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The Effect of an Animal-Assisted Reading Program on the Reading Rate, Accuracy and Comprehension of Grade 3 Students: A Randomized Control Study

Marieanna C. le Roux · Leslie Swartz · Estelle Swart

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Abstract
Background Animal-assisted therapy has been widely used with students. This study is the first known investigation into the impact of an animal-assisted reading program on reading skills, employing an experimental pre-test/post-test control group design and controlling for the effects of extra attention to student's reading.
Objective The purpose of the study was to evaluate the effects of an animal-assisted reading program on the reading rate, accuracy and comprehension of grade 3 students.
Method Students identified by the ESSI Reading Test as poor readers (N = 102) were randomly assigned to three experimental groups and one control group. Twenty-seven students read to a dog in the presence of a Pets as Therapy volunteer, 24 students read directly to an adult, while 26 students read to a teddy bear in the presence of an adult. Students in the control group (n = 25) were not part of the program and continued with their normal school activities. Data collection took place before the start of the program (Time 1), directly after completion of the 10-week reading program (Time 2), and again 8 weeks after the completion of the program (Time 3).
Results Mixed method analysis of variance revealed significant interaction between group and time on the Neale reading comprehension scores with the "*dog group*" scoring higher than the three other groups.
Conclusion The animal-assisted reading program had an impact on some of the reading skills of the students who read to a dog. The program is flexible and can be applied in a variety of settings.

Keywords Animal-assisted reading program · Grade 3 students · Reading intervention · South Africa

M. C. le Roux (✉) · L. Swartz
Department of Psychology, Stellenbosch University, Private Bag X1, Matieland 7602, South Africa
e-mail: mclr@sun.ac.za

E. Swart
Department of Educational Psychology, Stellenbosch University, Private Bag X1, Matieland 7602, South Africa

Introduction

Problems with reading are serious and pervasive world-wide. In America programs such as the *Read Well* program (Owens 2010) and the *Waterford Early Reading Program Evaluation* program (Llosa and Slayton 2009) and the *No Child Left Behind* Act of 2001 (2002), have been used to address reading problems—with limited success. The incidence of reading problems in less resourced countries appears to be similar, if not worse. The performance of South African grade 4 and 5 students was the poorest out of 40 countries that took part in the *Progress in International Reading Literacy Study* (*PIRLS)* (Howie et al. 2008). The *PIRLS* study also revealed that the reading skills of 80 % of South African students would not be fully developed by the time they reach grade 5 (Howie et al. 2008). A follow-up *PIRLS* study in 2011 revealed a similar picture (Howie et al. 2012). In 2011 the national literacy figure for South African grade 3 students was 35 % and that for numeracy 28 % (Department of Basic Education 2011). The Education Department of the Western Cape Province of South Africa, where this study was conducted, did their own assessments during 2011. These assessments revealed a literacy figure of 30 % and a numeracy figure of 48 % for grade 3 students (Western Cape Education Department 2012).

Reading difficulties may have a serious impact on the short-term as well as the long-term emotional development and learning experiences of young students (Dednam 2011; Elbaum and Vaughn 2003; Esterhuyse 1997) while students who struggle to read become anxious and make more mistakes (Shannon 2007). Their stress levels are raised, they may be teased by classmates and they usually have higher rates of absenteeism and late completion of school assignments (Intermountain Therapy Animals 2012).

A newly emerging approach to address reading difficulties is through animal-assisted programs. Boris Levinson started animal-assisted therapy (AAT) in the 1960s (Levinson 1969) when he described the presence of his own dog when working psychotherapeutically with students. AAT can be described as a goal-directed intervention with a trained animal as part of the therapy process. According to Nimer and Lundahl (2007) AAT may be viewed as a supplement intervention with the inclusion of a therapy animal as part of the intervention. Animal-assisted activities (AAA) refer to a more informal intervention that is delivered by trained professionals or by volunteers with a trained animal, but with no specific goals in mind (Kruger and Serpell 2010). Both AAT and AAA have been widely used with students, elderly people, people with disabilities and cancer patients as well as in schools, nursing homes, long-term care facilities and hospitals.

AAT has also been widely used with struggling readers (Booten 2011; Friesen 2012; Kaymen 2005; Paradise 2007), with students with learning disabilities (Esteves and Stokes 2008; Griess 2010; Scarborough 2010) and in libraries and afterschool centers (Friesen 2012; Shannon 2007). In South Africa AAT has been used with students with autistm (Rinquest 2005), in educational psychology settings (Scholtz 2010), with students with fetal alcohol syndrome (De Villiers 2009) and to enhance students' socialization skills and self-esteem (Lubbe and Scholtz 2013).

Animals, especially dogs, have been used in classrooms and in educational settings. In the early 1980s Margadant-van Arcken studied students' interaction with animals in the classroom (cited in Gee 2011). Initially the students had been afraid of the animals and then started to trust them. In a study by Kotrschal and Ortbauer (2003), students paid more attention to their teachers and boys displayed less aggressive and hyperactive behaviors when a dog was present in the classroom. Hergovich et al. (2002) found grade 1 students were less aggressive and had more empathy when a dog was present. In Jalongo's study

(2005) students' attention and motivation improved when using animals in the classroom. Some of the benefits of having dogs in the classroom are that students learn about animals, animal training and discipline, nurturance, responsible pet ownership, and kindness towards animals, and they develop their ability to have and show empathy (Chandler 2001).

Being in the presence of a dog and petting a dog also seem to have a physical effect on humans—both adults and students. According to Friedmann et al. (1983), students' blood pressure was lower when reading out loud in the presence of a dog than when reading out loud to a friend or an adult. Jenkins (1986) found that the blood pressures of both students and adults remained unaltered while reading out loud. However, while petting their dogs while reading their blood pressure lowered. In a study by Friedmann et al. (2000), students' anxiety lowered when in the presence of a calm dog.

These results confirmed the positive impact the presence of animals may have on students behavior and communication skills. This led to the development of various animal-assisted reading interventions such as *Reading Education Assistant Dog* (R.E.A.D.), *Beach Animals Reading with Kids* (B.A.R.K), *Reading to Rover* (Gee 2011) and the *Sit, Stay, and Read* program (Black 2009).

In 1999 Sandi Martin from Intermountain Therapy Animals started the first animal-assisted reading program (R.E.A.D.) in Salt Lake City, Utah. Registered therapy dogs that had the necessary training, personality and skills to work with students were used in this animal-assisted reading program. These dogs travelled eagerly, were used to noise and being part of activities as well as to being petted. The Intermountain Therapy Animal's informal results of 1999 indicated that the students' reading skills improved by two to four grade levels (Intermountain Therapy Animals 2012). These results were supported by those of Newlin (2003) who found an improvement in reading skills of at least two grade levels. In addition further research found that the students' self-esteem increased and their anxiety levels decreased (Black 2009; Bueche 2003; Morgan 2008; Newlin 2003). Students with emotional and behavioral difficulties also enjoyed the dog reading program (Bassette and Taber-Doughty 2013). Their on-task behavior improved during the dog intervention and this improvement was maintained over time.

Dogs in Education Assisting with Literacy (D.E.A.L.), a program related to R.E.A.D., started in 2002. Scott (2003) reported an improvement in reading skills and an increase in self-esteem with the D.E.A.L. program. According to Dunlap (2010) other programs similar to R.E.A.D. were also successful in improving students' reading skills.

A few formal studies were conducted on the effectiveness of animal-assisted reading programs in addressing reading problems. Kaymen (2005) found that students were more relaxed and they found reading more enjoyable when reading to a dog. Results of an exploratory study revealed that students could benefit from reading to dogs at public libraries and aftercare centers (Shannon 2007). The students were more positive towards dogs and they were more confident about reading. Eighty-eight percent of the guardians agreed that their children had benefitted from participating in an animal-assisted reading program although 73 % of those students read to a dog only once. Ninety-three percent of the students enjoyed reading to the dogs.

According to Paradise (2007), the reading skills of students assigned to therapy dogs were better than those of the control group who read to a teacher. The students who read to the therapy dogs were also more positive towards their schoolwork, they participated more in classroom activities and were more self-confident after they had read to the therapy dogs. The teachers in Dunham's project (cited in Shannon 2007) reported the students' participation in classroom activities and their concentration had increased. According to

the students, they had enjoyed reading to the dogs. Mertz (2009) included the role of petting and/or touching the dog while reading and speaking to the dog. Results in this project supported the notion of using dogs in a reading program to create a positive experience for those students who struggle to read.

Several studies confirmed the benefit of animal-assisted reading programs. In 2009, Jo McGinnis, a volunteer from Intermountain Therapy Animals, reported that 11 out of 12 students' reading improved by one to four grade levels (Intermountain Therapy Animals News 2009). Smith (2009) evaluated the *Sit Stay Read* program and found an improvement of 20 % in the oral fluency of the program group over the comparison group. Using the *Sit Stay Read* program also resulted in an improvement in reading scores and increase in reading rate by as much as 24 words per minute for the students who read to the dogs (Black 2009). Several studies with the *All Ears Reading® Program* revealed improvement in different aspects of reading. Smith and Meehan (2010) reported an increase of 30 % in the reading fluency of home-schooled youths after conducting the program for 10 weeks. Smith (2010) found a significant improvement in the reading skills of home-schooled students. Griess (2010) also reported a significant increase in the total amount of reading time during the intervention phase as compared to time spent on reading during the baseline phase. However, only three-fourth and fifth grade students with mild learning disabilities participated in this study.

Not all the research done on animal-assisted reading had positive results. Lenihan et al. (2011) investigated whether a reading program with dogs could reduce the loss of reading ability during school holidays. After a 5-week reading program they found no significant difference between the reading skills of the group that read to a dog and the control group. In a study with grade 5 students, Booten (2011) also found no significant differences between the reading and behavior scores of the experimental (reading to a dog) group and those of the control group.

Prior to the current study, an animal-assisted reading program in this format had never been tested in South Africa. Permission to follow the R.E.A.D. reading program of Intermountain Therapy Animals was obtained from the executive director of Intermountain Therapy Animals/R.E.A.D. (K. Klotz, personal communication, October 29 2009).

Previous studies on the impact of AAT tended to overlook the possibility that any positive effect of AAT might be attributable to the increased attention participants received in a research project rather than to the specific impact of the presence of the animal (Fine 2011; Kazdin 2011). As far as we could ascertain, our study was the first in this field to control both for the novelty effect—the extra attention and opportunity for students to practice reading—and for the effects of reading to a non-human audience. We therefore had four groups in the study: one group read to a dog and an adult, one group read to an adult only and another group read to a teddy bear with an adult present. A control group received no intervention.

The aim of the study was to determine the effect of an animal-assisted reading program on the reading skills of grade 3 students (Le Roux 2013). The particular focus of this article is to report on the effect of the animal-assisted reading program on the reading rate, accuracy and comprehension of grade 3 students as measured by the Neale Analysis of Reading Ability test. An animal-assisted reading program focused on creating a context where the students could practice their reading skills without the fear of making mistakes. This type of program does not include reading instructions, as given by the teachers, but serves as a support to the teachers. The hypothesis of the research in the current article is that the students in the "*dog group*" will read significantly beter on reading rate, accuracy and comprehension after an animal-assisted reading program.

Method

Participants

All the third graders in an Afrikaans medium elementary school in a low socio-economic community in the Western Cape, South Africa, were assessed with a South African reading and spelling test, the ESSI Reading and Spelling Test (Esterhuyse 1997), and with the Neale Analysis of Reading Ability (Neale 1999). Those students (N = 106) identified by means of the ESSI Reading Test as having a stanine score of 1 (very poor), 2 or 3 (poor) for reading, were asked to participate further. All the students in the current study were poor readers, with 75 % reading on grade 1 level and 25 % reading on grade 2 level despite being in grade 3. Thirty-two students were excluded from the study, nine students were students who read at grade level and 23 did not meet the inclusion criteria. Four students were lost from the final analysis due to leaving the school and therefore lost at follow-up data collection. The flow diagram of the participants based on the consort model is presented in Fig. 1.

All the students (N = 102) were between 7 and 13 years of age (M = 8 year 2 months; SD = .92). Most of the parents of these students were able to read and write, and printed media such as Bibles, magazines, newspapers and books were available in their homes. Most of these students (74 %) did not attend pre-school and at the time there was no library, neither in the school nor in the community.

Design

According to Kazdin (2011), design and practical issues such as single-group pre-post-only design and the use of single therapist and single animals need to be addressed when doing human-animal interaction research. In the current study we addressed most of these problems through the use of a pretest–posttest control group design. Three intervention groups followed a 10-week reading program and one control group continued with their normal school activities. Trained therapy dogs and their owners, members of *Pets as*

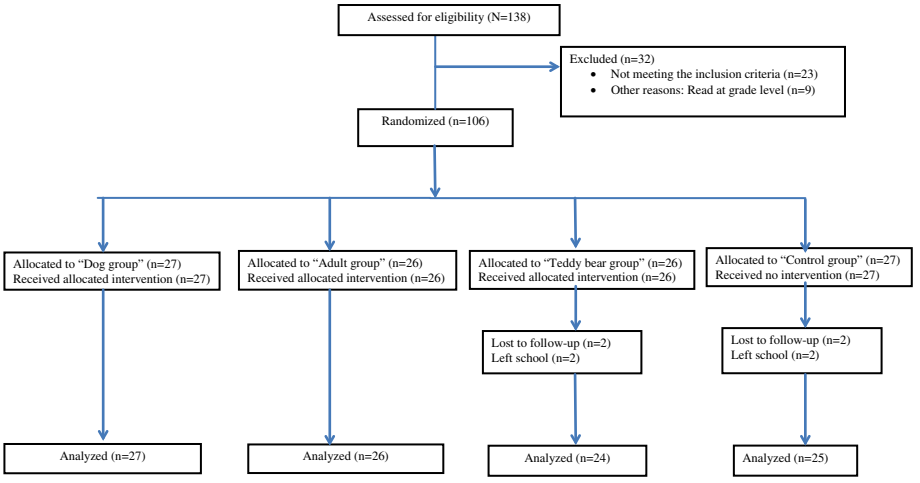


Fig. 1 Flow diagram

Therapy (P.A.T.), a non-profit organization organizing therapeutic visits to hospitals, schools and old age homes with trained therapy dogs, took part in the program.

Using the Research Randomizer program, those students identified by means of the ESSI Reading and Spelling Test, were randomly assigned to three experimental groups and one control group (see Fig. 1). Beetz et al. (2011) and Gee et al. (2009) both used a real dog, a stuffed or a toy dog and a friendly human in their research with 7–12 year old boys and preschoolers. In the current study we decided to use a real dog, an adult and a teddy bear. Our motivation to use a teddy bear and not a stuffed dog was that we wanted something that looked different from the real dog. In South Africa teddy bear therapy is a relatively new type of therapy for students between the ages of 3 and 11 with different problems (Grobler 2010; Voster n.d.). An "*adult group*" was included in the design to allow for the effect of extra attention. One man and eight women were in the P.A.T. volunteers group while one man and nine women were in the adult and teddy bear volunteer groups. The amount of time spent interacting in all the groups was the same.

Independent and Dependent Variable

The independent variables in the current study were groups, gender and time. Students were randomly assigned to three intervention groups: students reading to a dog ("*dog group*"), students reading to an adult ("*adult group*"), and students reading to a teddy bear ("*teddy bear group*"). Time was measured at Time 1, Time 2 and Time 3. The dependent variables were the student's growth on reading rate, accuracy and comprehension as measured by The Neale Analysis of Reading Ability (Neale 1999).

Instruments

Demographic Questionnaire

A demographic questionnaire was developed by the first author to collect details on the students' age, gender, parents' reading and writing skills, books and papers available in their homes, and if they have animals at home.

Neale Analysis of Reading Ability

The Neale Analysis of Reading Ability (Neale 1999) has been used in this study. This standardized reading test measures reading rate, accuracy and comprehension of students between the ages of 6 and 12 years. The instructions to students before they start reading were:

> … read the story to me. If you come to a hard word, try it aloud by yourself before I help you. I am going to record the time it takes you to read, but it is important to read carefully and to remember what you read. At the end I shall ask you some questions, so try to remember the story as you read it (Neale 1999, p. 12).

The content as well as the difficulty of the stories and comprehension questions increases with each grade level. The administrator records the time taken to read each story and the number of errors made in each story. Each story had a specific number of words. The reading rate is based on the stories that were read with 16 or lees errors. The total

number of words read by the student were divide by the total time and this was multiplied by 60 (Neale 1999). If the child makes more than 16 mistakes in a particular story the testing stops and that story is not used in any calculations (Neale 1999). Reading accuracy refers to the number of words read correctly. The number of errors made in each story is subtracted from 16 and these values are entered on the answering sheets. The errors are recorded by the researcher by using paper and pencil. Comprehension refers to the total number of questions answered correctly. There are four questions for the first story and eight questions for story 2–6. One mark is given for each correct answer. The numbers of correct answers are recorded in the answering sheet. The rate, accuracy and comprehension raw scores are converted to reading ages (Neale 1999). The Afrikaans translations of the Neale stories, translated by Le Cordeur (2004), were used in this study.

Procedure

The study received ethical clearance from Stellenbosch University Health Research Ethics Committee (reference N10/07/227). Permission for the study was obtained from the Western Cape Education Department, the principal of the school, the parents, and from the students themselves. Permission to use their volunteers was obtained from Pets as Therapy. Participation was voluntary and students were given a choice whether they wanted to participate in the program or not in case they had any allergies to and/or a fear of dogs. None of the students refused to take part in the study or were allergic to dogs.

Data collection took place at the end of the first term before any intervention took place (Time 1), directly after completion of the 10-week reading program (Time 2), and 8 weeks after the completion of the program (Time 3).

Animal-Assisted Reading Program

This study followed the Reading Educational Assistance Dogs (R.E.A.D.) program of Intermountain Therapy Animals which has been widely used in America, Canada and Europe. The focus of this program is to improve the reading skills of students who are poor readers. Students reading to the dogs do not experience the same stress and anxiety as when they are reading to their teachers. These dogs are nonjudgmental and the students are relaxed and they can now focus on their reading (Intermountain Therapy Animals 2012). During this particular program a student just reads to a dog and its owner since reading instruction as such is not part of the program. The students practice their reading skills while the dog listens to them. The program is not experienced as just another reading support program. Students improve their reading skills in a unique way, being totally accepted and not judged by the dogs. The program is flexible and can be applied and used in a variety of different environments such as schools, libraries and after school programs, and with any socio-economic or cultural group (Intermountain Therapy Animals 2012; Snider 2007).

Trained therapy animals and volunteers from Pets as Therapy (P.A.T.), a non-profit organization organizing therapeutic visits to hospitals, schools and old age homes, were recruited to be part of the program. All the dogs and their owners were assessed according to the Canine Good Citizenship Test and P.A.T. rules. Nine reading teams, each consisting of a P.A.T. volunteer with the dog, agreed to be part of the study. Each reading team had three students allocated to them. Prior to the start of the program, all the P.A.T. volunteers attended a training workshop and received a DVD and the training manual of the R.E.A.D. program (Intermountain Therapy Animals 2012) from the first author. These volunteers

were trained to facilitate the reading process and to talked through their dogs. Ten other adult volunteers formed the "*adult group*" and the "*teddy bear group*". The researcher also trained these 10 adult volunteers prior to the start of the program. They each had five students allocated to them and the students in these two groups also read out loud to the volunteers or to the teddy bear for about 15–20 min. The instructions to all the volunteers were the same and they were all encouraged to correct the errors of the students and support the students. There were no differences in the feedback provided to the students across the three groups.

The nine dogs were, one male Golden Retriever, three female Golden Retrievers, a female Boxer, a female King Charles Cavalier, a male Jack Russell cross, a female Maltese and a male Weimaraner. They were all registered therapy dogs and their owners were members of Pets as Therapy (see www.pat.org.za). All the students in the "*dog group*" were prepared for the dogs by being shown pictures of all the different dogs. At that stage the students could still withdraw from the program, but all of them decided to continue. All the students in the "*dog group*" had an opportunity to interact with the dog they had been paired with before they started reading to the dogs.

The students from each intervention group met individually with their teams 10 times for 20 min. This happened on a weekly basis, calculating to the equivalent of a school term. During these sessions the students in the "*dog group*" spent a few minutes interacting with the dog and then read out loud to the dog for the rest of the time. They showed the pictures in the book to the dogs and they were asked to explain difficult words to the dogs. Students from the other two groups, the "*adult group*" and the "*teddy bear group*", were also asked to explain difficult words. The students in the "*teddy bear group*" explained the words to the teddy bear and the students in the "*adult group*" explained the words to the adult.

All the intervention groups received the same appropriate grade 1 to grade 3 books with more or less the same themes to read from. These books were different from what they used in the current school. Prior to the start of the session the students were allowed to select their own low frustration books to read from. Most of the students took a few sessions to complete a book. Students from the "*dog group*" each received a book to take home each time they completed reading a book. Eventually they received a total of three books on average, including one at the end of the 10-week period, to take home.

Statistical Analysis

A mixed model analysis of variance from the Statistica program was used to test for significant differences between the pre-, post- and follow-up scores of the four groups according to gender and time. The Eta^2 was used to explain the proportion of variance associated with each of the main effects and interactions effect. The Least Significant Difference test (LSD) was used as a post hoc measurement. The effect size was measured with Cohen's *d*. Effect sizes were considered as small <.4, medium .4–.8, large >.8. The Statistical Package Social Sciences (SPSS) program was used for analyzing the biographical data. A level of significance of .05 was used in the analysis.

Results

No significant differences were found between the three intervention and control groups at baseline on the variables reading rate, accuracy and comprehension. The Neale Analysis of

Reading Ability test was used to measure the reading rate, accuracy and comprehension of the students at Time 1, Time 2 and Time 3.

The Neale *reading rate* age results revealed significant main effect for gender ($F_{1,94} = 5.53$, $p = .02$, $\eta^2 = .04$), with the "*girls*" ($M = 7.80$, $SD = 0.84$) scoring significantly higher ($p = .02$, $d = .36$) than the "*boys*" (=7.48, $SD = 0.93$). The main effect for group was also significant ($F_{3,94} = 3.40$, $p = .02$, $\eta^2 = .09$) with the "*dog group*" ($M = 7.94$, $SD = 0.96$) reading at a significantly higher ($p = .01$, $d = .55$) reading rate than the "*teddy bear group*" ($M = 7.45$, $SD = 0.79$). The significant main effect for time ($F_{2,187} = 21.49$, $p < .001$, $\eta^2 = .18$) revealed significant differences ($p = .00$, $d = .43$) between "Time 1" ($M = 7.43$, $SD = 0.90$) and "Time 2" ($M = 7.82$, $SD = 0.90$) and between "Time 1" and "Time 3" ($M = 7.79$, $SD = 0.80$) with $p = .00$, $d = .42$.

Significant interaction effects for gender × group ($F_{3,94} = 2.61$, $p = .05$, $\eta^2 = .10$) were found (see Fig. 2). LSD post hoc comparisons revealed no significant difference between the boys and girls of the "*dog group*", the "*adult group*" or the "*teddy bear group*". The only significant difference ($p = .00$, $d = 1.21$) was between the "*boys*" ($M = 7.17$, $SD = 0.83$) and "*girls*" ($M = 8.14$, $SD = 0.77$) of the "*control group*".

A significant gender × time interaction ($F_{2,187} = 2.97$, $p = .05$, $\eta^2 = .03$) was also found (see Fig. 3). At Time 1 the "*girls*" ($M = 7.62$, $SD = 0.\ 90$) read at a significantly higher ($p = .00$, $d = .59$) *reading rate* age than the "*boys*" ($M = 7.11$, $SD = 0.81$). The "*girls*" ($M = 7.93$, $SD = 0.84$) also read at a significantly higher ($p = .04$, $d = .33$) *reading rate* age than the "*boys*" ($M = 7.63$, $SD = 0.97$) at Time 2. No significant differences were found between boys and girls at Time 3.

The Neale *reading accuracy* age results revealed significant main effect for group ($F_{3,94} = 3.57$, $p = .01$, $\eta^2 = .13$). LSD post hoc results revealed significant differences ($p = .02$, $d = .29$) between the "*dog group*" ($M = 7.73$, $SD = 1.13$) and the "*adult group*" ($M = 7.43$, $SD = 0.90$,), "*dog group*" and "*teddy bear group*" ($M = 7.21$, $SD = 0.78$) with $p = .00$, $d = .53$ and "*dog group*" and the "*control group*" ($M = 7.28$, $SD = 0.77$) with $p = .00$, $d = .46$. The significant main effect for time ($F_{2,187} = 155.76$, $p < .001$, $\eta^2 = .62$) revealed significant LSD post hoc differences ($p = .00$, $d = .71$) between "*Time 1*" ($M = 6.87$, $SD = 0.68$) and "*Time 2*" ($M = 7.42$, $SD = 0.85$), and "*Time 1*" and "*Time 3*" ($M = 7.97$, $SD = 0.90$) with $p = .00$, $d = 1.37$.

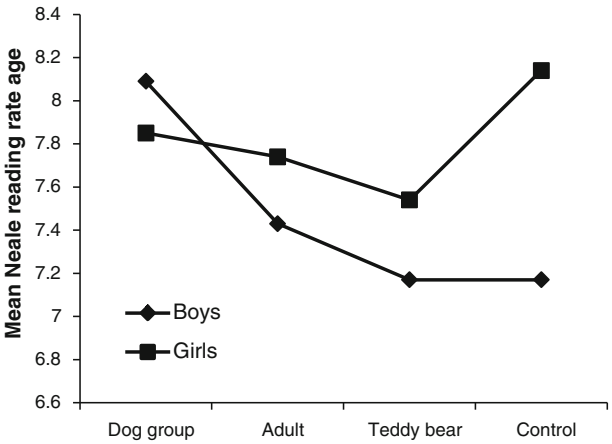


Fig. 2 Neale reading rate age interaction for gender × group

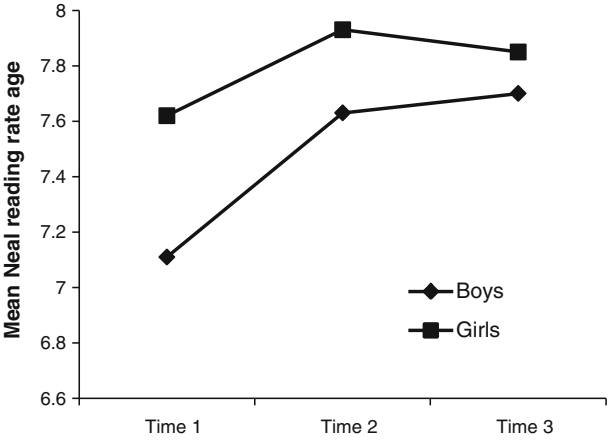


Fig. 3 Neale reading rate age interaction for gender × time

A significant interaction effect for gender × group ($F_{3,94} = 3.05$, $p = .03$, $\eta^2 = .11$) was found (see Fig. 4). LSD post hoc results revealed a significant difference ($p = .01$, $d = 1.01$) between the girls ($M = 7.62$, $SD = 0.75$) and the boys ($M = 6.92$, $SD = 0.63$) in the "*control group*".

The Neale *reading comprehension* age results revealed significant main effect for group ($F_{3,94} = 5.02$, $p = .02$, $\eta^2 = .15$). LSD post hoc results revealed significant differences ($p = .02$, $d = .51$) between the "*dog group*" ($M = 7.29$, $SD = 0.13$) and the "*adult group*" ($M = 6.96$, $SD = 0.90$), the "*dog group*" and the "*teddy bear group*" ($M = 6.59$, $SD = 0.80$, $p = .00$, $d = 1.22$) and the "*dog group*" and the "*control group*" ($M = 6.74$, $SD = 0.83$) with $p = .00$, $d = .92$. The significant main effect for time ($F_{2,187} = 99.82$, $p < .001$, $\eta^2 = .51$) revealed significant differences ($p = .00$, d = .76) between "*Time 1*" ($M = 6.36$, $SD = 0.63$) and "*Time 2*" ($M = 6.96$, $SD = 0.92$), "*Time 1*" and "*Time 3*" ($M = 7.36$, $SD = 1.04$) with $p = .00$, $d = 1.16$, and "*Time 2*" and "*Time 3*" with $p = .00$, $d = .40$.

Three significant interaction effects were found—for group × time ($F_{6,187} = 2.97$, $p < .001$, $\eta^2 = .08$), gender × group ($F_{3,94} = 3.29$, $p = .02$, $\eta^2 = .11$) and gender × group × time ($F_{6,187} = 2.22$, $p = .04$, $\eta^2 = .06$) (see Figs. 5, 6 and 7). Regarding the time × group interaction no significant differences were found in the *reading comprehension age* scores at Time 1. At Time 2 the *reading comprehension age* scores for the "*dog group*" ($M = 7.34$, $SD = 1.06$) were significantly higher ($p = .04$, $d = .34$) than that of the "*adult group*" ($M = 7.01$, $SD = 0.82$), the "*teddy bear group*" ($M = 6.71$, $SD = 0.91$) with $p = .01$, $d = .63$ and the "*control group*" ($M = 6.73$, $SD = 0.74$) with $p = .00$, $d = .66$. At Time 3, the *reading comprehension age* scores for the "*dog group*" ($M = 8.00$, $SD = 1.08$) were still significantly higher ($p = .00$, $d = .54$) than the "*adult group*" ($M = 7.44$, $SD = 0.98$), the "*teddy bear group*" ($M = 6.94$, $SD = 0.85$) with $p = .00$, $d = 1.09$ and the "*control group*" ($M = 7.17$, $SD = 0.99$) with $p = .00$, $d = .80$ (see Fig. 5).

The interaction between gender × group revealed no significant differences between the boys and girls on the *reading comprehension* age of either the "*dog group*", "*adult group*" or the "*teddy bear group*". It was only the *girls* of the "*control group*" ($M = 7.13$,

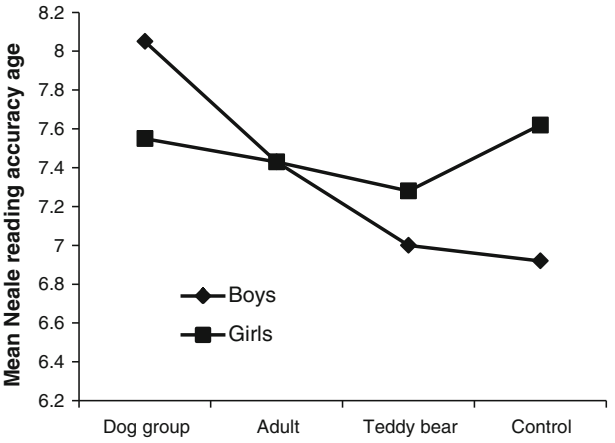
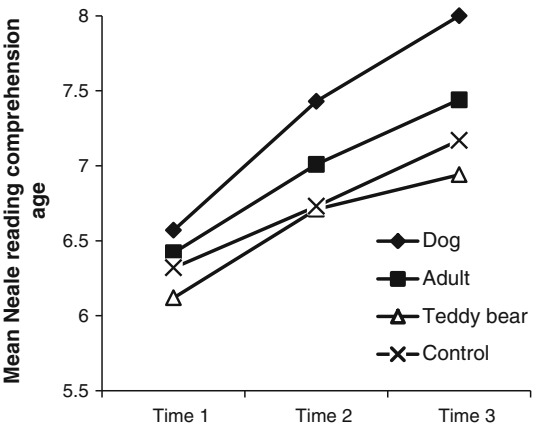


Fig. 4 Neale reading accuracy age for gender × group

Fig. 5 Neale reading comprehension age interaction for time × group



SD = 0.89) that read at a significantly higher ($p = .00$, $d = 1.22$) *reading comprehension* age than the boys of the "*control group*" ($M = 6.32$, $SD = 0.50$) (see Fig. 6).

Regarding the gender × group × time interaction for the boys alone, no significant differences in the *reading comprehension* age scores for Time 1 were found. At Time 2 the boys in the "*dog group*" ($M = 7.65$, $SD = 1.15$) attained significantly higher ($p = .01$, $d = .92$) *reading comprehension* age scores than the boys in both the "*adult group*" ($M = 6.71$, $SD = 0.86$) and the "*control group*" ($M = 6.29$, $SD = 0.43$) with $p = .00$, $d = 1.56$. At Time 3 the boys in the "*dog group*" ($M = 8.48$, $SD = 1.03$) read on a significantly higher (, $p = .00$, $d = 1.31$) *reading comprehension age* than those in the "*adult group*" ($M = 7.06$, $SD = 1.12$), the "*teddy bear group*" ($M = 6.74$, $SD = 0.82$) with $p = .00$, $d = 1.86$ and the "*control group*" ($M = 6.56$, $SD = 0.65$) with $p = .00$, $d = 2.22$ (see Fig. 7).

There were no significant differences found between the girls of all four groups at Time 1 and Time 2. At Time 3 the girls in the "*dog group*" ($M = 7.74$, $SD = 1.05$) read at a significantly higher ($p = .00$, $d = .76$) *reading comprehension* age than the girls in the

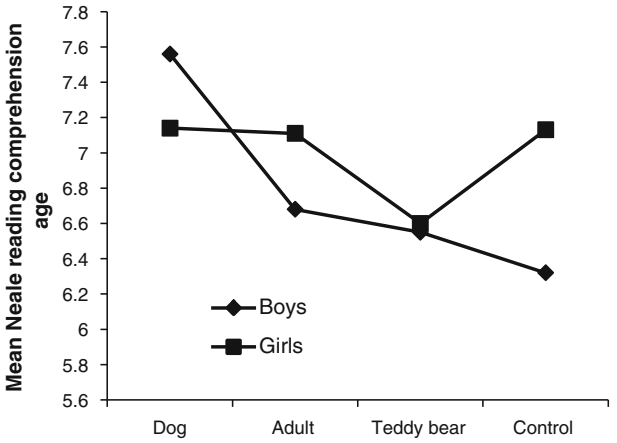


Fig. 6 Neale reading comprehension age interaction for gender × groups

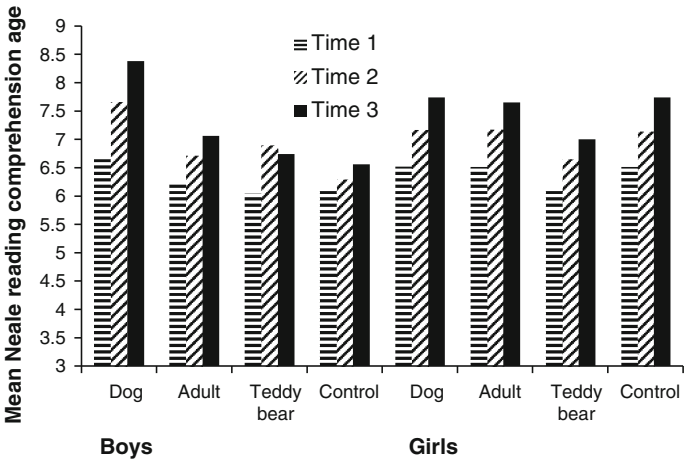


Fig. 7 Neale reading comprehension age interaction for gender × group × time

"*teddy bear group*" ($M = 7.00$, $SD = 0.87$). All the other differences at Time 3 were non-significant.

Discussion

The focus of this article was to report on the effects of an animal-assisted reading program on the reading rate, accuracy and comprehension of grade 3 students in a low socio-economic community in the Western Cape, South Africa. At the start of the program all the students participating in the program were only able to read at between grade 1 and grade 2 level, according to the ESSI Reading Test. The results in terms of the reading rate, accuracy and comprehension will be discussed.

O'Connor et al. (2010) found a significant improvement after a 20-week reading program on grade 2 and grade 5 students reading rate, comprehension and word recognition. When looking at *reading rate* of our study the main effects of gender, group and time all had an effect on the dependent variable, reading rate with small to medium effect sizes. The gender × group interaction revealed that the girls in this study read at a higher *reading rate* age than the boys at Time 1 and Time 2, but the 8-week follow-up measures were non-significant. A large effect size ($d = 1.21$) was reported with the "*control group*" girls reading better than the "*control group*" boys while all the other *reading rate* age differences between the "*dog group*", "*adult group*" and "*teddy bear group*" were non-significant. This could be attributed to the fact that the program was conducted for only 10 weeks. With regards to the gender × time interaction on *reading rate*, small to medium effect sizes were reported.

With regard to *reading accuracy*, the main effect for group revealed small to medium effect sizes while the main effect for time revealed medium to high effects sizes. The gender × group interaction revealed that the girls of the "*control group*" read at a significantly higher *reading accuracy* age than the boys of the "control group" with a high effect size ($d = 1.37$). These results differed from those of Le Cordeur (2004) who found significant differences in the *reading accuracy* of grade 7 students after a 16-week media reading program.

Sipe (2000) and O'Connor et al. (2010) argued that students' reading comprehension could improve by reading out loud and Militante (2006) found that students reading comprehension and vocabulary could improve by reading stories and then retelling and explaining it. Our study showed that the *reading comprehension* time and group as independent variables had an effect on comprehension. The main effect for time revealed a bigger effect size between Time 1 and Time 2 ($d = .76$) and Time 3 ($d = 1.16$) but not between Time 2 and Time 3 ($d = .40$). The main effect for group revealed medium to high effect sizes between the different groups. At the end of the program, students from the "*dog group*" read at a significantly higher *reading comprehension* age than the students in all three other groups. Eight weeks after completion of the program, students in the "*dog group*" retained this lead over the students of the other three groups. While all the students in this animal-assisted reading program read out loud and explained the stories to the dogs, the adults or the teddy bears, only the students in the "*dog group*" showed improvement in their reading comprehension. According to Bauman et al. (2003) improving the vocabulary of students may improve their reading comprehension, and there is a relationship between reading rate and comprehension. A failure to understand the meaning of a word could negatively impact on comprehension. All the students in the current study could practice their reading with the help of the dog, the adult and the teddy bear but only students from the "*dog group*" improved their comprehension scores significantly.

What possible explanations may there be for the improvement in the reading comprehension scores? According to O'Connor et al. (2010) repeatedly practicing reading the same stories could improve comprehension of the stories but not if they read unpractised stories. Wide reading (different stories) could improve vocabulary and rate. Improvement in rate is an indicator of improvement in other aspects of reading such as word recognition, vocabulary and comprehension (O'Connor et al. 2010). According to Young et al. (1996) it is important to poor readers to get feedback of their reading errors. The students in the current study all made use of wide reading (different stories) and all explained difficult words to the dog, adult or teddy bear and got feedback from the volunteers.

Regarding *reading comprehension*, interaction effects between gender × group × time were revealed. Gender differences were found in *reading comprehension* age with the boys

in the "*dog group*" reading at a significantly higher (medium to high effect sizes) *reading comprehension* age than the boys in the other three groups, both at the end of the program and at the follow-up assessment 8 weeks (high effect sizes) later (see Fig. 6). The girls in the "*dog group*" read at a significantly higher (medium effect size) *reading comprehension* age than the girls in the "*teddy bear group*" 8 weeks after completion of the program, which suggests that this animal-assisted reading program had a positive impact on the *reading comprehension* age of both boys and girls in the "*dog group*". This finding contrasts with that of Petersen (2008), who found no significant differences between the reading comprehension scores of grade 7 students after a 1-week interaction program with companion animals and those without companion animals. In Petersen's study different types of companion animals were used whereas in the current study only dogs were used. Le Cordeur (2004) also used the Neale Analysis of Reading Ability test as a measuring instrument. He reported non-significant differences with grade 7 students after a 16-week media reading strategies program. Corkett et al. (2011) reported that girls read better than boys but there were no differences between their spelling and writing skills.

However, our findings are in line with those of Martin (2001), Newlin (2003), Paradise (2007), Smith (2009) and Friesen (2012) who reported an improvement in reading skills of students reading to dogs. In her qualitative study, Mertz (2009) also reported a canine reading program as a positive experience for young readers.

What possible explanations may there be for the improvement in some of the reading skills of the students in the "*dog group*", but not those of the students in the other two groups? The improvement may be due to the stress-moderating effect of a calm animal (Jalongo et al. 2004). Friedmann et al. (1983) also examined the calming effect of dogs and reported that the presence and involvement of dogs can reduce the blood pressure of students. These results support the notion that readers who struggle may relax in the presence of a calm non-judgmental animal, and then start to enjoy reading. This relaxed enjoyment of reading may then transfer to the classroom (Friedmann et al. 2000).

Our results confirmed those of Beetz et al. (2011) who reported that in a stressful situation 7–12 year old boys benefited more from interacting with a friendly dog than with a friendly human or a toy dog. They found that the more the students stroked the dog the lower their cortisol levels became. Our results also confirmed those of Shannon (2007) who reported that most students had benefited from a reading with dogs program in public libraries and school centers. These students were willing to read out loud, their reading confidence was better and their attitudes towards dogs had improved. Students who have difficulty in reading, like those in our program, were more likely to participate in reading to dogs which could build their self-confidence. The dogs accepted the students and liked the attention. It does not matter if the students are good or bad readers, if their clothes are clean or dirty or if the students are clean or not (Petersen 2008).

The presence of the reading dog may provide an explanation for our results. The students in the "*dog group*" were unconditionally accepted by the therapy dogs and the dogs' presence could have motivated the students to improve their reading and change their attitudes towards reading. The dogs "listened" while the students were reading at their own pace. The dogs did not laugh, judge or criticize them and therefore they were not embarrassed by their own mistakes.

The unconditional acceptance of the therapy dogs in our study made it possible for the students to read out loud. It allowed them to make mistakes without the threat of being punished or ridiculed. They became teachers to a transient being who could not read at all and through that process they were teaching themselves.

The students in our program were taken out of their classrooms to separate rooms. This procedure differed from other studies in which the students had read in their classrooms. The classroom environment itself may have an effect on the struggling reader in the sense that the teacher and classmates may make comments and laugh at them for making mistakes while reading (Paradise 2007). Although all three groups were taken out of the classroom, the students in the "*adult*" and the "*teddy bear*" groups, without the calming effect of a dog, possibly still experienced the strain of reading to an adult. Students in the current study were from a low socio-economic community. Therefore there is a possibility that they were not used to soft toys or teddy bears and therefore the students in the "*teddy bear*" group probably did not attach importance to the teddy bears.

The *reading comprehension* age scores of the students in the "*dog group*" were better than those of the students in the "*adult group"*, "*teddy bear group"* and "*control group*" after a 10-week reading program. The conclusion may therefore be that the dogs had a positive impact on the reading comprehension scores of the students in the "*dog group*". Several factors might have an impact on the success of a student's reading abilities, and the use of dogs is one approach to better students reading skills. An animal-assisted reading program may therefore be regarded as a unique way of helping students to read better, to develop a different perception about reading and change their attitude towards reading. This is a non-threatening reading program that can be used in any setting, school or library. It may therefore be argued that this study contributed to existing AAT/AAA literature on the use of therapy dogs in helping students to better their reading skills. As the current study made use of an animal-assisted reading program where the focus is on creating a context where students could practice their reading skills, no explanation could be given regarding the different reading strategies and theories. The purpose of this program is to support the teachers in the classrooms and not to teach the students to read.

Limitations and Recommendations

The current study implemented a 10-week reading program at one school and involved only grade 3 students. We therefore suggest that future researchers involve more than one school and implement a longer program. According to O'Connor et al. (2010) the reading rate of students will only change after 10 weeks while Pretorius and Currin (2010) insisted that reading skills change very slowly and reading programs should not be regarded as a quick fix. It is also important to use this type of reading program with students of various ages and grade levels to determine the effect of this program on their reading abilities. This type of reading program might even help adults with their reading skills.

Students in the current animal-assisted reading program were taken out of the classrooms which could have been a negative experience for some of them since it was an indication that they needed help with their reading. However, all the students from all three groups were taken out of the classrooms individually. It is possible to implement this type of reading program in classrooms since it has been done by Friesen (2012), Smith (2009, 2010), Smith and Meehan (2010).

Bassette and Taber-Doughty (2013), and Chitic et al. (2012) recommended that researchers should consider the novelty effect of reading to the dogs and examine if changes were due to the presence of the dogs or that of the adults. In the current study we used a group of students who read to a dog in the presence of an adult, a group who read to an adult only and a group who read to a teddy bear in the presence of an adult. With this design we controlled for the effect that adults might have on the students' reading skills.

Jalongo et al. (2004) and Shaw (2013) also recommended that trained and certified therapy animals and volunteers from a registered organization, such as *Pets as Therapy*, be involved in a program such as the *R.E.A.D.* program. Both dogs and handlers must be covered by the liability insurance of the organization.

A further limitation of this study could be the handing out of books to the students in the "*dog group*" every time they had completed reading a book. They received on average three books, including one at the end of the 10-week period, while the students from the three other groups each just received the one book at the end of the program. Even though they received only two books more than the others, it could have served as an extra motivation to them.

In the current study the students wrote a letter to the dog they had read to and some of them drew a picture of the dog. These data were not analyzed for the current article, neither were data from the reports and notes of the volunteers. All those data might provide important qualitative information about the students and their reaction to the dogs. More research should be done on the use of dogs in educational settings whereby the effects of dogs on test anxiety, separation anxiety and behavior change in students could be examined. The nature and effect of the bond between the students and the dogs are important topics that need further research. Continuing research on animal-assisted reading programs in different socio-economic groups, languages and cultures is also necessary. The results of the current study provide evidence that this type of reading program can play a role in helping students to improve their reading skills. The results from the current study could be helpful in applying for funding to do more research on this topic.

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

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