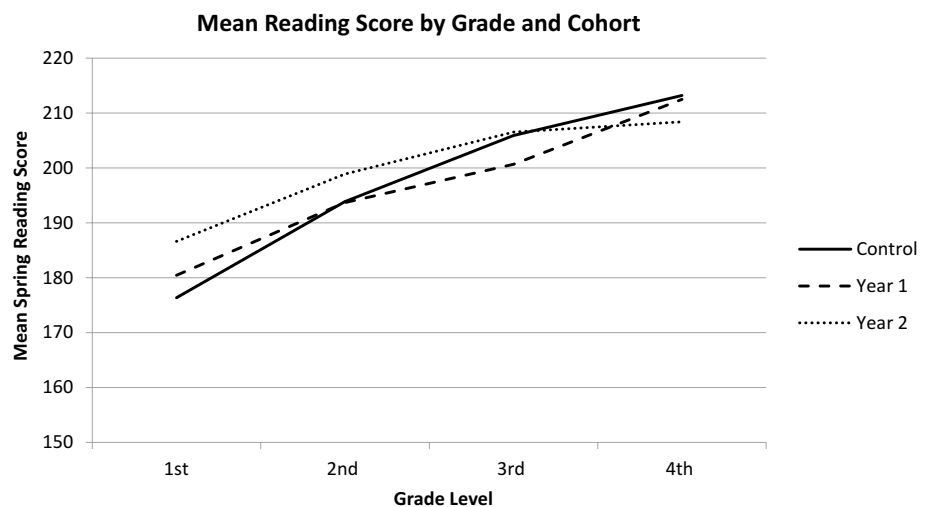
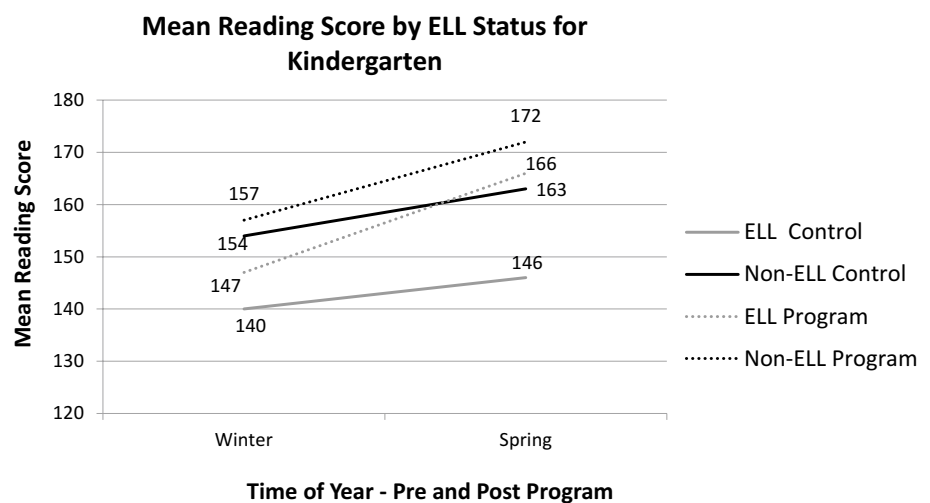


Fig. 3 Combined Years 1 and 2 of the program compared to the control cohort reveal significant improvement in reading scores for both ELL and non-ELL students in kindergarten



was recently exposed to English reading. No differences in reading score variance were found when comparing the control and DLP groups.

As would be expected, winter reading score was a significant covariate, $F(1,75)=59.69$, $p<.001$, whose inclusion in the model significantly changed the contributions of other variables. When winter reading score was taken into account, the main effect for ELL was no longer significant, $F(1,75)=0.63$, $p=.429$. However, the main effect of program remained significant, $F(1,75)=18.07$, $p<.001$, with those in the DLP reporting significantly higher spring reading scores ($M=171.31$; $SD=10.84$) than the control group ($M=160.34$, $SD=11.97$) supporting Hypothesis 3. The interaction of ELL by program was not statistically significant, $F(1,75)=2.10$, $p=.152$. Despite the combination of the first 2 years of data for the program, the sample sizes for ELL were still very small (ELL control=5, ELL program=6) and likely hindered the ability to obtain a significant interaction. Means for winter and spring reading

scores appear in Fig. 3 for ELL and non-ELL groups. While developmentally one expects growth from winter to spring, there is a clear main effect for the reading program relative to the control group.

Discussion

This study's results support earlier research demonstrating that a DLP has a positive impact on reading skills in lower grades (Friesen 2012; Friesen and Delisle 2012; Griesen 2010; Heyer 2007, as cited in Shaw 2013; Kaymen 2005; LeRoux et al. 2014; Martin 2001; Paradise 2007; Smith 2009, 2010; Walsh 2014), and also shows that these results can be replicated in subsequent years of the program. Specifically, kindergarten students and first graders enrolled in the second year of the program outperformed their control group counterparts. Hypothesis 1 was supported in that kindergarten students in the second year cohort performed

better than a control group. This finding confirmed the earlier study by Kirnan et al. (2016) at the same site that analyzed data from the first year of the program. Replication of findings from the first year to subsequent cohorts also agrees with research by various reading programs provided in their annual reports (Intermountain Therapy Animals 2016b; Sit Stay Read 2013; Tales of Joy 2015). What such reports usually lack, however, is sufficient controls called for by Hall et al. (2016). Unlike these studies, which confirm ongoing, cross-sectional program success, the current research employed a more rigorous design accounting for pre-existing reading ability and using a control group, as was done by Schriberg (2013).

Partial support was found for Hypothesis 2, which postulated that upper grades (1 through 4) would demonstrate higher reading scores than the control in Year 2 of the program. While Kirnan et al. (2016) did not find significant differences in upper grades, it was thought that, by the end of a second year of exposure to the program, an increase would be evidenced. Statistically significant differences in reading were found, but only in first grade. Again, these differences remained after controlling for reading ability in kindergarten, suggesting a long-term or possibly delayed effect for the reading program in upper grades. Ideally, reading scores from both subsequent years and multiple earlier years would be obtained to further track student progress. However, the school partner in the current study has discontinued the use of the MAP standardized reading test and thus, another measure would need to be identified and data obtained for both program and control groups. It is strongly recommended that future research into DLPs obtain longitudinal data on reading ability and attitudes. Ideally, this data would extend for several years before the program is initiated and several years after program completion. It may well be that in upper grades, the impact of the program is delayed.

The failure to find statistically significant reading differences in the upper grades, second through fourth, agrees with research by Booten (2011) and Kirnan et al. (2016). One possible explanation for these results stems from the fact that in this study's kindergarten, the therapy dogs were more fully integrated into the language arts curricula (e.g., students wrote stories about dogs, played reading games with a dog theme), which may have reinforced the skills acquired during weekly sessions, leading to stronger effects. And indeed, prior research on AAT with child victims of sexual abuse supports the notion that fuller integration of therapy animals allows for more meaningful outcomes (see Dietz et al. 2012).

In addition to variations in curricular integration, the implementation of the DLP on a school-wide basis, rather than just with struggling readers, may have contributed to the difficulty in demonstrating reading improvement.

The inability to demonstrate significant improvement in upper grades may be a statistical artifact in that typically developing readers have less room and opportunity for growth and their larger proportion in the sample dilutes the improvements of struggling readers. But, more importantly, it is essential to remember that the school-wide program evaluated in the present study is unique, in that the vast majority of successful DLPs described within the literature allow *struggling* readers the opportunity to read one-on-one to the dog and its handler (e.g., Griese 2010; Le Roux et al. 2014; Paradise 2007; Shaw 2013). Whereas best practices in reading instruction would support the use of intensive, one-on-one instruction and practice that is tailored to the needs, pace, and preferences of struggling readers (Linan-Thompson and Vaughn 2010), a school-wide, universal implementation in which all students split into small groups involves less time per student, as well as less structure and individualization, and perhaps greater anxiety or distraction. Thus, programs more similar to those most commonly studied, which focus on struggling readers and afford more meetings and/or depth to interactions may enjoy more success with upper grade students.

Alternatively, it may prove that both school-wide and one-on-one programs are more effective with younger students. Students in kindergarten are beginning to form attitudes and develop behaviors related to reading, making it easier to influence them relative to children who have been reading for several years and may strongly associate reading with anxiety and/or failure. Smith (2009), summarizing teacher interview findings in the SSR program, suggested that similar interventions would be most successful if implemented early, no later than third grade.

Hypothesis 3 was supported in that significant improvement was demonstrated for both ELL and non-ELL students. Significant reading score differences were found between ELL and non-ELL students, as well as those enrolled in the program compared with the control group. When prior reading ability was controlled for, the main effect for ELL status disappeared, but the main effect for reading program was still significant. ELL students in the control group improved by 6 points, while those in the DLP improved by 19; non-ELL students in the control group improved by 9 points, while those in the DLP improved by 15. The interaction of ELL and reading program did not achieve significance and may have been hindered by the extremely small sample size of the ELL group, despite the combination of 2 years of data. While the interaction was not significant, the mean scores suggest a powerful impact of the program for young ELL students. At the end of the year, the reading scores for ELL students participating in the reading program were comparable to the non-ELL control group.

The program under study differs from others as it is one of the few to include kindergarten; only Shaw (2013) and Martin (2001) extended their programs to these younger ages. Additionally, the program is a school-wide initiative, including every child in dog-assisted literacy rather than just struggling readers. This type of implementation is unusual as most school based programs, except for Friesen (2012), Booten (2011) and Smith (2009), focused only on struggling readers. Programs that focus on a few readers are more likely to differ in structure and design. While a school-wide initiative generates much enthusiasm, this process inevitably results in less time per student due to the small group nature versus one-on-one process of reading to the dogs. The focus of small group interventions is more akin to AAA with general reading goals established for the class or small group, while one-on-one interventions address specific learning goals for individual students as described by AAT. Also, statistically, the effect for struggling readers may be diluted by scores of typically developing readers for whom one would not expect to see as large an increase in reading skill. Thus, the findings suggest that for school-wide programs or programs of a more AAA format that have less individualization in goals or process, the strongest results will appear in younger students. Struggling readers in upper grades should be included in programs with more individualized instruction and specific learning goals and targeted measurement of those goals.

There is some evidence that continued participation in a DLP may have long-term benefits. The analysis of first grade students who completed a second year in the program showed higher reading scores than a control group. Earlier interview results (Kirnan et al. 2016) provided qualitative data to support interest and enthusiasm in all grades, which can be considered a meaningful outcome in and of itself, as positive student attitudes toward reading are associated with reading achievement, especially for elementary school students (Petscher 2010). Future research should consider longitudinal measurement of reading skill as well as measures of student attitudes toward reading at all grade levels.

Hall et al. (2016) called for increased scientific rigor in the research on DLPs. The current study is a first step in that process by examining the second year of a program while accounting for pre-existing differences in reading skill and comparison to a control group. This study replicated findings on a second cohort at a specific site, thus addressing concerns that the novelty of the program and the dogs might not persist over time. Additionally, a separate analysis of ELL students demonstrated the strong influence of a less structured, generalized program in early intervention for non-English speaking students. Moving forward, research should continue to explore the effects of DLPs, both in the long term and on ELL students. As Kirnan et al. (2016) note, even a well-designed quasi-experimental

project cannot account for all possible threats to internal validity, such as cohort differences or historical events. Thus, an experimental design which utilizes random assignment to groups, similar to the one included in Le Roux et al. (2014), would be optimal.

Nonetheless, the current study provides additional evidence for the use of DLPs, especially in the lower grades, and is innovative in its purposeful inclusion of ELL students. While strict methodological control (e.g., random assignment to groups) was not possible, the results taken in the context of prior research on DLPs suggest many benefits. From a practical perspective, given that the dog owners are volunteers, the cost to the school is minimal.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Disclosure The lead author is a therapy dog volunteer. She has volunteered at senior citizen assisted living centers, a summer camp for adults with developmental disabilities, and the reading program at the school under study.

Ethical approval This is an original piece of research that has not been published elsewhere, nor is it currently submitted elsewhere for publication consideration. Further, all relevant IRB and school approvals were obtained and protocols followed in this study of archival data.

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