

The Effect of a Dog Assisted Reading Program on the Reading Ability and Motivation of Children with Dyslexia

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Dog assisted reading programs have been shown to improve children's reading skills and attitudes toward reading (Kirnan et al., 2016; Levinson et al., 2017; Linder et al., 2018) and on-task behavior in children who struggle with reading (Bassette & Taber-Doughty, 2013). The purpose of this study was to determine if the benefits of reading to a therapy dog would generalize to a sample of 38 children (8-11 years of age) with dyslexia. We found that the children exhibited significant improvements in reading fluency from baseline to post-treatment. Teacher opinions of students' reading attitude - motivation also improved from baseline to post-treatment. They also reported greater reading motivation and mood when they read to the dog (i.e., experimental condition) compared to when they read to the experimenter (i.e., control condition). Inconsistent with the hypotheses, there was no significant increase in comprehension scores or trait reading motivation from baseline to post-treatment, nor was there a significance increase in reading fluency between when they read to the dog compared to when they read to the experimenter. Some of these aforementioned results (i.e., teacher reports and reading mood and motivation) were age / grade dependent. The results imply that dog assisted reading programs may benefit the number of words read per minute, reading motivation, and mood of children with dyslexia, but not reading comprehension.

Keywords: therapy dog, children, dyslexia, reading, learning resources

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Dyslexia is a specific learning disorder characterized by a pattern of difficulties with word recognition and spelling despite adequate intelligence and educational instruction (American Psychiatric Association, 2013). In addition to reading impairments, children with dyslexia also suffer from other attention deficits that impair the learning process by making it difficult for them to focus on tasks for extended periods of time (Facoetti, Lorusso, Cattaneo, Galli, & Molteni, 2005). In addition to attention deficits, children with dyslexia may experience difficulties reaching academic milestones at the same pace as classmates who do not have dyslexia (Gindrich, 2004). Due to these reading and speaking challenges, children with dyslexia may be nervous to read or speak in front of a class (Dockrell, Peacey, & Lunt, 2002). Novita (2016) focused on the self-esteem and general anxiety differences between children with dyslexia and children without dyslexia. Novita (2016) reported that children with dyslexia had significantly higher anxiety compared to children without dyslexia. Furthermore, there is evidence that children or adolescents with severe dyslexia are more withdrawn, anxious, depressed, and have more somatic complaints and social problems (Dahle, Knivsberg, & Andreassen, 2011). Given their anxiety and lack of motivation regarding reading, it is important to explore classroom techniques that might improve the reading engagement and reading ability of children with dyslexia.

One intervention that may help children with dyslexia experience less anxiety while reading and improve reading motivation is reading to a dog. There is growing evidence that dog assisted reading programs can benefit children in a variety of different ways including inducing calming effects and improvements in mood (Burrows, Adams, & Spiers, 2008; Fujisawa, Kumasaka, Masu, & Kataoka, 2016; Kertes et al., 2017). For example, Kertes et al. (2017) found that children (ages 7 to 12) exhibited lower levels of anxiety and stress in response to school related tasks when they were allowed to have their dog accompany them. This research is consistent with previous research showing that 4th graders allowed to interact with a dog in their classroom exhibited increases in mood (Fujisawa et al., 2016). There is also evidence that the calming effects of therapy dogs generalize to children with special needs. For example, Burrows et al. (2008) found that parents reported that their children with autism (ages 4 - 14) were more relaxed and calmer after three months of exposure to a service dog within the home. Taken together these results imply that children from various backgrounds and with various developmental delays seem to benefit emotionally from exposure to therapy dogs.

Because therapy dogs have calming, stress reducing, and mood improving effects, dog

assisted reading programs may be an efficacious method for improving reading motivation. The results of recently published studies provide support for the use of therapy dogs to improve reading mood and motivation (Bassette & Taber-Doughty, 2013; Griess, 2010; Linder, Mueller, Gibbs, Alper, & Freeman, 2018; Shaw, 2018). Griess (2010) for example, reported improvements in length of reading time and reading motivation from baseline to post-treatment in a sample of three children with a history of reading difficulties. Bassette and Taber-Doughty (2013) found that children with behavioral and emotional disabilities ($n = 3$) who read to a dog exhibited improvements from baseline to post-treatment in on-task reading behavior. Similarly, others reported significant improvements in reading motivation and mood in children (ages 7-8, $n = 14$) who participated in a dog assisted reading program compared to control participants ($n = 14$) who did not participate in the program (Linder et al., 2018). Shaw (2013) also examined the effect of a dog assisted reading program on a large sample of children ($n = 197$) (kindergarten - 5th grade) and found significant improvements in parental and teachers' assessments of reading interest, motivation, and confidence.

The mood and emotional benefits of exposure to dogs during learning may positively impact learning. Support for the link between mood and learning comes from Barbara Fredrickson's 'Broaden-and-Build' theory (2004). The Broaden and Build theory expresses that through the expression of positive emotions, people can broaden their thought - action repertoires and build their personal resources. The academic application of this theory shows that more positive emotions can cause people to examine and analyze their environment more and help broaden their thinking. The increase in positive emotions could make students more receptive to the new information they are being presented with, thus increasing their academic interest, and feasibly their academic performance (Fredrickson, 2004).

Consistent with the previous studies on the benefits of dog assisted reading programs on reading mood and motivation and with the Broaden and Build theory, others reported improvements in reading ability as well (Kirnan, Siminero, & Wong, 2016; Levinson, Vogt, Barker, Jalongo, & Van Zandt, 2017; Smith, 2009). In fact, recent evidence suggests that the emotional benefits of therapy dog exposure also apply specifically to reading activities and supports the use of dog assisted reading programs for the purposes of improving reading performance in younger students (Kirnan et al., 2016; Levinson, et al., 2017; Smith, 2009) or for struggling readers (Jalongo, 2005; Le Roux et al., 2014; Martin, 2001). For example, Levinson et

al. (2017) found that children (ages 7 – 11, 2nd – 5th graders) who read to a therapy dog tended to increase in oral reading fluency more than a control group who read to their peers (Levinson et al., 2017). Importantly, they also found that the reading benefit was more prominent and consistent in the younger children (i.e., 2nd graders) ($n = 6$) than in the older children. Consistent with the previous research, Kirnan et al. (2016) also found support for dog assisted reading programs to improve reading ability. Similar to Levinson et al. (2017), the reading ability benefits they found were also limited to younger children as they only found statistically significant improvements in reading ability from baseline to post-treatment for kindergarten students in the therapy dog condition ($n = 28$). They did not find reading benefits for 1st through 4th graders. Smith (2009) also found that compared to a control group, 2nd graders who read to a therapy dog exhibited greater increases in oral fluency. Taken together, the results of previously described studies (Kirnan et al., 2016; Levinson et al., 2017; Smith, 2009) suggest that dog assisted reading programs might be more beneficial for improving the reading skills of younger children.

In addition to inducing a reading skill improvement in younger children, others have shown that dog assisted reading programs might also serve struggling readers (Jalongo, 2005; Le Roux et al., 2014; Martin, 2001). For example, Le Roux et al., (2014) reported significant improvements in reading accuracy, comprehension, and reading rate in poor readers who read to a dog (compared to a variety of control groups). Martin (2001) also examined the effect of a dog assisted reading program on a sample of children reading below their grade level ($n = 10$) and found improvements in reading ability and confidence. Jalongo (2005) found similar results within the same school the following year. Taken together, the aforementioned research results provide evidence of the efficacy of dog assisted reading programs in helping younger children or struggling readers improve a variety of different reading skills.

The previous research on dog-assisted reading programs in schools provides a growing body of evidence that dog assisted reading programs improve reading motivation, mood, and reading performance (for exceptions see Booten, 2011 and Linder et al., 2018). Although some studies did include an examination of such programs on the reading abilities of poor readers (Bassette & Taber-Doughty, 2013; Griess, 2010; Le Roux et al., 2014), none of the studies included a true sample of children with dyslexia. Therefore, the main purpose of the current study was to determine if a therapy dog-assisted reading program would help children with dyslexia improve their reading motivation, mood during reading, reading fluency, and comprehension. Given the

previous benefits for struggling readers, we predicted that the motivation, mood, and reading fluency and comprehension benefits would generalize to children with dyslexia. This prediction was also based in part on research showing that dogs have a calming effect on children, allowing them to focus on tasks (Burrows et al., 2008; Fujisawa et al., 2016; Kertes, 2017).

In addition to the gap in the research regarding the effect of dog-assisted reading programs on children with dyslexia, the aforementioned research may have included struggling readers but did not identify or analyze them separately for program effectiveness (Smith, 2009; Booten, 2011; Kirnan et al., 2016; Levinson et al., 2017). Additionally, one study on non-struggling readers had a small experimental sample ($n = 14$) (Linder et al., 2018), and the few studies that did include struggling readers employed case study methodologies with small sample sizes (3 to 4 participants) (Griess, 2010; Bassette & Taber-Doughty, 2013). Still others lacked a control group (Bassette & Taber-Doughty, 2013) or only included one age group (Smith, 2009; Booten, 2011; Le Roux et al., 2014; Linder et al., 2018), thus limiting conclusions regarding age differences in the efficacy of such programs. Therefore, an additional purpose was to utilize a larger sample of struggling readers (26, 5th graders and 12, 3rd graders). We also employed a switching replications design in order to create a true control condition. By including students from two grades (3rd and 5th) from the same school for children with dyslexia, we were able to determine if the benefits of the dog assisted reading program generalized to both younger and older students with dyslexia. According to previous research, older students benefit less than younger (Kirnan et al., 2016), however given that both younger and older students, in the current study, were reading below their current grade level and therefore should have room for reading improvement up to their current grade level, we predicted an improvement in reading ability in both age groups. In conclusion, we hypothesized that both younger and older children with dyslexia would exhibit better reading fluency, comprehension, motivation and mood when reading to a therapy dog compared to reading to the experimenter.

Method

Participants

The sample of children included 26 students in three 5th grade classes and 12 students in one 3rd grade class from an elementary school for children with dyslexia. The school is located in the Southeastern United States. Most 3rd graders were reading at a 1st grade level, with some reading below 1st grade. Most 5th graders were reading at a 3rd grade level, with some reading

below a 3rd grade level. The samples of participants were reading, on average, two grade levels below their current grade, offering opportunities for reading enhancement. The sample was 61% male and 39% female. The participants were between the ages of 8-11 years.

Design

This study employed a time series (baseline - post-treatment) with switching replications design. All 38 participants were split into two equally sized groups (Group 1 and 2) ($n = 6$, 3rd graders, $n = 13$, 5th graders) for the purposes of treatment (experimental vs. control) with switching replications. Each time wave lasted 3 weeks. This study included two study designs depending on the dependent measures utilized. The reason for including two designs within the same study was due to the nature of the treatment (i.e., reading to the dog) that prevented collection of standardized assessments of reading ability and trait reading motivation while the students were either reading to the dog (experimental condition) or reading to the experimenter (control condition). The reason we did not use standardized assessments was because we wanted the students to be able to pick out their own reading material. Thus, some measures were only collected prior to exposure to the treatment (baseline) and after exposure to the treatment (post-treatment), while others were collected during the treatment and control phases of the experiment. The two designs included:

1. As shown below (T = Time Wave and X = Treatment), part of the study formed a 2 x 2 mixed-subjects factorial design with grade level (3rd, 5th) as the grouping variable and baseline and post-treatment assessments of: 1. the teachers' perceptions of student reading confidence, ability, and motivation, 2. students' Quality Reading Inventory (QRI) reading comprehension and fluency scores, and 3. Students' subjective ratings of trait reading motivation.

Group 1	T _{Baseline}	X		T _{Post-test}
Group 2			T _{Baseline}	X
				T _{Post-test}

2. As shown below (T = Time Wave and X = Treatment), the other part of the study formed a 2 x 2 mixed-subjects factorial design with grade level (3rd, 5th) as the grouping variable and treatment condition (experimental, control) as the within-subjects factor. Repeated measures of the number of words read per minute (i.e., reading fluency or the running record) and state reading mood and motivation served as the dependent measures within the treatment and control phases of the experiment.

Group 1	T ₁	X	T ₂	T ₃
Group 2	T ₁	T ₂	X	T ₃

Measures and Materials

Pet Therapy Team. The dog used in this study was a miniature Shiba Inu, certified pet therapy animal by *Alliance of Therapy Dogs* (<https://www.therapydogs.com/join-therapy-dogs/>). The small 20 pound dog had a very calm and peaceful demeanor. The children could be rambunctious around her and she would not show any stressed response. The dog and the handler completed testing to ensure the dog was safe around children, and the handler completed Collaborative Institutional Training Initiative (CITI) ethics training. The handler and experimenters were trained how to interact with the children in the same way to make sure there were not any differences in experiences/procedures as a function of experimenter. The experimenters also read from a script to greet the children and told them when they were ready they could begin to read. The dog handler was present while the children read in order to make sure the dog stayed next to the children while they read and to ensure safety. While the child was reading to the dog, there were two people present (the experimenter and the handler).

Attitude Towards Dogs Survey (Appendix A). Designed by the researchers, the children answered five questions designed to assess comfort and prior experience with dogs and any dog allergies. All children completed this survey before the study began. If an extreme fear or allergy was detected, the child was permitted to read to a stuffed toy dog instead of the therapy dog so that they could participate in the experimental procedures. Only one child (a 5th grader) fell into this category: this child read to a toy dog and this child's data was not included in the study. The toy dog was very similar in appearance and size to the therapy dog.

Dependent Measures.

Teacher Perceptions of Academic Engagement and Reading Confidence, Ability, and Motivation (Teacher-AERCAM) (see Appendix B). This 8-item questionnaire was developed by the researchers to assess teacher perceptions of each students' academic engagement and reading confidence, ability, and motivation at baseline and post-treatment. For each student, teachers rated how much they agreed with each statement (e.g., "*My student ____ likes to read books for fun*") on a 5-point rating scale (1 = "Disagree" and 5 = "Agree"). The possible range of scores was 8-40, with higher scores indicating greater levels of academic engagement and reading confidence, ability, and motivation. Each teacher only rated the students in their class (i.e., each student was rated by only one teacher), thus inter-rater reliability analyses were not possible.

Objective Assessment of Reading Ability. The Qualitative Reading Inventory (QRI) (Leslie & Caldwell, 2011) was used to assess reading fluency (i.e., how quickly and accurately a child can read) (QRI-WCPM) and explicit and implicit comprehension (QRI-Comp) at baseline and post-treatment. Explicit comprehension refers to understanding information directly expressed in the reading passage, while implicit comprehension refers to understanding information inferred from the text, but not directly expressed in the passage. The participants read a short passage, while the experimenter recorded the number of words correctly read per minute. After reading the passage, the children answered recall and comprehension questions. QRIs were chosen so that they matched the reading level of each child. The appropriateness in terms of level of difficulty of each QRI was verified by the child's teacher. Thus, we ensured that each child received a QRI at baseline and post-treatment that was appropriate for the child's reading level. The range of QRI-WCPM scores varied from child to child because such scores are calculated from the amount of time each child took to read the amount of words in each story (each grade level employed a different story). Higher QRI-WCPM scores indicate better speed and accuracy (or fluency) of reading. QRI-Comp scores ranged between 0 and 100%. Higher QRI-Comp scores indicate more accurate comprehension of the story. The validity of the QRI as compared to other standardized tests of reading achievement is .55 ($p < .05$) for third grade and .44 ($p < .01$) for fifth grade (Leslie & Caldwell 2017).

Trait Reading Motivation. The reading motivation subscale of the Elementary School Motivation Scale (ESMS-Reading) (Guay, Marsh, Dowson, & Larose, 2005) was used to assess trait levels of intrinsic motivation, identified regulation, and external regulation of reading in elementary school children at baseline and post-treatment. The children rated nine statements (e.g., "*I read to get a nice reward*") on a 5-point rating scale (1 = "no, always" and 5 = "yes always"); $\alpha = .$ The possible scores ranged from 3-15, with greater scores indicating greater reading motivation that day. Guay et al. (2005) reported relatively high convergent validity between the reading subscale of the ESMS and the reading subscale of Academic Self-Description Questionnaire ($r = .37$ to $.62$) (Marsh, 1990).

Running Record - Words Correctly Read per Minute (RR-WCPM). The researchers recorded the number of words correctly read per minute by the child while reading to either the dog or the experimenter. Correct number of words read per minute was determined by totaling the number of words read per minute and subtracting the number of errors (i.e., number of mistakes

out of the total number of words) and the number of self-corrections (i.e., how many times the participants corrected themselves after an error). Types of errors were classified as repetition (i.e., repeating a word or words a few times), omission (i.e., leaving out/skipping over a word or words), insertion (i.e., inserting a word that is not actually in the text), and substitution (i.e., saying a different word than what is actually written). The experimenters collected this dependent measure (RR-WCPM) twice for each Group: once during the 2nd week of T₁ (control phase) and T₂ (treatment phase) for Group 1, and once during the 2nd week of T₂ (control phase) and T₃ (treatment phase) for Group 2. We chose to collect reading performance measures in the 2nd week of each time wave in order to avoid any effects associated with the novelty of the dog (week 1) as well as too much acclimation to the dog (week 3). Larger scores on the RR-WCPM measure indicated better reading performance (i.e., fewer reading mistakes and greater amount of words read per minute).

State Reading Mood and Motivation (see Appendix C). The researchers developed two versions of this survey to assess mood and motivation when reading to the therapy dog (i.e., the experimental survey of state reading mood and motivation) and when reading to the experimenter (i.e., the control survey). The children completed these surveys after they read during the week of the running record, to assess their mood and motivation towards reading. The forms differed only in the wording of the questions. An example of a control question was, “*How did you like reading to me today?*”. The analogous experimental question was, “*How did you like reading to the dog today?*”. The possible range of scores was 3-15, with higher scores indicating more positive mood and greater motivation to read that day with the therapy dog or the experimenter.

Procedure

Before the commencement of the study, the researchers’ institutional review board approved the study, all experimenters completed human participants ethics training via the Collaborative Institutional Training Initiative (CITI), and consent was collected from both the students and the parents. In case of emergency, we implemented an emergency protocol: in the event that an emergency situation was to occur (allergic reaction, lice, fleas, dog bite, etc.) researchers would immediately notify school officials, and the parents of the participant. If the emergency situation was severe, EMS (911) would also be contacted.

In order to ensure that all of the children with dyslexia understood the content of the written surveys, the experimenters read all of the surveys to the children as they completed them.

After collecting parental informed consent and student assent, all children completed the Attitudes Towards Dogs survey to assess dog allergies and/or fear of dogs. Only one child opted to read to the toy dog for the experimental phases of the study and this child's data was omitted from the data analyses. Because the study was conducted during the spring semester, the students were likely to be well-adjusted to the school environment. By conducting the study in the spring semester, we avoided the possible confound of rapid improvement in depressed reading scores usually associated with the summer slump

Baseline Phase. Baseline measures were collected from the children and teachers including: 1. Teacher-AERCAM, 2. QRI, and 3. Trait Reading Mood and Motivation.

T₁ to T₂. For the first three weeks (T₁ to T₂), Group 1 (i.e., half of the 5th graders ($n = 13$) and half of the 3rd graders ($n = 6$)) spent one, 5-minute session a week reading to the therapy dog team (the experimenter, therapy dog, and dog handler) (the experimental group; $n = 19$), while the other half of the 5th graders and 3rd graders (Group 2) spent one 5-minute session reading to the researcher (the control group; $n = 19$) each week. During all treatment and control phases the researchers took the children one at a time into a corner of the classroom to read to the therapy dog team or the researcher individually. The children read either from a book or a short passage of their choosing that was determined by their teacher to be appropriate for their reading level and material they had not read previously. During the experimental condition, the experimenter brought the individual child over to the dog and handler on the floor where the child sat next to the dog and was allowed to pet it before beginning to read out loud. The child was also allowed to pet and interact with the dog after they had finished reading. During the 2nd week of the T₁ to T₂ phase, the researchers completed a measures of reading fluency (RR-WCPM) while the child read aloud to the therapy dog team or the experimenter. After reading to the therapy dog team or the experimenter, all of the children then completed the State Reading Mood and Motivation survey.

T₂ to T₃. After three weeks of treatment, the experimental and control groups switched conditions so that the former control participants (Group 2) were exposed to the treatment of reading to the therapy dog team for the second set of 3 weeks (T₂ – T₃), while the former experimental group served (Group 1) served as the control. The procedure from the T₁ to T₂ phase was repeated where the experimenter collected measures of reading fluency (RR-WCPM) and State Reading Mood and Motivation.

Post-Treatment Phase. After 7 weeks, the therapy dog was removed from the school. In the week following the final treatment phase, researchers re-collected the same assessments from the teachers and students that were collected during the baseline phase of the study (1. Teacher-AERCAM, 2. QRI, and 3. Trait Reading Mood and Motivation).

Results

Study Design 1

A series of 2 x 2 mixed-subjects factorial ANOVAs were conducted with grade (3rd, 5th) as the grouping variable and baseline and post-treatment measures of teacher perceptions of student reading ability, enjoyment, and motivation (Teacher-AERCAM), objective assessments of reading fluency and comprehension (QRI), and student self-assessment of trait reading motivation (ESMS-Reading). The baseline and post-treatment averages of the aforementioned dependent measures and the results of the pairwise comparisons between baseline and post-treatment are shown in Table 1.

Teacher Perceptions of Academic Engagement and Reading Confidence, Ability, and Motivation (Teacher-AERCAM). There was a significant increase in Teacher-AERCAM from baseline ($M = 25.95$, $SE = 1.03$) to post-treatment ($M = 26.89$, $SE = 1.08$), $F(1,36) = 8.99$, $p = .005$, $\eta_p^2 = 0.20$. There was no significant relationship between grade and Teacher-AERCAM, $F < 1$. The 3rd grade teacher ($M = 26.42$, $SE = 1.84$) did not differ in their assessment of student reading ability and motivation compared to 5th grade teachers ($M = 26.42$, $SE = 1.25$), $\eta_p^2 = 0.00$. However, as shown in Figure 1, there was a significant interaction between grade and Teacher-AERCAM, $F(1,36) = 8.99$, $p = .005$, $\eta_p^2 = 0.20$. Follow-up paired samples t-tests (see Table 1) revealed that the 3rd grade teacher reported a significant increase in perceptions of student academic engagement and reading confidence, ability, and motivation from baseline to post-treatment, $p = .001$. However, 5th grade teachers did not report a significant increase in Teacher-AERCAM from baseline to post-treatment, $p = .99$.

Table 1

Average Change in Teacher Perceptions of Academic Engagement and Reading Confidence, Motivation, and Ability, Standardized Reading Fluency and Comprehension Scores, and Trait Reading Mood and Motivation from Baseline to Post-Treatment as a Function of Grade.

Dependent Measure	Grade	Treatment Phase	Mean (SD)	t stat	p	d
Teacher-AERCAM	3 rd	Baseline	24.92 (7.39)	4.31**	.001	-.37
		Post-Treatment	27.92 (8.90)			
	5 th	Baseline	26.42 (5.87)	0.00	.999	.00
		Post-Treatment	26.42 (5.49)			
QRI-WCPM	3 rd	Baseline	41.50 (24.83)	3.10*	.010	-.50
		Post-Treatment	55.17 (28.85)			
	5 th	Baseline	83.35 (29.70)	3.85**	.001	-.50
		Post-Treatment	99.46 (35.91)			
QRI-Comp	3 rd	Baseline	72.00% (0.26)	1.33	.210	-.31
		Post-Treatment	79.17% (0.20)			
	5 th	Baseline	77.40% (0.21)	1.12	.270	-.21
		Post-Treatment	81.73% (0.21)			
Trait Reading Mood and Motivation	3 rd	Baseline	32.58 (8.73)	1.18	.260	-.24
		Post-Treatment	34.42 (6.23)			
	5 th	Baseline	30.69 (8.36)	0.24	.830	.03
		Post-Treatment	30.46 (8.31)			

Note. Teacher-AERCAM = Teacher Perceptions of Academic Engagement and Reading Confidence, Ability, and Motivation, QRI-WCPM = Qualitative Reading Inventory – words correctly read per minute, and QRI-Comp = Qualitative Reading Inventory – reading comprehension. *indicates significance at $p < .05$. ** indicates significance at $p < .01$.

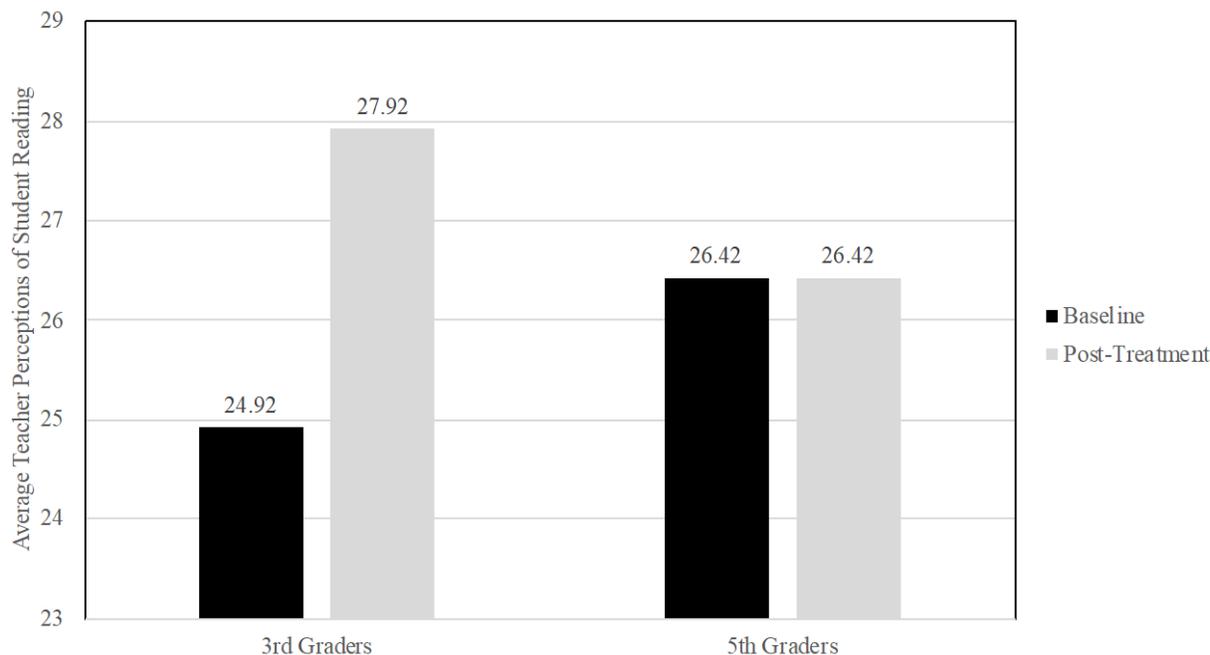


Figure 1. Average change in teacher perceptions of student academic engagement, reading confidence, reading ability, and motivation between baseline and post-treatment as function of grade level.

Qualitative Reading Inventory - Words Correct Per Minute (QRI-WCPM). There was a significant increase in words read correctly per minute or fluency (QRI-WCPM) assessment from baseline ($M = 70.13$, $SE = 5.54$) to post-treatment ($M = 85.47$, $SE = 6.40$), $F(1,36) = 18.76$, $p < .001$, $\eta_p^2 = 0.34$. There was also a significant relationship between grade and QRI-WCPM, $F(1,36) = 17.34$, $p < .001$, $\eta_p^2 = 0.33$. As expected (due to a lower grade level), 3rd graders scored significantly lower on the QRI-WCPM ($M = 48.33$, $SE = 8.56$) compared to 5th graders ($M = 91.40$, $SE = 5.81$). There was no significant interaction between grade and QRI-WCPM performance, $F < 1$, $\eta_p^2 = 0.004$. As shown in Table 1, follow-up paired samples t-tests revealed that both 3rd and 5th graders exhibited a significant increase in their QRI-WCPM from baseline, $ps < .05$.

Qualitative Reading Inventory - Implicit and Explicit Comprehension (QRI-Comp). There was an increase in QRI-Comp scores from baseline ($M = 76.77\%$, $SE = 3.63\%$) to post-treatment ($M = 80.92\%$, $SE = 3.33\%$), however this effect only approached significance, $F(1,36) = 2.83$, $p = .10$, $\eta_p^2 = 0.07$. There was also no significant relationship between grade and QRI-comprehension scores, $F < 1$, $\eta_p^2 = 0.009$. There was no difference in QRI-Comp scores between 3rd grader's ($M = 75.70\%$, $SE = 5.6\%$) and 5th graders ($M = 79.6\%$, $SE = 3.80\%$). There was also

no significant interaction between grade and QRI-Comp performance, $F < 1$, $\eta_p^2 = 0.004$. As shown in Table 1., follow-up paired samples t-tests revealed that both 3rd graders and 5th graders failed to exhibit a significant increase in their QRI-Comp scores from baseline to post-treatment, $ps > .21$, $ds = -.30, -.21$, respectively.

Trait Reading Motivation Questionnaire. There was no significant increase in trait reading motivation from baseline ($M = 31.29$, $SE = 1.36$) to post-treatment ($M = 31.71$, $SE = 1.27$), $F < 1$, $\eta_p^2 = 0.02$. There was also no significant relationship between grade and assessment of trait reading motivation, $F(1,36) = 1.19$, $p = .28$, $\eta_p^2 = 0.03$. There was no difference in trait reading motivation scores between 3rd grader's ($M = 33.50$, $SE = 2.21$) and 5th graders ($M = 30.58$, $SE = 1.50$). There was also no significant interaction between grade and trait reading motivation, $F(1,36) = 1.24$, $p = .27$, $\eta_p^2 = 0.03$. As shown in Table 1., follow-up paired samples t-tests revealed that both 3rd and 5th grader's failed to exhibit a significant increase in their trait reading motivation scores from baseline to post-treatment, $ps > .26$, $ds = -.24, -.03$, respectively.

Study Design 2

We also conducted a series of 2 x 2 mixed-subjects factorial ANOVAs with grade (3rd, 5th) as the grouping variable, treatment (experimental, control) as within-subjects factor, and words correctly read per minute while reading to the dog or the experimenter (RR-WCPM) and state reading motivation and mood (while reading to the dog or the experimenter) as the dependent measure. The RR-WCPM and state reading motivation and mood averages and the results of the pairwise comparisons between the experimental and control conditions are shown in Table 2.

Running Record - Words Correctly Read per Minute while Reading to the Dog / Experimenter (RR-WCPM). There was no significant main effect of treatment on RR-WCPM, $F(1,35) = 1.59$, $p = .22$, $\eta_p^2 = 0.04$. When participants were in the experimental condition (i.e., when the read to the dog) they failed to report higher RR-WCPM scores ($M = 71.86$, $SE = 6.50$) compared to when they were in the control condition ($M = 64.86$, $SE = 5.13$). There was a significant relationship between grade and RR-WCPM scores, $F(1,35) = 4.90$, $p = .034$, $\eta_p^2 = 0.12$. As expected (due to being in a lower grade level), 3rd graders exhibited significantly lower RR-WCPM scores ($M = 56.96$, $SE = 8.47$) compared to 5th graders ($M = 79.76$, $SE = 5.87$). There was no interaction between grade and treatment, $F < 1$, $\eta_p^2 = 0.001$. As shown in Table 2, follow-up paired samples t-tests revealed that both 3rd and 5th graders exhibited higher RR-WCPM scores when they were in the experimental condition reading to dogs compared to when they were in the

control condition reading to the experimenter ($M_{3rd\text{diff}} = 5.92$; $M_{5th\text{diff}} = 8.08$), but this reading to dog benefit on RR-WCPM scores was not significant for either 3rd or 5th graders, $ps > .20$, $ds = -.24, -.22$, respectively.

Table 2

Average Words Correctly Read per Minute (RR-WCPM)) and State Reading Mood and Motivation as a Function of Grade (3rd, 5th) and Treatment Condition (Control, Experimental).

Dependent Measure	Grade	Treatment Phase	Mean (SD)	t stat	p.	d
RR-WCPM	3 rd	Control	54.00 (26.08)	1.37	.200	-.24
		Experimental	59.92 (24.21)			
	5 th	Control	75.72 (30.56)	1.10	.280	-.22
		Experimental	83.80 (41.56)			
State Reading Mood and Motivation	3 rd	Control	12.83 (2.25)	1.00	.340	-.16
		Experimental	13.17 (2.13)			
	5 th	Control	11.72 (2.35)	3.80**	.001	-.86
		Experimental	13.44 (1.56)			

Note. RR-WCPM= number of words correctly read per minute while reading to the therapy dog team/experimenter. * indicates significance at $p < .05$. ** indicates significance at $p < .01$.

State Reading Mood and Motivation. There was a significant main effect of treatment on state reading motivation and mood scores, $F(1,35) = 8.69$, $p = .006$, $\eta_p^2 = 0.20$. When participants were in the experimental condition reading to the dog they reported significantly higher state reading motivation and mood ($M = 13.35$, $SE = .29$) compared to when they were in the control condition ($M = 12.08$, $SE = .39$). Third graders did not report significantly different state reading motivation and mood scores ($M = 13.00$, $SE = .52$) compared to 5th graders ($M = 12.58$, $SE = .36$), $F < 1$, $\eta_p^2 = 0.01$. However as shown in Figure 2, there was a significant interaction between grade and treatment, $F(1,35) = 3.96$, $p = .05$, $\eta_p^2 = 0.10$. Follow-up paired samples t-tests (see Table 2) revealed that 3rd graders did not exhibit a significant difference in

state reading motivation and mood between when they were in the experimental condition reading to dogs ($M = 13.17$, $SE = .61$) and when they were in the control condition reading to the experimenter ($M = 12.83$, $SE = .65$), $t(11) = 1.00$, $p = .34$, $d = -.16$. However, 5th graders did exhibit significantly higher state reading motivation and mood when they were in the experimental condition ($M = 13.44$, $SE = .31$) compared to when they were in the control condition ($M = 11.72$, $SE = .47$), $t(24) = 3.80$, $p = .001$, $d = -.86$.

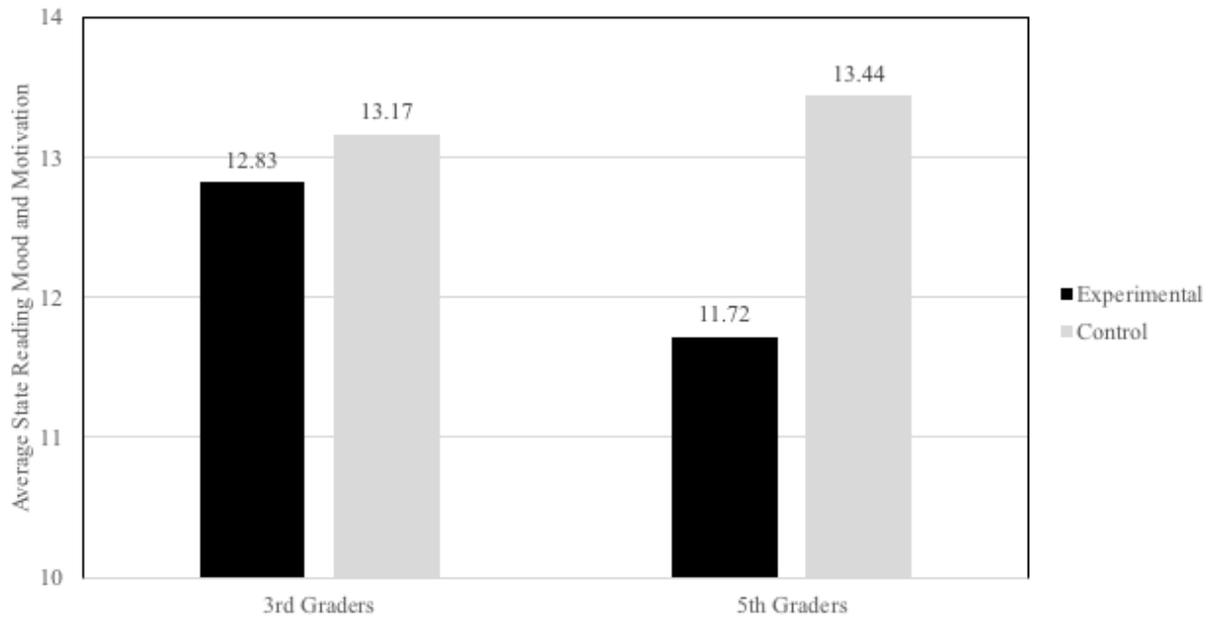


Figure 2. Average state reading mood and motivation ratings as a function of treatment condition and grade level.

Discussion

The purpose of this study was to determine if a therapy dog-assisted reading program would help children with dyslexia improve their reading motivation, mood during reading, and reading fluency and comprehension. Because previous research was limited by small samples (Griess, 2010; Bassette & Taber-Doughty, 2013; Linder et al., 2018), samples that did not focus on non-struggling readers (Kirnan et al., 2016; Levinson et al., 2017; Linder et al., 2018), lacked control groups (Bassette & Taber-Doughty, 2013), or only included one age group (Smith, 2009; Booten, 2011; Le Roux et al., 2014; Linder et al., 2018), we collected data from a larger sample of children ($n = 38$) with dyslexia from two different grades (3rd and 5th) and employed a switching replications with a true control condition. By including students from two grades (3rd and 5th) from

the same school for children with dyslexia, we were able to determine if the benefits of the dog assisted reading program generalized to both younger and older students with dyslexia. Because both younger and older students in the current study had substantial room for improvement in their reading ability, we hypothesized that both younger and older children with dyslexia would exhibit better reading fluency, comprehension, and mood when reading to a therapy dog compared to reading to the experimenter.

Overall, and consistent with the hypotheses, the children exhibited a significant increase in teacher reports of academic engagement and reading confidence, ability, and motivation and QRI-words count per minute from baseline to post-treatment. In addition, and consistent with the hypothesis, when participants were in the experimental condition, they reported greater state reading motivation and mood compared to when they were in the control condition. Some of these aforementioned results (i.e., teacher reports and reading mood and motivation) were age / grade dependent and so we described those results in more detail in the subsequent paragraphs. Inconsistent with the hypotheses, there was no significant increase in QRI-comprehension scores (which only approached significance) or trait reading mood and motivation from baseline to post-treatment. Finally, students' reading fluency while they read to the dog (experimental condition) was not greater compared to when they read to the experimenter (control condition).

As hypothesized and due to being in a lower grade level, the 3rd graders scored significantly lower than the 5th graders on the tests of fluency overall and tests of fluency while reading to the dog or experimenter. Consistent with the hypothesis, 3rd grade teacher's opinions of student's academic engagement and reading confidence, ability, and motivation increased between baseline and post-treatment. However, contrary to the hypothesis, we failed to find a significant increase in 5th grade teacher perceptions of student's academic engagement and reading confidence, ability, and motivation. As hypothesized both 3rd and 5th grade students exhibited a significant increase in reading fluency (QRI -WCPM) between baseline and post-treatment.

Although both grades exhibited increases in explicit and implicit comprehension (QRI-Comp) between baseline and post-treatment, this increase in reading comprehension only approached significance. Similar to comprehension scores and inconsistent with the hypothesis, both 3rd and 5th graders exhibited greater fluency (RR-WCPM) when they read to the therapy dog compared to when they read to the experimenter, but this increase was not statistically significant. Inconsistent with the hypothesis, there was no significant difference in the trait reading motivation

between baseline and post treatment, however partially consistent with the hypothesis, 5th grade students reported greater state reading motivation and mood when reading to the dog compared to reading to the experimenter. To summarize, for 3rd grade students, we found significant improvements in teachers' perceptions of academic engagement and reading confidence, ability, and motivation and in reading fluency from baseline to post-treatment. For 5th grade students, we found significant improvements in reading fluency from baseline to post-treatments and 5th graders also reported greater levels of state mood and motivation while reading to the dog compared to reading to the experimenter.

Previous research has suggested that younger children benefit more from therapy dog reading programs (Kirnan et al., 2016; Levinson et al., 2017). In line with the aforementioned research, the 3rd grade teacher reported an increase in their students' academic engagement and reading confidence, ability, and motivation between baseline and post-treatment, while the 5th grade teachers did not report an increase in their perceptions of student academic engagement and reading confidence, ability, and motivation. However, overall our results run contrary to previous research showing that younger children benefit more from dog assisted reading programs. Specifically, we found that both younger (3rd grade) and older (5th grade) age groups with dyslexia exhibited significant increases in reading fluency from baseline to post-treatment; and older children (5th graders) had a greater increase in their state reading motivation and mood when reading to the dog compared to reading to the experimenters. Perhaps the reason we found a benefit for older students while other researchers did not is because our older age groups, because of dyslexia, had lower reading ability baselines. Thus, our older group may have had more room for improvement in reading ability compared to previous studies. Similar previous studies on the effects of dog assisted reading programs on struggling readers either did not vary age (e.g., Le Roux et al., 2014) or the age ranges they used were unclear (Jalongo, 2005). Therefore, the current study is unique in providing evidence that for children with dyslexia, a dog assisted therapy program might benefit struggling readers who range in age from younger children such as those in 3rd grade and older children such as those in 5th grade.

Studies show that children with dyslexia have higher anxiety while reading in front of the class (Dockrell et al., 2002; Novita, 2016). The current results imply that the presence of a dog during reading could alleviate some of this anxiety and help increase focus on reading. In addition, children with dyslexia are more withdrawn, anxious, and depressed in the classroom (Dahle et al.,

2011), so reading to a dog may brighten their mood and help them focus on learning. There is evidence that dog assisted reading programs do brighten the moods of children and help them read more clearly (Burrows et al., 2008; Fujisawa et al., 2016; Kertes, 2017). These programs help to lower the stress levels of the child and calm them down while they read, resulting in less mistakes made and greater reading comprehension and words read per minute. These studies were conducted with various ages ranging from 4 – 14, so the effects can be generalized over a range of developmental stages, but many of these studies did not focus primarily on children with specific reading disorders such as dyslexia. Thus, the current results are unique because all of the children in the current study had dyslexia and we saw some improvement in both their reading comprehension and words read per minute (from baseline to post-treatment), as well as their mood while reading (experimental condition vs. control). Dog assisted reading programs are calming, stress reducing, and mood improving which may explain why so many children exhibited an increase in their reading motivation after participating in one of these programs (Bassette & Taber-Doughty, 2013; Griess, 2010; Linder et al., 2018; Shaw, 2018).

Bassette and Taber-Doughty (2013) found that children with behavioral difficulties exhibited a greater amount of on-task behavior while reading to a dog. This previous finding is relevant to the current findings because of the high comorbidity between dyslexia and ADHD and ADHD is associated with off-task behaviors in children (Germano et al., 2010; Karande et al., 2007). Our findings provide additional evidence that the presence of a dog may have calming and attention-grabbing effects that help children with attention issues focus staying on task while reading.

There are some limitations to our interpretation of the results that warrant discussion. First, the significant improvements from baseline to post-treatment in teacher reports of academic engagement and reading confidence, ability, and motivation and QRI-reading fluency could have been due to maturation. However, if maturation were driving the effect and not exposure to the dogs while reading, then one would have expected to find the benefit across both age groups and across all additional dependent variables. However, this was not the case. The only benefit in terms of the teachers' perceptions occurred for the 3rd graders and there were no significant improvements in reading comprehension and trait reading motivation from baseline to post-test. Also, maturation cannot explain the state reading motivation and mood benefits reported by the students while they were reading to the dog compared to when they read to the experimenters.

Additional experiments that implement measures of trait reading motivation and experimenter determined, standardized reading fluency and reading comprehension during the treatment phases would help rule out the influence of maturation.

Avenues that future researchers could take while studying dog assisted reading programs could be better location or quieter setting due to the distractions of everyday classroom activities going on in the background. Ideally, a future study like this one should span the entire school year, and have participants reading to the dog more than 5-minutes a week. A longer treatment phase these may yield greater scores on the comprehension and reading fluency, along with potential increases in their trait reading motivation ratings. The dependent measures (e.g., Teacher-AERCAM, QRI, trait reading motivation, RR, and state reading motivation) could also be collected more frequently throughout the school year for both the control and experimental conditions to assess any trends in the data. In addition, future researchers may consider collecting parental perception data in addition to teacher perceptions in order to determine if the parents notice any improvements in reading motivation at home from participating in the treatment at school.

One factor that may have reduced the size of the treatment effect, was the fact during treatment, the child read in the presence of a dog, experimenter, and therapy dog handler. The presence of two additional adults during the treatment phase may have induced stress and anxiety in the participants. During the control phase of the experiment, the child only had to read to one adult. Thus, we may have inadvertently created a confound of greater anxiety and stress in the experimental condition. Because we did not collect any measures of stress and anxiety, we cannot determine if a confound of this nature impacted the treatment effect. Future researchers may consider adding assessments of anxiety and stress to determine how these variables might moderate the size of the treatment effect. Although we assessed state levels of mood while reading to the dog and the experimenter, we did not collect preference measures. Therefore, it may be informative to collect preference ratings from the children to determine if they prefer to read to the experimenter or to the dog. Despite the possible issues of elevated stress and anxiety in our treatment condition, our results were noteworthy because we still obtained a treatment effect in some cases.

Carlisle (2015) found that children with autism who had a dog in the home exhibited an increase in social skills (e.g., cooperation, communication, assertion, responsibility, empathy,

engagement, and self-control). Zents, Fisk, and Lauback (2017) found that children (ages 8 - 18) with social, emotional, or behavioral problems who came into contact with a therapy dog within the context of therapy with a school psychologist exhibited better communication with the therapist. The promotion of social skills could increase the communication between the teachers and students. Therefore, future researchers could also evaluate the effects of dog assisted reading programs on the communication and social skills of children with reading difficulties.

Overall, the results of this study support the use of therapy dogs to help children improve their reading skills. We found that reading to the therapy dog had significant effects on teacher opinions of students' reading attitudes and motivation towards reading. The results also supported the aforementioned implication due to the significant difference in reading motivation and mood scores between the control and the experimental conditions in the 5th grade. The 3rd and 5th grade students also experienced significant increases in reading fluency, shown by the significant increase in the QRI words correct per minute scores. The results of this study support the results of previous research (Bassette & Taber-Doughty, 2013; Kirnan et al., 2016; Levinson et al., 2017; Linder et al., 2018) and provide evidence that dog assisted reading programs also benefit the reading ability, motivation, and mood of children with dyslexia.

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Appendix A

Attitude Towards Dogs Survey

Please answer Yes or No to the following questions:

1. Do you like dogs?

Yes

No

2. Do you have a dog at home?

Yes

No

3. Do you have constant contact with a friend or neighbor's dog?

Yes

No

4. Are you afraid of dogs?

Yes

No

Appendix B

Teacher Perceptions of Academic Engagement and Reading Confidence, Ability, and Motivation (Teacher-AERCAM)

Student Name _____

Teacher Survey

Circle the answer that matches your opinion best about the questions asked.

My student _____ likes to read books for fun.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

My student _____ enjoys learning.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

My student _____ struggles with reading fluency.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

My student _____ enjoys coming to school.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

My student _____ reads confidently.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

My student _____ thinks school is important.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

My student _____ struggles with reading comprehension.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

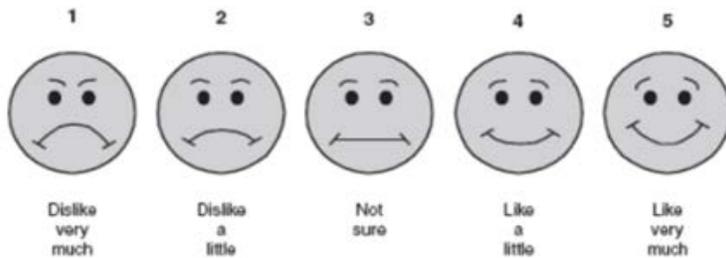
My student _____ can concentrate on his/her schoolwork.

DISAGREE	SLIGHTLY DISAGREE	NEUTRAL	SLIGHTLY AGREE	AGREE
1	2	3	4	5

Appendix C

State Reading Motivation and Mood

Note. For the experimental survey (i.e., given after the child read to the dog in the 2nd week of the appropriate time wave), the statements included “dog,” but for the control survey (i.e., given after the child read to the experimenter in the 2nd week of the appropriate time wave), the statement included “me.”



1. Please rate how much you liked reading to me/the dog today.
2. Please rate how motivated you were to read to me/the dog today.
3. Please rate your mood while reading to me/the dog today.