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RUNNING HEAD: Animal-Assisted Therapy

Animal-Assisted Therapy as a Pain Relief Intervention for Children

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ABSTRACT

Animal-assisted therapy (AAT) is a healing modality involving a patient, an animal therapist, and handler with a goal of achieving a specified therapeutic outcome. Despite the myriad of studies documenting the benefits of AAT, no studies have yet determined the impact of animals on alleviation of pain in children. Therefore, a quasi-experimental intervention design was used to capture the change in pain and vital signs with (n=18) or without (n=39) AAT in children ages 3-17 in one acute care pediatric setting. The AAT intervention group experienced a significant reduction in pain level compared to the control group,  $t(55)=-2.86$ ,  $p=.006$ . Although blood pressure and pulse were not impacted, respiratory rates became significantly higher in the AAT group (by an average of 2.22 breaths/minute) as compared to the control group,  $t(55)=-2.63$ ,  $p=.011$ . This study provides further support to the numerous health benefits of AAT, particularly for children in pain.

Key Words: animal-assisted therapy, animal-assisted intervention, pet therapy, pain

## INTRODUCTION

The symbiosis between humans and animals extends to primitive times when select animals were viewed as protectors, companions, and cultural icons.<sup>1</sup> Throughout history, animals have played an important role in the lives of humans.<sup>2</sup> This complex relationship has been defined both within the confines of the incidental human interaction with companion animals as well as the formal role of animals as therapists or healers. In 1860, Florence Nightingale commented on the positive impact of small animals on those with chronic illness.<sup>3</sup> Over 100 years later, the human health benefits from exposure to companion animals, both psychological and physical, have been well-documented.<sup>4-25</sup>

Animal-assisted therapy (AAT) differs from common interaction with companion animals. AAT, also referred to as animal-assisted intervention, is an intentional and distinct healing modality<sup>26</sup> involving a patient, a trained animal as therapist, and the human owner or handler with a goal of facilitating the patient success in achieving therapeutic goals.<sup>8</sup> Such goals can include improvement in physical, social, emotional, and cognitive functioning.<sup>27</sup> Animal therapists are most commonly dogs or cats but can also include birds, guinea pigs, fish, horses, dolphins, and others. The aim is to match the patient's needs with the animal best suited to meet that need.<sup>28</sup> The animals are extensively trained and have a clear therapeutic goal; the relationship terminates when the therapy is complete.

## LITERATURE REVIEW

The interest in AAT has been fueled by studies supporting the many health benefits. Animal-assisted therapy has proven a useful adjunct in a variety of settings including mental health facilities,<sup>8,29-32</sup> nursing homes,<sup>33-36</sup> and hospitals<sup>37-39</sup> where most studies were performed with adult patients with variable interventions, goals, patient characteristics, and patient needs. In these studies, AAT resulted in significant reductions in anxiety, agitation, and fear. In children, AAT dogs decreased distress during painful medical procedures,<sup>40</sup> promoted calmness in a child with post-traumatic stress disorder,<sup>41</sup> and increased attention and positive behaviors in children with pervasive developmental disorders.<sup>42</sup> Dolphins increased attention and language skills among children with autism.<sup>43</sup> In one ethnographic study, the AAT dog exhibited a “sixth sense” and was able to predict an adolescent’s seizures.<sup>29</sup>

Nurses are acutely aware of the need to study and utilize effective pharmacologic and non-pharmacologic pain interventions, particularly for children. It is well known that the experience of hospitalization can be stressful for both children and their parents and is often associated with pain, helplessness, fear, and boredom.<sup>16,44,45</sup> Animal-assisted therapy has been shown to facilitate a child’s coping with hospitalization.<sup>16</sup> This may have an impact on pain perception but, to date, no formal studies on the relationship between AAT and pain perception in hospitalized children have been reported.

## METHODS

This study sought to answer the following questions: What is the impact of AAT as a pain intervention for children ages 3-17 years? What is the impact of AAT on vital signs? Is there a relationship between the pain response and select demographic variables including age, gender, previous AAT experience, or having a pet at home? To answer these questions, a quasi-experimental intervention study was used to capture the difference in pain level and vital sign indicators with or without the animal-assisted therapy intervention. The null hypothesis stated no statistical or clinical differences in pain and vital signs would occur between the intervention and control groups and that there would be no differences between the demographic groups with respect to pain response.

The sample included immunocompetent children ages 3-17 years of age in one acute care pediatric setting with an established AAT program. The target age range was determined based on the published utility, reliability, and validity of the Wong-Baker FACES pain assessment scale.<sup>36</sup> Children were included if they were able to use the FACES pain scale and reported a pain level of two or above (“hurts a little”) out of 10 and were not fearful or allergic to dogs. For the protection of the handler and dog, children in isolation or those with any infectious diseases were excluded. A desired sample size of 47 for each group for a total of 94 subjects was determined based on power 90%, alpha=.05, using a 2-tailed test, estimating a decrease in pain level by 2 points or greater after the animal-assisted therapy intervention.<sup>46</sup>

The study was approved by the St. Cloud Hospital Institutional Review Board prior to implementation. Parental permission was obtained through an informed consent process with adherence to the Health Insurance Portability and Accountability Act (HIPAA).

Written child assent was also obtained in children seven years of age and older before study enrollment. Prior to study implementation, the dog therapist underwent rigorous screening and training. The dog was fully vaccinated, bathed regularly, screened for enteric pathogens, and treated for internal and external parasites on a monthly basis.<sup>47</sup> The dog and owner met hospital policy for participating in animal-assisted therapy, including documentation of the dog's current vaccinations, controllability, and temperament.

Participants were placed into the intervention group if the dog was present and the child met the eligibility requirements. Children were placed in the control group when the dog was not present or if the child was fearful or allergic to dogs. For both groups, baseline blood pressure and pulse rate were measured using the electronic equipment available on the acute care pediatric unit (GE Dynamap Procare, #2019205-001). Calibration of the electronic blood pressure equipment was performed monthly on the clinical unit according to the manufacturer's specifications and as needed to assure measurement accuracy. Respiratory rate was counted for one minute. Pain level was determined by having the child indicate their level of pain using the FACES pain scale. The FACES pain scale consisted of six black and white stylized cartoon faces representing various degrees of pain. Each face corresponded to a numerical indicator of pain level (0=smiling, no pain, to 5=crying, worst pain). The child was asked to "point to or tell me which face shows how much you hurt right now". Without seeing or hearing the response of the child, parents were also asked to rate the child's pain using the FACES pain scale. Reliability and validity of the FACES pain scale have been well-established.<sup>48,49</sup>

The intervention group underwent a 15-20 minute session with the AAT dog and handler. The dog was introduced to the child and chose whether or not to "work with" the



child. This was determined by the handler noting that the dog settled in next to the child and matched the child's breathing pattern. The dog chose to work with all of the children in the intervention group. The handler sat quietly in the room and did not verbalize any observations that may bias the participant's response to the interaction. Post-test measurements of pain level, blood pressure, pulse, and respiratory rate were measured after the dog and handler left the room.

For the control group, baseline blood pressure, pulse, respiratory rate, and pain level were also measured as per the intervention protocol. The child was asked to sit quietly for 15 minutes. The measurements were repeated after 15 minutes. All effort were made to provide an uninterrupted, calm environment during that time to avoid confounding variables that could impact the relaxation response and subsequently impact pain level.

Finally, information directly related to pain was collected from the child's medical record. The specific information gathered from the chart included the child's date of birth, the date of admission to the hospital, the reason for hospital admission, the list of acute and chronic illnesses indicated in the health history, and pain history including pain assessment ratings, interventions to relieve pain, and effectiveness of the pain interventions. This study protocol did not deny children pharmacologic pain relief measures prior to, during, or after the intervention. This information was carefully documented to determine potential relationships between pharmacologic and the animal-assisted therapy intervention. All data were collected by trained research assistants. Data were analyzed using SPSS (16.0).

## RESULTS

The study was conducted between November 2005 and December 2008. During that time, over 500 children and their caregivers were approached to discuss study participation. The majority of children between the ages of 3 and 17 were not currently experiencing pain and therefore did not meet the study eligibility requirements. In fewer cases, the parents/guardians were not available to consent. Of those that met all eligibility requirements and parents were present, 100% chose to participate in the study resulting in a final sample of 57 participants. The average age of the sample was 12.1 years (SD=4.4), and nearly half (49.1%) were female. Almost two-thirds (63.2%) of the children had a pet in their home, and only 7 of the children (12.3%) had previous experience with AAT. Of the 57 participants, 18 were enrolled into the intervention group and 39 in the control group. Unfortunately, the desired sample size of 94 was not achieved due to the death of the AAT dog prior to the conclusion of the study. The animal therapist died peacefully in her home in the care of her handler. There were no adverse effects for the participants as a result of the dog's death. Since the dog was an important variable in the study and other dogs in the facility were not yet fully trained, the researchers chose to report the study findings with the current sample. These study findings are therefore the result of the work of one AAT dog and one AAT handler.

### Impact of AAT on pain and vital signs

Cross-tabulation tables with chi-square statistics and two independent samples t-tests were used to determine if there were any significant differences between the intervention and control groups at baseline. Our findings showed that the intervention and control groups were very similar at baseline. No statistical differences were found with

regard to age, gender, days from admission, previous experience with AAT, type of pet at home, length of time they have had a pet, pain level, diastolic blood pressure, pulse, and respiratory rate between the groups (Tables 1 and 2). Systolic blood pressure was found to be higher in the control group at baseline,  $t(55)=2.09$ ,  $p=.041$ , and significantly more intervention group participants had a pet at home,  $\chi^2(1)=7.49$ ,  $p=.006$ , although only two intervention group participants did not have a pet, which was a very small cell size for use in making comparisons.

A difference score was created for each participant to determine the change in pain level from pre-test to post-test. A two independent samples t-test was used to determine whether the intervention and control groups differed significantly in pain level and vital signs after the intervention had been administered. In both groups, pain difference scores were lower at post-test (mean difference=0.31 for the control group and 1.61 in the intervention group). However, the intervention group had a significantly lower pain score at the post-test, on average, than the control group,  $t(55)=-2.86$ ,  $p=.006$ . This was also true for parent's perception of the child's pain. For both groups, parents perceived a reduction of pain but the intervention group parents reported that pain level, on average, appeared to decrease more (mean difference=0.21 for the control group and 1.44 for the intervention group) in the children undergoing AAT,  $t(55)=-2.76$ ,  $p=.008$ . Although blood pressure and pulse did not change significantly with the AAT intervention, respiratory rates became significantly higher in the AAT group (by an average of 2.22 breaths/minute) as compared to the control group,  $t(55)=-2.63$ ,  $p=.011$ .

Since pain medications were not withheld during the study, a two independent samples t-test comparing the average time in minutes was calculated to determine if the

groups were significantly different with regard to pharmacologic treatment. The average time from the last pain medication administration was 206 minutes for the intervention group and 313 minutes for the control group. The time in minutes between the intervention and control groups was found not to be statistically significant,  $t(47)=-.928$ ,  $p=.358$ .

#### Relationship of other variables with pain response

Using two independent samples t-tests and a Pearson correlation, we examined the relationship between select demographic variables (age, gender, AAT experience, and having a pet at home) with the pain difference score. Few of the participants ( $n=7$ ) had previous experience with AAT so adequate comparisons were not possible. For the other variables, there were no statistically significant relationships. As seen in Table 3, both children with and without pets in their homes had lower scores at the posttest. Those with pets perceived less pain than those without pets; however, the difference was not statistically significant ( $p=.414$ ). Similarly, both males and females had lower pain scores after the intervention was completed. Males perceived less pain than females, but again, the difference did not reach statistical significance ( $p=.428$ ). With respect to the child's age, there was virtually no relationship. The Pearson correlation was nearly zero ( $r=-.03$ ,  $p=.415$ ).

## DISCUSSION

This study provides strong evidence that AAT can be an effective method for reducing pain in children. Pain reduction was four times greater in those children undergoing AAT as compared to those relaxing quietly for 15 minutes. The results indicate that being in the intervention group was the single variable consistently associated with pain reduction. Clinically, the results are also significant. The pain reduction experienced within 15 minutes by these children is comparable to the use of oral acetaminophen with and without codeine in adults.<sup>50</sup> One individual case had a reduction of pain from a level of eight to zero without the administration of analgesics for at least 3 hours.

The impact on pain reduction may be explained by the current understanding of the role of pets in modulating a psychoneuroendocrine response.<sup>51,52</sup> In this response, emotions promote biochemically-mediated neurologic and immune responses to emotionally-based stimuli. In other words, exposure to a pet or other friendly animal induces the release of endorphins, which induce a feeling of well-being, and lymphocytes, which increase the immune response. Physiologic indicators, such as reduced heart rate, reduced blood pressure, reduced respiratory rate, increased peripheral skin temperature, and papillary constriction are indicative of decreased sympathetic nervous system activity and the activation of the parasympathetic nervous system indicative of the relaxation response.<sup>53</sup> Interestingly, the children in the AAT demonstrated a slight increase in respiratory rate (2 breaths/minute), which may be reflective of the excitement or anticipation of seeing the dog in the hospital setting.

As indicated, pain medications were not withheld during the study procedures but the administration of pain medications did not seem to have a statistically or clinically

significant impact on the effectiveness of the AAT intervention. When other possible variables, such as age, gender, and having a pet at home, are compared to the AAT pain response, the only variable that consistently presents as having an impact on pain is undergoing the AAT intervention.

The study was limited by a small sample size and the lack of true randomization. The trained dog was present on the pediatric unit three hours per week so it was a challenge to recruit eligible subjects within a reasonable timeframe. Unfortunately, the dog died prior to the completion of the study so the desired sample size was not achieved. The strain of therapeutic interventions on the animal therapists must certainly be considered. In many cases, the dog appeared to “take on” the pain of the child. The handler was very cognizant of this and limited the number of intense sessions to no more than three per week (once per visit to the facility). The handler would provide massages and other calming measures to the dog after intense sessions. Likewise, Johnson, Odendaal, and Meadows cautioned researchers to be cognizant of humane treatment of the animal therapists.<sup>47</sup> The work of the animal therapist can be exhausting and potentially debilitating for the animal unless adequate rest and stress reduction measures are implemented. As was the case for this study, facilities and AAT handlers must adhere to published standards for the humane use of animal-assisted therapy in any health care setting.<sup>58</sup>

The study may also be limited by lack of comparison to other AAT dogs. This dog, a 13-year old springer spaniel, was incredibly skilled at working with children and adults. Anecdotal evidence of the many therapeutic outcomes facilitated by this dog was the impetus for this research study. Controlled comparisons with other trained animal therapists are warranted to determine the effectiveness of AAT pain reduction by other

animal therapists. Also, this study did not determine the duration of pain relief for these children. Future research should explore the onset and length of pain relief over time.

Notably, the use of animal-assisted therapy is not without risks<sup>54</sup> although no adverse outcomes resulted from this study. Bacha and Domachowske reported a case of a 16-year old boy with Duchenne's muscular dystrophy who was licked by a companion dog on his new tracheostomy site and contracted *Pasteurella multocida* pneumonia.<sup>55</sup> Although these reports exist for those children in close contact with oral secretions of pets, the likelihood of transmission of infection from an immunized animal to an immunocompetent child is low.<sup>54,56</sup> In one report, 1,690 patients visited by AAT dogs over a 5 year period did not result in any zoonotic infections.<sup>33</sup> Another study of 284 nursing homes documented one pet-related incident for every 100,000 hours of resident live-in pet contact.<sup>57</sup> AAT appears to be a therapeutic modality in which the benefits greatly outweigh the risks.

## CONCLUSION

Several studies have shown a high level of patient, family, and health care staff acceptance of AAT utilization for people of all ages and for numerous therapeutic outcomes.<sup>16,30,38,45,59</sup> Yet currently, a great deal of literature related to animal-assisted therapy is anecdotal.<sup>38,57,60</sup> This study provides beginning evidence that AAT can effectively be used as a complementary therapy to reduce pain in children along with its previously documented effects on reducing stress during hospitalization.



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### CONFLICT OF INTEREST

The authors are not aware of any conflicts of interest related to this project. The study sponsors were not directly involved in the study design, data collection, analysis/interpretation of the data, or writing of the manuscript.

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Table 1. Demographic comparison of intervention and control groups

Categorical Variables	Intervention Group (n=18)	Control Group (n=39)	$\chi^2$ value	p
Males	7	22	1.51	.172
Females	11	17	1.51	.172
Have a pet at home	16	20	7.49	.006*
Have previous experience with AAT	3	4	0.47	.387
Continuous Variable	Intervention Group (n=18) Mean [SD]	Control Group (n=39) Mean [SD]	t-value	p
Age (years)	13.00 [4.01]	11.69 [4.61]	-1.04	.305

\*p&lt;.05



Table 2. Impact of AAT on pain and vital signs

Continuous Variables	Intervention Group (n=18) Mean [SD]	Control Group (n=39) Mean [SD]	t-value	p
Pre-pain score	4.72 [2.22]	5.23 [2.53]	7.32	.467
Post-pain score	3.11 [2.45]	4.92 [2.99]	2.25	.029*
Pain difference score	1.61 [2.06]	0.31 [1.34]	-2.68	.006*
Pre-BP (systolic)†	107.17 [11.24]	115.00 [3.90]	2.09	.041*
Post-BP (systolic)	108.00 [11.91]	116.38 [13.05]	2.32	.024*
BP (systolic) difference	-.83 [6.70]	-1.38 [10.88]	-.20	.845
Pre-BP (diastolic)†	57.72 [8.87]	63.15 [10.10]	1.96	.055
Post-BP (diastolic)	58.61 [7.18]	63.28 [9.85]	1.80	.077
BP (diastolic) difference	-.89 [6.60]	-.13 [9.36]	.31	.757
Pre-pulse/minute	83.00 [24.97]	85.56 [23.38]	.24	.814
Post-pulse/minute	83.06 [24.50]	87.38 [26.45]	.59	.559
Pulse difference score	-.06 [5.91]	-2.82 [10.06]	-1.08	.285
Pre-resp. rate/minute	20.72 [4.20]	19.74 [4.38]	-.79	.413
Post-resp. rate/minute	18.50 [4.18]	19.92 [3.79]	1.28	.207
Resp. rate difference	2.22 [2.53]	-.18 [3.46]	-2.63	.011*

\*p&lt;0.05

† BP measured in mmHg

Table 3. Relationship of select demographic variables on pain reduction

Variable	N	Mean	SD	t-value	p*
Gender					
Male	29	.90	2.06	.80	.428
Female	28				
Have a pet at home	21	.86	1.17	-.83	.414
Yes	36	.11	1.94		
No					

\*p&lt;0.05