Handling a Dog by Children with Attention-Deficit/Hyperactivity Disorder: Calming or Exciting?

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Physiological reactions to handling a dog were recorded for 17 children (13 males & 4 females ranging in age from 7 to 12 years), 16 with a primary diagnosis of Attention Deficit Hyperactive Disorder. The major finding was a significant increase in blood pressure and pulse rate five minutes after holding a dog. It was concluded that a dog used for pet therapy with children diagnosed as ADHD was more likely to have an excitatory effect than a calming one.

Several studies have provided convincing evidence that pet ownership, especially ownership of dogs, has significant long term cardiovascular benefits (Friedmann, Katcher, Lynch, & Thomas, 1980; Friedmann & Thomas, 1995; Friedmann, Thomas, Stein, & Kleiger, 2003) as well as other health benefits (Siegel, 1990). These findings have led to an interest in the possible therapeutic benefits of introducing animals in a variety of institutional settings.

Often, pet therapy occurs in an institution with relatively brief exposure to an animal. Therefore, studies which assess participants' reactions following brief exposure to an animal may be comparable to the limited exposure times which often typify pet therapy programs.

Research on blood pressure and heart rate reactions to a dog have studied participants from several different age groups. Vormbrock and Grossberg (1988) found that among college students petting a dog produced the lowest systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP). Talking to the dog without physical contact produced higher SBP, DBP, and MAP, and talking to the experimenter produced still higher SBP, DBP, and MAP. Higher heart rates (HR) were obtained when participants were touching the dog and when participants talked to the dog while touching it. Allen, Blascovich, Tomaka and Kelsey (1991) studied adult female dog owners, ranging in age from 27 to 55. Four physiological measures were used: skin conductance response frequency (SCR), SBP, DBP, and pulse rate

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(PR). Participants in a condition involving the presence of a dog in the room showed significant reductions in SCR, SBP, and PR when performing stressful tasks (mental arithmetic) than participants in other conditions. When participants performed the task in the presence of a close female friend, they showed substantial physiological reactivity.

Generally, research with adults has indicated a reduction in autonomic activation when a dog is present. However, Baun, Bergstrom, Langston and Thomas (1984), using participants ranging in age from 24 to 74, reported an initial excitatory effect involving a significant increase in both SBP and DBP when the participants' own dogs were brought into the testing room.

Blood pressure and heart rate reactions to a dog have been studied in normal children who are inpatients in a hospital, as well as non-patients. Friedman, Katcher, Thomas, Lynch and Messent (1983) studied the effects of dogs during a mildly stressful situation on 9 to 16 year-old, normal children's SBP, DBP, MAT, and HR. A major finding was that the presence of one of three friendly unfamiliar dogs resulted in significantly lower MAP, SBP, DBP, and HR both while resting and reading than when no dog was present.

Nagengast, Baun, Megel and Leibowitz (1997), in a study of normal children between the ages of 3 and 6 years, reported a significant decrease in MAP, HR, and SBP, during an experimental condition involving a physical examination in which a dog (a beagle) was present, compared to a control condition involving a physical examination in which no dog was present. No significant difference in DBP was found for the same comparison. Children with allergies to dogs, or an extreme fear of dogs, and children with chronic conditions requiring frequent doctor visits (more than three times per year) were excluded. A control condition in which there was a physical examination with the dog absent was compared with a similar physical examination with the dog present, the order of which was counterbalanced. It was presumed that a physical exam for children of this age constituted a stressful procedure. The physical exam used a stethoscope, tongue blade and flashlight, otoscope, neurological hammer, and ophthalmoscope.

Kaminski, Pellino and Wish (2002) studied 70 children, 5 years or older who were inpatients at a large university hospital; 40 were in a group in which the primary form of therapy was a variety of play activities and 30 of the children were in a pet therapy group which interacted with a pet one night a week. Children exposed to pet therapy had a higher HR after the session with an animal than children following a play therapy session with no animal. However, HR was not monitored during the session in which children interacted with the animals. Children in the pet group engaged in significantly more physical contact

with the animals than children in the play therapy group did with other persons. Ratings of mood by parents and caretakers did not differ between the play therapy and pet therapy groups. The authors suggested that their finding of an increase in HR as opposed to other studies reporting a decrease in physiological activity might have been due to the fact that other studies involved efforts to increase stress prior to the introduction of a pet.

Research with children on physiological responses to a dog has not yielded consistent results. Children with behavior problems associated with Attention-Deficit/Hyperactivity Disorder (ADHD) may react differently to an unfamiliar animal than normal children. It is conceivable that companion animals may have a calming effect on children with ADHD. However, it is also possible that exposure to an unfamiliar animal in children who tend to be excitable and over reactive may tend to increase physiological arousal. The primary purpose of the present study was to assess physiological reactions by children with a primary diagnosis of ADHD to a friendly dog.

METHOD

The school from which children participated was a "level 3" special education school which served 30 students in the 6 to 12-year-old age group. The average duration of a student's stay in this school was three to four years. The longest a student could stay in this school is from preschool (three-years-old) to 5th grade (14 years old). The primary goal of the school is to facilitate the transition of students back to a classroom in a regular school.

Participants

The principal of the school explained the research to parents attending a parent/teacher conference and parents were given an informed consent form. Parental permission was obtained for 22 children, 17 males and 5 females. Since the school served only 30 children in the age group studied, parental consent for 22 children represented over two thirds of the available population. It is not known how many parents failed to attend the parent /teacher conference or if any parents in attendance refused to give their consent.

The study also was explained to each child for whom parental consent was obtained and only children who gave their verbal consent participated in the study. All 22 children gave their initial verbal consent; however, five of the children did not complete all aspects of the study and were excluded from data analysis for the following reasons: accurate measurements could not be obtained for one male because of excessive movement; a teacher took a second male back to the classroom prior to

testing because of misbehavior; and the remaining three children did not want to complete one or all three of the measurements taken on the day in which no dog was present. None of the five children declined participation on the test day in which the dog was present.

Of the 17 children for whom complete data were obtained, there were 13 males, ranging in age from 7 to 12 years (mean age = 9.31) and 4 females, ranging in age from 7 to 10 (mean age = 9.0). The mean age for all children who had completed data was 9.24 years.

To preserve confidentiality, individual diagnostic labels were not requested, but group diagnostic labels were provided for all 17 participants. The ethnic background of participants with completed data included eleven Caucasians, four African Americans, and one child described as bi-racial (one African American Parent and one Caucasian parent).

Three of the four females were diagnosed as having Attention-Deficit/Hyperactivity Disorder (ADHD). One of the three also had additional diagnoses of Oppositional Defiant Disorder (ODD) and Mental Retardation (MR) and another had an additional diagnosis of ODD. The fourth female had a single diagnosis of ODD.

Complete diagnostic information was obtained for all 13 males. All had a diagnosis of ADHD (8 of the 13 had a co-diagnosis of ODD, 1 had a co-diagnosis of Depression, 1 had a co-diagnosis of Bipolar Disorder, and 1 had a co-diagnosis of MR).

In summary, data analysis was based on 17 children, 16 with an ADHD diagnosis as well as other co-diagnoses, and one with a single diagnosis of ODD.

Measures

Teacher Ratings of Behavior. Teachers were asked to rate each child on a five-point scale approximately one hour after a child returned from each of two sessions, one with a dog present and one with no dog present. Teachers were not told which session was with a dog or with no dog. Five statements were rated on a five point scale where "1" was strongly agree, and "5" was strongly disagree. The five statements were: 1) Child appeared to be happy and in a better mood than before the research session, 2) Child appeared to be calmer and more at ease than before the research session, 3) Child appeared to be more anxious and ill at ease than before the research session, 4) Child seemed to be less attentive than before the research session, and 5) Child seemed to be more disruptive than before the research session.

Test sessions with children. Each child was tested for 15 minutes on each of two test days. SBP, DBP, and HR were recorded at the end of each 5-minute period during the 15 minute session. Children were taken

to a vacant school room by a female experimenter and were accompanied by one member from the school staff. A dog was introduced during the second 5-minute interval on one of the two test days. The dog was placed on the child's lap for five minutes and remained there until after SBP, DBP and HR were recorded. Children were given no instructions regarding how to interact with the dog. They were not discouraged from petting the dog or talking to it except at the end of the five minute interval when physiological measures were taken. The dog was then removed from the room prior to the third 5-minute interval. The test day with a dog was alternated with the test day with no dog. Children were permitted to engage in conversations with the experimenter on both test days and during all time intervals except during the recordings of SBP, DBP, and HR.

Description of the Dog. The same dog was used for all participants. The dog was a thirteen pound, four year-old blonde female Shi-Tzu which had been examined by a veterinarian one week prior to the study. The animal had no parasites or fleas and had all required shots, was non-aggressive, and accustomed to being handled by many different persons.

Blood pressure and Heart Rate Recordings. SBP, DBP, and HR were recorded using a Timex Automatic Upper Arm Blood Pressure Monitor. For each measurement, the cuff was placed around the child's right arm with the bottom of the cuff approximately one inch above the elbow. In most cases, the child pressed the "Start" button although it was occasionally pushed by the examiner. The cuff automatically inflated and subsequently, digital measures of SBP, DBP, and HR were displayed and recorded.

Each child was asked if they have a dog currently, have ever owned a dog, or have not had a dog. Out of the 17 participants, 6 have a dog currently, 9 have had a dog, and 2 have never had a dog.

Of 17 children, therefore, 15 either currently have a dog or have had a dog in the past. We did not record what happened to the dogs for the 9 children that once owned a dog. None of the children reported that their dogs were or had been mean or aggressive.

RESULTS

A 2 (dog presence: dog day versus no dog day) by 3 (three consecutive test sessions) repeated measures design was used to analyze each of three dependent variables: SBP, DBP, and HR.

For the three ANOVAS, the main effect for dog presence approached significance for SBP, $F(1,16) = 4.217$, $p = .057$, was significant for DBP, $F(1,16) = 4.863$, $p < .05$, and was not significant for HR, $F(1,16) = 0.952$, $p = .344$.

The main effect for the three time intervals was not significant for SBP, $F(2,32) = 1.551$, $p = .228$; DBP, $F(2,32) = 0.725$, $p = .492$; or HR, $F(2,32) = .305$, $p = .739$.

There was no significant interaction between the main effect for dog present versus dog absent days and the main effect for the three 5-minute time intervals for SBP, $F(2,32) = .666$, $p = .52$; DBP, $F(2,32) = .54$, $p = .59$; or HR, $F(2,32) = 2.04$, $p = .156$.

Post hoc *t*-tests were used to compare the "dog present" day and the "dog absent" day for each of the three 5-minute time intervals for SBP, DBP, and HR. Post hoc *t* tests comparing baseline measures taken at the end of the first time interval between "dog present" and "dog absent" days were not significant for SBP, $t(16) = 1.29$; for DBP, $t(16) = 0.47$; or HR, $t(16) = 1.29$.

Children held the dog in their laps for five minutes during the second 5-minute interval on the test day with the dog and simply interacted with the experimenter during the second 5-minute interval on the test day with no dog. Post hoc *t*-tests comparing measures taken after the second time interval between "dog present" and "dog absent" days was not significant for SBP, $t(16) = 0.13$; was significant for DBP, $t(16) = 2.29$, $p<.05$, *SEM* 3.46; and not significant for HR, $t(16) = 1.21$.

No dog was present during the third 5-minute interval for the test day with a dog or the test day without a dog. Post hoc *t*-tests comparing measures at the end of the third time interval for the test day with a dog versus the test day with no dog, yielded a significant increase in SBP for the test day with a dog, $t(16) = 3.08$, $p < .01$, *SEM* = 4.16; an increase in DBP which approached significance for the test day with a dog, $t(16) = 2.07$, $p = .055$, *SEM* = 8.07; and a significant decrease in HR for the test day with a dog, $t(16) = 2.90$, $p <.01$, *SEM* = 2.82.

In summary, DBP significantly increased while children held the dog and SBP significantly increased during the interval that followed holding the dog. However, HR significantly decreased during the interval that followed holding the dog.

Teacher ratings for five behaviors. Teacher ratings on a five point scale (1 = strongly agree and 5 = strongly disagree) were taken at the end of each test day. *T*-tests were used to compare teacher ratings for dog and no-dog days for each of the five statements about child behavior mentioned in the Method section. None approached significance, and only the first statement, "Child appeared to be happy and in a better mood than before the research session", yielded a *t* value higher or lower than 1, $t (16) = -1.17$.

DISCUSSION

Previous research on pet therapy with both children and adults has tended to emphasize the calming effects that companion animals,

particularly dogs, have on autonomic activity. Although there are exceptions, most research has provided evidence that even brief exposure to dogs tends to lower blood pressure. By contrast, the present study with children whose primary diagnosis was ADHD resulted in a significant increase in DBP while children held the dog and an increase in SBP during the time period after holding the dog. The pattern for both SBP and DBP was to increase while children held the dog in their laps as well as to increase in the time period after holding the dog. However, the pattern for HR was a decrease during both time periods. Almost all of the children appeared enthusiastic when they found out that it was their day to be with the dog. Hans Selye distinguished between physiological changes associated with response to negative stimuli (distress) and similar changes associated with response to positive stimuli (eustress).We interpret the increase in blood pressure as indicating eustress, a response to positive stimuli associated with handling a dog. The decrease in HR during the same time periods is more difficult to interpret. Increases or decreases in pulse do not invariably correspond to increases or decreases in blood pressure, particularly in subgroups such as individuals with closed head injuries. Decreases in pulse have also been noted to occur while persons are orienting to a stimulus situation. Conceivably, the decrease in pulse associated with handling a dog may have involved a form of orienting behavior. Recall that measures of blood pressure and pulse were taken simultaneously by an automatic upper arm blood pressure monitor. Thus, the inverse relationship between blood pressure and pulse did not involve a time difference between blood pressure and pulse measures.

For children who have a diagnosis of ADHD, there is probably a tendency by teachers to favor influences that are perceived as calming rather than exciting. Such expressions as “calm down,” “don’t get excited,” etc., primarily reflect our values as they relate to quietness and inactivity in an educational environment. However, we can also recognize that being happy, elated, or excited are positive aspects of our emotional experience. Such may be the case when children are enthusiastic about interacting with a friendly dog. In that sense, these findings could actually indicate some positive consequences of pet therapy with ADHD children.

Another aspect of this study was to assess whether there would be any behavioral changes that might be detected by teachers on days when children interacted with the dog. Based on teacher ratings, there were no significant changes in any of these moods or behaviors.

Why did the findings of this study differ from a study by Nagengast et al.(1997)? One explanation may be that in the present study, there was no intentional manipulation of the stress variable. Children were simply

taken from their classroom to another familiar room in the same building while in the company of a staff member and the experimenter. Rather than seeking to create a stressful situation, efforts were made to keep the educational and physical environment constant and minimize any stress that might be associated with the experimental situation. In the study by Nagengast, et al., children were taken to an examining room and intentional efforts were made to simulate a presumably stressful situation involving a physical examination. It is conceivable that the physiological baseline for their study was one of increased arousal whereas the baseline in the present study was one of relatively low arousal.

A possible explanation for the findings with ADHD children is that handling a friendly dog is associated with an initial and continuing increase in blood pressure resulting from excitement. Since there were no measures taken after the 15 minute test periods, it is not possible to determine whether interacting with the dog was associated with a sustained arousal beyond the experimental session. It is improbable that physiological arousal related to handling of a dog was due to novelty effects resulting from minimal prior contact with dogs, because most of the children owned or had owned a dog.

One limitation of the present study was the lack of a control test session consisting of some type of manipulation other than just the absence of the dog. For example, a test day using a stuffed animal or some other manipulation than simply a test day in which no dog was present. As suggested by studies cited in the introduction, temporary increases or decreases in both blood pressure and heart rate can occur as a result of a variety of manipulations such as talking to the experimenter, reading, solving a math problem, or the presence of a familiar person. In the present study, the effects of the dog could not be isolated as the specific cause of autonomic activation.

In summary, one possible interpretation of the results of the present study is that the use of pet therapy with ADHD children may be a positive experience associated with excitement. However, the absence of a control group with an alternative manipulation limits this conclusion. Regardless, there was no support for a possible assumption that interactions with a friendly animal would have a calming effect on ADHD children.

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