THE EFFECTS OF ANIMAL-ASSISTED INTERVENTIONS IN

CHILDREN WITH AUTISM: COULD A FURRY FRIEND HELP?

By

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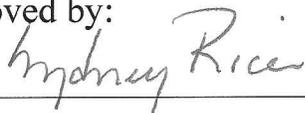
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ABSTRACT

The aim of this study was to test the effects of animal-assisted interventions on children with Autism Spectrum Disorder in the areas of requesting, facial expressions, and social initiation. The 9 participants in this study were first screened for fear of animals, allergies to animals, and mobility impairments that would make it impossible to interact with a dog. They were then asked to attend 8 weekly play sessions, 4 weeks would be with a dog and 4 weeks would be with a human proxy. Throughout the study, coders would observe the participants and code for requesting, facial expressions, and initiation of social interaction. We found that appropriate requesting began sooner when the participants were exposed to a dog. We also found that smiling spiked in week 4 with the dog, and other facial expressions decreased drastically throughout the entire four weeks with the dog. Interestingly, we also saw a major decrease in social initiation when exposed to both the dog and the proxy that could be due to error. Although the data looks promising, 8 weeks may not have been enough time to ensure that these changes were due to the dog's presence.

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The aim of this study was to test the effects of animal-assisted interventions on children with Autism Spectrum Disorder in the areas of requesting, facial expressions, and social initiation. The 9 participants in this study were first screened for fear of animals, allergies to animals, and mobility impairments that would make it impossible to interact with a dog. They were then asked to attend 8 weekly play sessions, 4 weeks would be with a dog and 4 weeks would be with a human proxy. Throughout the study, coders would observe the participants and code for requesting, facial expressions, and initiation of social interaction. We found that appropriate requesting began sooner when the participants were exposed to a dog. We also found that smiling spiked in week 4 with the dog, and other facial expressions decreased drastically throughout the entire four weeks with the dog. Interestingly, we also saw a major decrease in social initiation when exposed to both the dog and the proxy. Although the data looks promising, 8 weeks may not have been enough time to ensure that these changes were due to the dog's presence.

INTRODUCTION

Autism Spectrum Disorder, also called autism or ASD, is a term used to describe a group of complex neurodevelopmental disorders that vary in severity. ASD is characterized by social impairments, difficulties in nonverbal and verbal communication, and repetitive, restricted behaviors [1, 2]. The onset of these symptoms must be seen before the age of 3 years old. Autism has a strong genetic basis that involves multiple, interacting genes, but also has an environmental component. The exact cause for ASD is still unknown because of the complex and variable behaviors seen in each person with the disorder [1]. The Center for Disease Control and Prevention (CDC) estimates that 1 in 68 children are diagnosed with ASD and that it is five times more likely in boys than girls. The CDC also states that more people than ever are being diagnosed with ASD, which is likely due to better diagnosis and a broader definition of ASD.

There are supports and therapies which aim at improving the quality of life of individuals with ASD. Some examples of therapies offered to children with ASD are occupational therapy,

speech therapy, and sensory integration therapy, all mentioned by the CDC. There are also alternative methods, like animal-assisted interventions. Sessions with dogs, horses, and dolphins have all been shown to increase prosocial behaviors [4]. One study found that the integration of assistance dogs resulted in decreased anxiety and anger, less emotional outbursts, and better sleeping habits. This study also reported parents feeling more secure while the dog was around. One reasons for this newfound sense of security was because the dog would prevent the child from bolting by physically anchoring the child. Another reason was because the dog would alert the parents if the child was wandering from the bedroom, therefore acting as an extra pair of eyes [5]. Another study stated that dogs in particular can have an intense calming effect on children and that the non-judgmental nature of the dog can promote a feeling of safety [6]. Similarly, a study done by Olga Solomon explains that dogs can facilitate communication in children with autism by being easily readable [7]. Despite all the positive outcomes found in many studies, one systematic literature review revealed that most studies are limited due to weaknesses in the methods, and emphasizes the need for more rigorous research [8].

The aim of this study is to further evaluate the effects of animal-assisted interventions in children with ASD. The results of the study should allow us to make inferences on whether or not animal-assisted interventions show potential as a possible treatment method. This study also allowed us to test a protocol developed by our research team in order to make adjustment for future studies. It is important to keep in mind that this was a pilot program created to test the feasibility of the study, so changes were made throughout the study.

METHODS

Participants

Children

The participants for this study were recruited through the Department of Pediatric Developmental and Behavioral Clinics. The initial cohort included 11 children between the ages of 6-10 years old with a prior diagnosis of ASD. The parents of the possible participants were asked to complete a screening questionnaire over the phone to ensure that their children were eligible to participate. The inclusion criteria included children with a clinical diagnosis of autism age 6-10 years at the beginning of the project. The exclusion criteria included fear of animals, allergies to animals, mobility impairments that would make it impossible to interact with the dog.

If the child was deemed eligible, the parents were asked to commit to attending an information session describing the details of the pilot program and 8 weekly play sessions at a local children's clinic. The final cohort consisted of nine children, six males and three females, with varying degrees of ASD. When using the word "participant" in the study, it should be assumed that the word is being used to describe the children.

Dogs

The dogs selected for this study were recruited through the local Humane Society's Pet VIP Therapy and Visitation Program. The animals certified through this program must pass the AKC Canine Good Citizen Test, undergo 6 weeks of training/evaluations, and pass a final evaluation that ensures the animal has a friendly, mellow temperament and is healthy (hssaz.org). The specific dogs chosen for this study were chosen by the Pet VIP Coordinator. The coordinator selected ten dogs that were very tolerant in case a child acted inappropriately/aggressively.

After the dogs were selected, the dog handlers (which are the owners of the dog) were invited to attend a mock play session with a typically developing child who was instructed to exhibit behaviors associated with ASD. The mock play session was done to prepare the handlers for what they and their dogs could encounter, as well as prepare the research team that would be leading each play session. The handlers were asked to bring their dogs to the information session and commit to 4 weekly play sessions. During the information session, the children were matched with their respective dog and their interactions were observed to ensure that there were no issues between the two.

The Study

The study took place over the course of 8 weeks at a Children's Clinics. Each participant was assigned a specific day (Monday through Friday) and time (either 5:30 PM or 6:00 PM) to come in for their weekly play session. The participants scheduled at 5:30 PM were assigned a dog for the first 4 weeks of the study, while the participants scheduled at 6:00 PM were assigned a dog for the last 4 weeks. During the 4 weeks where the participants did not have a dog, they would play with a proxy, who serves as the human replacement for the dog. Each play session lasted 25 minutes and had a maximum of 8 activities per session. Each participant was encouraged to partake in the activities for at least 2 minutes and 30 seconds, but no longer than 5 minutes were spent on each activity. The room chosen for the play sessions was a small room with only two

doors, one entrance door and one closet door (Figure 1). A small room was chosen to reduce any possible distractions for the participants.

       The parents of the participants were expected to be in the room for the play sessions and could participate in the activities if the child asked for their participation, but were asked not to help the child interact. There was also one facilitator, one supervisor, at least one coder (although two coders were usually present), and either a dog and handler *or* a proxy in the room during each play session. Each person in the room had a very specific role, which is outlined in Table 1. Following the protocol closely was important in order to keep the play sessions very similar to each other. The activity box (displayed as the light blue rectangle in Figure 1) contained all the materials needed for each activity and only one activity box was used throughout the study. This was to ensure that all the participants were using the same materials during their play sessions.

Figure 1: The basic setup of the room where the play sessions were held. There was one couch and a small table in the main room, and the activity box was inside the closet

Facilitator	The facilitator leads all of the activities by following the steps in the protocol. The goal of the facilitator is to set up scenarios that provide the participant with opportunities to display self-directed interactions.
Coder(s)	The coders are expected to pay close attention to the participant and code for particular behaviors. The in-person coder(s) are inside the room during the play sessions and are expected to move around in order to always have a view of the participant's face. The video coders watch the recording of the session and code via video.
Supervisor	The supervisor checks in families when they arrive for their session. The supervisor also keeps track of time and makes sure the facilitator does not go over the 5 minute maximum set for each activity, and also lets the facilitator know when the 25 minute session is over. The supervisor also provides assistance throughout the session.
Handler	The handlers will bring their dog's brush for the brushing activity and will be in charge of making sure their dog reacts correctly to each activity. The handler can also bring an alternative snack if they prefer not to use Pirates Booty or Cheerios.
Dog/Proxy	The dog and proxy will be there for the participant to play with. The proxy is the human replacement for the dog, and is expected to not to verbalize things to the participant, but to still show signs of excitement and interest (like a dog would do).

Table 1: The roles and responsibilities of each person in the room during the play sessions.

The activity box contained two Nerf guns with foam Nerf bullets, two paint brushes, a small plastic container with fake "fleas" inside, a bubble toy, bubble soap, plexiglass, dry erase markers/crayons, a box of drinking straws, Pirates Booty snack or Cheerios, a plastic plate, birthday candles, birthday hats, Play-Doh, and a toy with multiples "doors" meant to hide treats.

Protocol

The activities varied slightly based on each participant's degree of autism. Some of the participant's required more persistence than others in order to get them to respond to an activity. A basic protocol was followed for every play session, and the protocol was divided up by activity. Every activity began by attempting to gain the participant's attention (usually done by calling their name) and drawing attention to the proxy or dog. If this attempt failed, the participant would be re-oriented towards the proxy/dog. Different tactics were used to gain the participant's attention if the initial calling of the name did not work.

Brushing activity

For the brushing activity, the handler or proxy were asked to bring their own brush for hygiene purposes. The participant was encouraged by the facilitator to say hello to the proxy/dog. This was done by the facilitator mimicking saying hello and waving or shaking hands/paw then waiting to see if the child initiated interaction. The facilitator would then show the brush to the participant and ask them if they would like to brush the hair. If the participant did not take the brush or was using it inappropriately, the facilitator would take back the brush

and show the participant how to brush the hair. The facilitator would then re-offer the brush to the participant. If the participant did not take the brush again, the facilitator would place the brush on the floor, model brushing the hair without the brush, ask the participant to try brushing the hair, then re-model the hair brushing using the brush. If the participant did take brush and use it appropriately, the facilitator would say positive things to express encouragement.

Nerf Gun Activity

The facilitator would then show the Nerf gun to the participant, show the Nerf gun to the proxy or dog, and then insert a foam Nerf bullet into the gun. The facilitator would alert the participant and proxy/dog by saying something to grab their attention, then shoot the Nerf gun. If the participant responded by requesting to play the Nerf gun, the facilitator would offer them the gun and encourage them to include the proxy/dog in the activity. If the participant did not respond, the facilitator would repeat the action of shooting the Nerf gun up to three times or until the participant responded.

Flea Circus Activity

For this activity, the facilitator would place fake "fleas" on the proxy or the dog, then place the flea container and paint brushes on the floor next to the proxy/dog. If the child did not respond, the facilitator would show the flea container and paint brushes to the participant, and demonstrate and explain how to softly brush the fleas off using the paint brush. The facilitator would then offer the paint brushes to the participant. If the participant took the paint brushes and joined in on the activity, the facilitator would express words of encouragement. If the participant still did not take the brushes, the facilitator would continue to model the activity and would ask the participant to brush the fleas off up to three times or until the participant responded.

Bubbles Activity

If the participant acknowledged the transition between activities, the facilitator would pour bubble soap onto a plate and activate the bubble toy (by blowing bubbles). If the participant was not responding to the new activity, the facilitator would activate the bubble toy in order to attempt to gain the participant's attention. The participant was encouraged to interact by popping the bubbles or using the toy to blow bubbles of their own. If the participant asked for the bubble toy the facilitator would give it to them, but would keep the bubble soap in order to stimulate requesting. If the participant requested bubble soap, it would be given to them. If the participant

did not request for bubble soap, the facilitator would offer it. The dog and proxy were just expected to interact with the participant by popping the bubbles and acting excited.

Drawing Activity

The facilitator would bring out the dry erase markers and plexiglass then ask the participant to trace the dog/proxy. If the participant did not respond, the facilitator would demonstrate the drawing activity by tracing the dog and then offer the markers to the participant. If the participant took the markers and used them correctly, the facilitator would voice encouragement. If the participant did not take the markers, the facilitator would continue to ask the participant to trace the dog/proxy. If this did not work, the facilitator would try to give the markers to the participant, place the markers on the floor near the plexiglass, or re-model the activity.

Treat Puffing Activity

For this activity, the dog/proxy would sit at one end of a small table. The facilitator would ask the participant to sit at the other end of the table then demonstrate the activity by blowing a treat (either Pirates Booty or Cheerios) across the table to the dog/proxy using a straw. The dog would eat (or catch, in the case of the proxy) the treat once it came close enough to the edge of the table. The facilitator would then offer the participant a straw and ask them to try the activity. If the participant took the straw, the facilitator would express encouragement. If the participant did not take the straw, the facilitator would re-model the activity and continue to ask the participant to engage in the activity.

Birthday Party Activity

This activity was designed to be a pretend birthday party for the dog or proxy. The dog/proxy would be seated at one end of the table and the facilitator would ask the participant to sit at the other end. The facilitator would then ask the participant to make a birthday cake out of Play-Doh because it is the dog's/proxy's birthday. The facilitator would begin molding the cake in order to motivate the participant to take over and continue molding the cake. Once the participant finished molding the cake, the facilitator would offer candles and ask the participant to put them on the cake. The facilitator would then pretend to light the candles and sing the Happy Birthday song to prompt the child to sing along. The child and facilitator would then pretend to blow out the candles to end the activity.

Find the Treat Activity

This activity was done with a specific toy that had multiple "doors" to hide treats in. The facilitator would demonstrate the activity by hiding a treat behind one of the doors and asking the dog/proxy to find it. After finding the treat, the facilitator and dog/proxy would express excitement. The facilitator would then ask the participant if they would like to play and wait for the participant to initiate the activity. If the participant did not initiate the activity, the facilitator would ask them to play and re-model the activity. If the participant did initiate the activity, the facilitator would let the participant play and voice encouragement.

Coding

The in-person coder(s) were walking around the room and coding for certain behaviors that the participant exhibited. They were coding specifically for requesting, facial expressions, and social interactions. These activities were designed to allow for these three things to naturally occur throughout the play session. The coder(s) were also scoring the transitions between each activity, which determined whether or not the participant was moving from one activity to the next with ease. Since this study consisted of two in-person coders, one of the coders wore a video camera on their chest to record the sessions. This was done so that other coders could code the video sessions later. A comparison of in-person and video coding was included in this pilot to see if it is possible to code the sessions accurately be video.

RESULTS

In order to calculate the data shown in the Table 3-6, the raw scores from the coding sheets were weighted by adding a specific amount of points to each raw score. The raw score consisted of how many times each action (grabbing requested item without eye contact or vocalization, smiling – undirected or self-directed, etc.) was observed by the coder; tally marks were used to keep track of this. Once all the raw data was collected, a certain amount of points were assigned to the same actions that were coded for, which meant that each of the tally marks would count for 1, 2, 3, or 4 points. The breakdown of how many points were assigned to each action is shown in Table 1.

	Action	Points per Activity
Requesting	Appropriate request that integrates eye contact, vocalization, and definitive indication of desire/wanting	4
	Use of one or more strategies (vocalization, pointing, gazing, looking at object), but not coordinated to indicate wanting	3
	Grabbing requested item without eye contact or vocalization	2
	Physically indicating wanting through pulling of facilitator or bringing object to facilitator	1
Facial Expressions	Smiling – Directed at Facilitator or Parent	2
	Other Facial Expression – Directed at Facilitator or Parent	2
	Smiling – Undirected or Self-Directed	1
	Other Facial Expression – Undirected or Self-Directed	1
Social Initiation	Initiation of social interaction	1
Transition	Response to Transition 1) Responds after 1st attempt to engage; 2) Responds after 2nd attempt to engage; 3) Responds after 3 - 5 attempts to engage; 4) Does not respond- scenario is brought to child	1) 4 2) 3 3) 2 4) 1

Table 2: This table explains how many points each tally mark was worth when calculating the new weighted scores

The new scores were calculated for each participant and then divided into the same categories seen on the coding sheet – requesting (Table 3), facial expressions (Table 5), and social initiation (Table 6). The scores for smiling were also calculated to see whether or not the participant smiled more in the presence of a dog (Table 4). The scores were then further divided into two groups – "with dog" and "with proxy". There are 4 columns under both the "with dog" and "with proxy" categories that represent the 4 weeks the participants spent with each one. The scores of all the participants were averaged for each week and graphed to see if there were any significant differences when the participants were exposed to a dog instead of a proxy.

Although 4 weeks (with a dog) may not have been enough time to see any drastic changes in behavior, the graphs did show some interesting patterns that could be promising. For requesting, the participants began to request sooner in the presence of a dog versus a proxy. The requesting spiked in week 2 with the dogs and week 3 with the proxy, and then seemed to plateau (see Figure 2). This means that the participants began to appropriately ask the facilitator for something they wanted, which demonstrates communication. Smiling was categorized under

facial expressions on the coding sheet, but was analyzed separately for the data. The facial expression data included other facial expressions that were not smiling. Both of the graphs showed very different trends. Smiling stayed fairly consistent in the play sessions with the proxy, but spiked in week 4 of the play sessions with the dog (see Figure 3). This means that the participants did not smile any more than usual when in the presence of a human proxy, but did smile more after spending a few weeks with a dog. Facial expressions, on the other hand, decreased dramatically in both groups (see Figure 4). Facial expression scores dropped sooner when the participants were with the proxy than with the dog (week 2 with the proxy, week 3 with the dog). Decreasing facial expressions can be interpreted as a good or bad thing. As humans, facial expressions are important when communicating; therefore this decrease could be viewed negatively. On the other hand, since a spike in smiling was observed in from week 3 to week 4 when the participants were exposed to the dog, the decrease in other facial expressions could mean more time was spent smiling.

The final analysis was done on the initiation of social interactions. Although the results do not look promising because of the large decrease in social initiation in both groups, this could be due to error. The coders expressed initial misunderstanding of what was considered social interaction and therefore may have over-coded for the behavior. This could explain the decrease seen between weeks 1-3 (see Figure 5). Possible errors aside, the data does show that the participants displayed more social initiation in the first 2 weeks when exposed to the dogs. Social initiation was measured by the amount of times the participant instigated interacted with the facilitator or parent, not the dog or proxy.

| Total Requesting Scores							
Participants	With Dog				With Proxy		
#1	38.00	48.00	0.00	54.00	78.00	107.00	79.00	63.00
#2	22.00	0.00	0.00	15.00	58.00	29.00	18.00	21.00
#3	9.00	24.00	0.00	12.00	39.00	29.00	20.00	19.00
#4	94.00	0.00	72.00	80.00	0.00	26.00	37.00	15.00
#5	34.00	21.00	25.00	50.00	54.00	65.00	81.00	73.00
#6	0.00	127.00	166.00	47.00	27.00	57.00	158.00	122.00
#7	19.00	18.00	0.00	23.00	0.00	0.00	14.00	16.00
#8	42.00	49.00	23.00	35.00	36.00	6.00	0.00	40.00
#9	0.00	58.00	58.00	40.00	45.00	0.00	44.00	54.00
Average	28.67	38.33	38.22	39.56	37.44	35.44	50.11	47.00

Table 3: This table shows the weighted requesting scores of each participant when exposed to a dog and a proxy. This table also shows the average scores of each week.
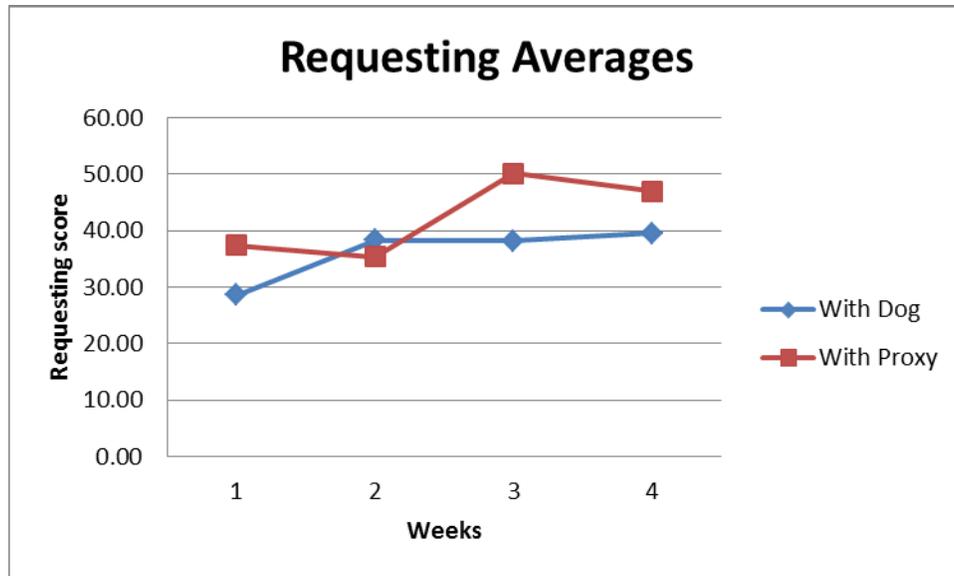
Figure 2: This graph shows the average requesting scores from each week depending on whether the participants were exposed to a dog and a proxy.

| Total Smiling Scores								
Participant	With Dog				With Proxy			
#1	13.00	23.00	0.00	11.00	18.00	34.00	10.00	18.00
#2	16.00	20.00	17.00	15.00	30.00	36.00	24.00	27.00
#3	14.00	39.00	0.00	48.00	31.00	22.00	14.00	25.00
#4	72.00	0.00	63.00	68.00	0.00	71.00	68.00	39.00
#5	20.00	15.00	25.00	16.00	14.00	7.00	15.00	22.00
#6	0.00	13.00	17.00	9.00	43.00	14.00	17.00	9.00
#7	25.00	25.00	0.00	17.00	21.00	14.00	14.00	10.00
#8	15.00	19.00	16.00	16.00	26.00	19.00	14.00	17.00
#9	0.00	19.00	17.00	12.00	25.00	0.00	37.00	24.00
Average	19.44	19.22	17.22	23.56	23.11	24.11	23.67	21.22

Table 4: This table shows the weighted smiling scores of each participant when exposed to a dog and a proxy. This table also shows the average scores of each week.
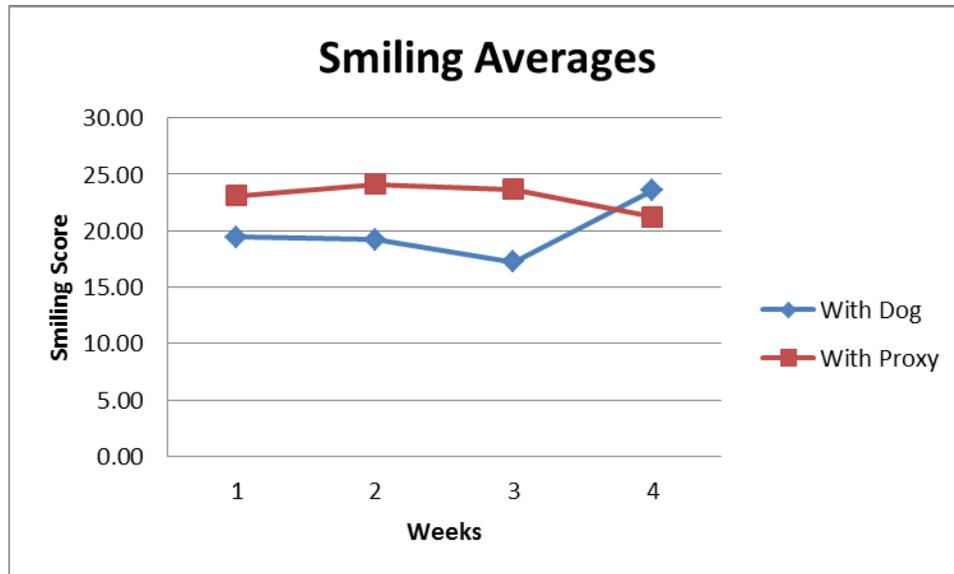
Figure 3: This graph shows the average smiling scores from each week depending on whether the participants were exposed to a dog and a proxy.

| Total Facial Expression Scores								
Participant	With Dog				With Proxy			
#1	29.00	38.00	0.00	3.00	7.00	2.00	11.00	10.00
#2	5.00	4.00	12.00	5.00	9.00	0.00	1.00	1.00
#3	11.00	9.00	0.00	0.00	1.00	0.00	0.00	0.00
#4	3.00	0.00	2.00	0.00	0.00	3.00	2.00	0.00
#5	7.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00
#6	0.00	0.00	2.00	0.00	3.00	0.00	0.00	0.00
#7	0.00	0.00	0.00	0.00	18.00	5.00	3.00	1.00
#8	0.00	0.00	0.00	0.00	4.00	2.00	2.00	0.00
#9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average	6.11	5.78	1.89	1.00	4.67	1.33	2.22	1.33

Table 5: This table shows the weighted facial expression scores of each participant when exposed to a dog and a proxy. This table also shows the average scores of each week.
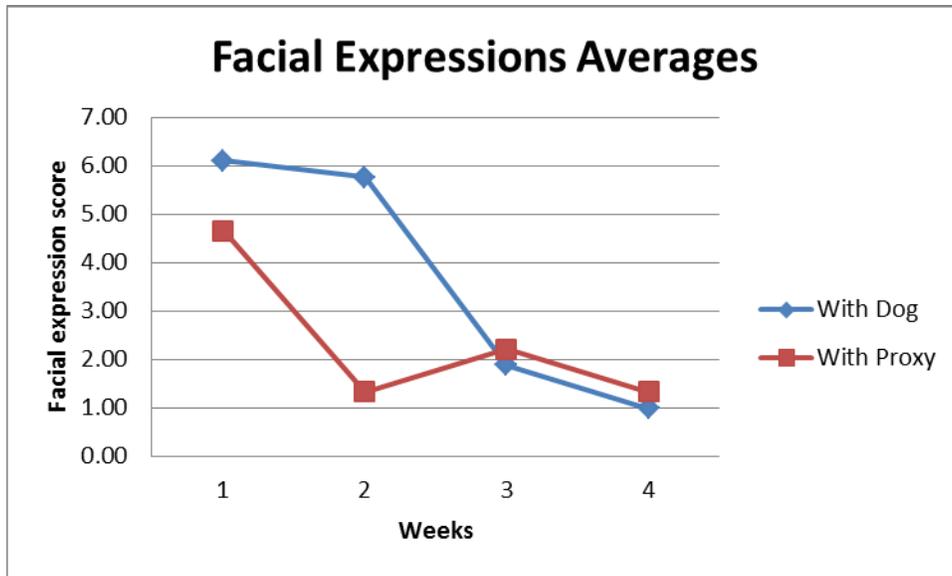
Figure 4: This graph shows the average facial expressions scores from each week depending on whether the participants were exposed to a dog and a proxy.

Total Social Initiation Scores								
Participant	With Dog				With Proxy			
#1	41.00	26.00	0.00	18.00	19.00	12.00	13.00	15.00
#2	76.00	44.00	29.00	17.00	17.00	17.00	7.00	11.00
#3	40.00	39.00	0.00	18.00	18.00	17.00	1.00	23.00
#4	36.00	0.00	12.00	6.00	0.00	8.00	8.00	10.00
#5	55.00	27.00	28.00	17.00	17.00	8.00	19.00	8.00
#6	0.00	13.00	8.00	9.00	31.00	41.00	15.00	12.00
#7	3.00	1.00	0.00	2.00	8.00	5.00	3.00	1.00
#8	17.00	4.00	6.00	2.00	28.00	15.00	11.00	12.00
#9	0.00	1.00	0.00	6.00	11.00	0.00	0.00	3.00
Average	29.78	17.22	9.22	10.56	16.56	13.67	8.56	10.56

Table 6: This table shows the weighted social initiation scores of each participant when exposed to a dog and a proxy. This table also shows the average scores of each week.
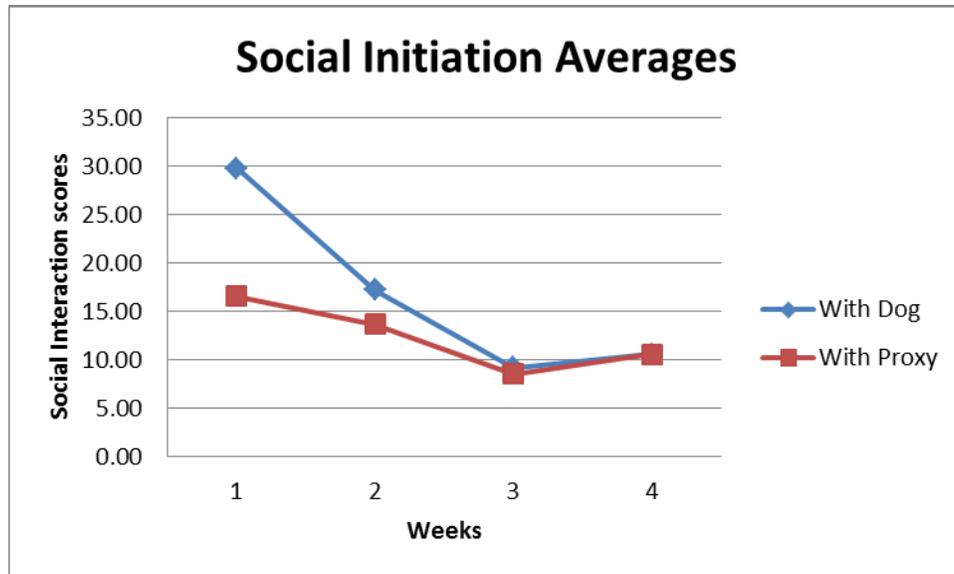
Figure 5: This graph shows the average social initiation scores from each week depending on whether the participants were exposed to a dog and a proxy.

DISCUSSION

During this study, we aimed to see if animal-assisted interventions had any effects on children with ASD in the areas of requesting, facial expression (which includes smiling), and initiation of social interaction. We found that children exposed to a dog during play sessions would appropriately request more often and sooner than when exposed to a human proxy. We also found that the children eventually began to smile more and express less facial expressions (expressions other than smiling), which could mean that more of time was spent smiling than anything else. Disappointingly, our data shows a decrease in social initiation when exposed to both the dog and the proxy. This could be due to errors in coding since the coders did express some confusion concerning what exactly counted as social initiation, leading to this behavior being over-coded. The decrease may be showing that the coders became better at distinguishing initiation of social interactions (therefore coding for the behavior less), not an actual decrease in social interaction in the participants. Putting possible errors aside, Figure 5 did show that more social initiation was seen in the children when they were first exposed to the dogs in comparison to the proxy. Studies have shown that dogs have many beneficial effects and can improve the quality of life in someone who has ASD, as well as improve the quality of life for their families

by promoting better sleeping habits (meaning parents can also sleep better) and providing a sense of security [5]. Though positive outcomes have been reported, much more research needs to be done on this topic before we can confidently say that animal-assisted interventions are an effective form of treatment for children with ASD.

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