# Effect of Animal-Assisted Play Therapy on Facilitating Social Behavior for Children with Autism: A Preliminary Comparison Study

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Despite evidence that Animal-Assisted Play Therapy increases the positive social behavior of children with autism, little is known about the mechanism of this treatment effect. In the present study, ten children with autism, aged 7-10, were randomized into two groups. One group attended 14 individual sessions of structured Animal-Assisted Play Therapy (AAPT) with a therapy dog, while the comparison group attended 14 individual sessions with a doll as the dog surrogate. Nonparametric tests showed that overall, children's social behaviors were similar in the two treatments, with a trend toward more positive verbal behavior with AAPT. However, the AAPT group showed significantly less negative behavior toward the social object (the therapy dog) compared with the comparison group's behavior toward the doll. The therapy dog's unambiguous response to the children's behavior and the dog's role in modeling social behaviors are possible explanations for the more positive outcomes seen in AAPT.

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Human-animal interaction is thought to have a great impact on the psychosocial and psycho-physiological parameters in human development (Chandler, 2011; Fine, 2010; Levinson, 1972; Melson, 2005). Research has indicated that human-animal interaction is associated with decreased human stress levels (Odendaal, 2000; Sobo, Eng, & Kassity-Krich, 2006); decreased depression (Antonioli & Reveley, 2005), increased social behaviors (Fung & Leung, 2014; Martin & Farnum, 2002; Redefer & Goodman, 1989), and increased self-confidence (Schultz et al., 2007). Some forms of therapy now integrate human-animal interaction. A meta-analysis of studies that evaluated Animal-Assisted Therapy (AAT), a therapy that incorporates animals into therapeutic contexts, showed that AAT was associated with moderate

effect sizes, with improved outcomes in four areas of symptomatology. One of the four areas includes the symptoms of Autism-Spectrum Disorder (ASD) (Nimer & Lundahl, 2007), the focus of the current study.

Persistent deficits in social communication and interaction across contexts are one of the two defining features of autism (American Psychiatric Association, 2013). These deficits include the inability to initiate interactions; problems with sharing attention, emotions, and interests with others; and difficulty engaging in age-appropriate social activities (Chawarska & Volkmar, 2005; American Psychiatric Association, 2013). The impaired communication of people with autism also manifests itself in nonverbal communication. In the communication process, humans use a variety of cues, such as facial expression, body posture, and tone of voice, to predict others' behavior. That is, our understanding of other people's intentions, beliefs, and desires depends on what messages we have received via our visual channel. The lack of eye contact, as well as inability to accurately process eye gaze, causes children with autism to experience difficulties when they have to make inferences about others' mental states. Some children with autism may have continued difficulty in joint attention

interactions, in which gestures, such as pointing, showing, and gaze-following are used to direct attention and establish a shared focus of interest (Loveland & Tunali-Kotoski, 2005). These children may fail to use or respond to such gestural behaviors or may do so inconsistently, leading to marked difficulty in maintaining social-communicative interactions (Loveland & Tunali-Kotoski, 2005). As mentioned by Arieh and Miller (2009), these deficits in joint attention may also be accompanied by profound delays in language acquisition.

The above-mentioned pathognomonic symptoms often cause children with ASD to experience significant difficulties in developing normal social relationships. Vygotsky (1978) believed that a child who remains isolated from play experiences will not gain the knowledge required for establishing social relationships. To acquire social competencies, children need play experiences that take place within a social context. Children do not develop in isolation nor through manipulation but through interaction (Vygotsky, 1978). Vygotsky observed that children's ability for self-regulation and their social behavior during play are frequently more evident than they are in other socially demanding or non-play situations. This effect also appears to apply to children with autism. Seach

(2007) observed that when the focus of the play between a child and a play partner is one of mutual engagement, such as "rough and tumble" play, chasing, or bouncing on a trampoline, the child with autism displays significantly more skills in social interaction and emotional reciprocity than at other times.

However, one of the distinguishing marks of young children with autism is that they lack imaginative play (Volkmar, Klin, & Cohen, 2005). Indeed, many children with autism do not engage in any form of play during unstructured time in schools. They do not share interest or enjoyment in objects, people, or events. They also tend to lack play skills during social times, such as taking turns when playing with others (Arieh & Miller, 2009). All of these characteristics hinder children with autism from developing their social understanding and social behavior in a natural play context. Therefore, specially designed play intervention for this population is of vital importance.

In the last decade, the preference of children with autism for humans, animals, and objects has been examined. This line of research has implications for play interventions for children with autism. Some studies have found that the minimal interest in social cooperation of children with autism might be limited to interactions with humans (Celani, 2002; Prothmann, Ettrich, & Prothmann, 2009). Some results suggest that animals have a social attractiveness to withdrawn children and may be beneficial to children with social deficits (Celani, 2002; Martin & Farnum, 2002; Prothmann et al., 2009). As Levinson (1972) stated, it is not easy for therapists to enter into the world of and gain trust from children with autism. He believed that pets could be easily accepted by these children as their playmates and could foster their positive social behaviors with humans.

The suitability of incorporating a therapy dog into treatment for children with autism is also recognized by many researchers who have emphasized that the treatment goal of AAT is to enhance human interaction (Chandler, 2011; Levinson, 1972; Melson, 2005; Redefer & Goodman, 1989). As explained by Chandler (2011), therapy dogs are different from toys or blankets because they are affectionate and responsive, and they are also different from most humans in that they convey direct and simple messages. These special qualities make it possible for therapy dogs to act as transitional objects in interventions for children with autism.

AAT researchers have conducted a number of studies to evaluate the therapeutic effects of animals on children with autism in recent decades (Fung &

Leung, 2014; Martin & Farnum, 2002; Redefer & Goodman, 1989). However, the empirical evidence for AAT intervention in ASD is very scant. Single-subject and within-participant designs were found to be the most common study designs, while between-subject studies are very rare (O'Haire, 2013). Among the between-subject design studies, some included a comparison condition of no treatment (e.g., Viau et al., 2010; Kern et al., 2011) or a comparison condition of treatment without animals (e.g., Redefer & Goodman, 1989; Sams, Fortney, & Willenbring, 2006). The absence of a control condition was a major limitation of the current AAT studies regarding ASD because the results of the studies can be extraneously attributed.

**The Current Study**

The current study was a preliminary comparison study that was part of a larger project to evaluate the effectiveness of Animal-Assisted Therapy relative to alternate treatments. The specific form of AAT was Animal-Assisted Play Therapy (AAPT), a therapy that incorporates therapy animals into play intervention contexts. It has been reported that AAPT increases the social verbal behavior of children with autism (Fung & Leung, 2014). Although the

magnitude of this increase was not significantly larger than that in the comparison group, the findings suggested that the therapy dog had a positive impact on social interaction. In the current study, quantitative data were used to show the social reactions of children with autism that are affected by incorporating the therapy dog in the structured play context of therapy. The types of outcomes that were affected gave clues about the mechanisms of AAPT. Qualitative analyses were also conducted to provide additional information about the possible mechanisms of AAPT. The two treatment groups were compared in terms of the children's interactions with the dog or doll and in terms of the child-therapist interactions in each treatment. It was hypothesized that the children with autism would spend more time with and show more frequent positive social verbal and nonverbal behavior in the presence of the therapy dog than with the doll. It was also hypothesized that the therapist-child social interactions would be more frequent in presence of the therapy dog than the doll. The focus of the children in the AAPT group would be shifted from their own world to the outside world. During the treatment stage of the intervention, the AAPT group would be expected to show significantly less isolation, autistic behavior, and negative behavior, and significantly

more social behaviors, compared with the comparison group.

**Method**

*Participants*

The participants were eight boys and two girls who were diagnosed with autism, aged 7-10 (*M* = 8.90 years). The children attended a school in Hong Kong that provides educational services to students with mild intellectual disability. The selection criteria were as follows: aged 6-10; met DSM-IV diagnostic criteria for Autistic Disorder; and met DSM-IV criteria for no other specific psychiatric disorder. The children were randomly assigned to the experimental group (AAPT) or the comparison group. All children in the AAPT group were then screened to ensure that the use of a therapy animal in treatment was not contraindicated. All the children were diagnosed with Intellectual Disability, with 80% in the mild range and 20% in the moderate range. Verbal delay was mild in 40% of children and moderate to severe in 60%. Table 1 shows the participants' demographic information.

*Measures*

**Observational Coding System:** The social performance of the children with autism was measured using an observational assessment of two behavioral categories: social behaviors (SB) and nonsocial behaviors (NSB). In this coding system, these two categories are defined as mutually

**Table 1.** Participant Demographics

| Variable | AAPT Group (*n* = 5) | | Comparison Group (*n* = 5) | |
|---|---|---|---|---|
| *Gender* | | | | |
| Boy | 4 | 80% | 4 | 80% |
| Girl | 1 | 20% | 1 | 20% |
| *Age in Years* | | | | |
| Seven | 1 | 20% | 1 | 20% |
| Eight | 1 | 20% | 0 | 0% |
| Nine | 0 | 0% | 3 | 60% |
| Ten | 3 | 60% | 1 | 20% |
| *Verbal Ability* | | | | |
| Mild Delay | 2 | 40% | 2 | 40% |
| Moderate Delay | 3 | 60% | 2 | 40% |
| Severe Delay | 0 | 0% | 1 | 20% |
| *Intellectual Disability* | | | | |
| Mild | 4 | 80% | 4 | 80% |
| Moderate | 1 | 20% | 1 | 20% |

*Note:* AAPT = Animal-assisted play therapy

exclusive. These behaviors were also coded in terms of the target (the dog/doll, the therapist, or neither).The category of SB is further divided into social nonverbal behaviors (SNVB) and social verbal behaviors (SVB). Under the subcategory of SNVB, eight items are measured: eye contact, touch, following instructions, joint attention, imitation, waiting, initiation, and response. Under the SVB subcategory, five items are measured: questioning, verbal response, verbal imitation, needing expression, and sharing.

The category of NSB is divided into the subcategories of isolation, autistic features, and negative behaviors. In the case of isolation and autistic features, no target is coded. For negative behaviors, the target is registered as doll/dog or therapist, as it is for the subcategories of social behaviors. Behaviors that are not included in the above categories, such as the child's shifting his or her attention from one activity to another, are listed as other. If the behaviors of the children could not be seen or captured, the category not seen was then checked. Table 2 shows the framework of the coding system. Momentary time sampling was used to

**Table 2.** Framework of the Coding System

| Categories | Sub categories | Items |
|---|---|---|
| Social Behavior (SB) | Social Nonverbal Behavior (SNVB) | 1. Eye Contact<br>2. Touch<br>3. Following Instructions<br>4. Joint Attention<br>5. Imitation<br>6. Waiting<br>7. Initiation<br>8. Response |
| | Social Verbal Behavior (SVB) | 1. Questioning<br>2. Verbal Response<br>3. Verbal Imitation<br>4. Needing Expression<br>5. Sharing |
| Non-Social Behavior (NSB) | Isolation (no target is coded) | ---------- |
| | Autistic Features (no target is coded) | ---------- |
| | Negative Behaviors | ---------- |
| Other | | |
| Not Seen | | |

estimate the frequency of the target behaviors (Richards, Taylor, Ramasamy, & Richards, 1999) using a 15-second interval (a typical time frame in research of this kind; see Kennedy, 2005). Behavioral categories were checked every 15 seconds throughout the 20-min session. A coding manual and a code sheet were designed accordingly.

The three coding criteria reflect the assumption that a strong preference for or dislike of animals could have led to biased interpretations of the observed behaviors: no animal fears or phobias; no history of negative experiences with animals; and no animals as pets. Two coders were selected to serve in the study, and the importance of confidentiality was addressed. The coders participated in systematic training and began their work independently only after 87% intercoder agreement on their trials was reached. Intercoder reliability was calculated based on 15% of the analyzed videotaped sessions, which were selected randomly and coded again by a second coder. Intercoder agreement was calculated using a total agreement approach (the totals of the total numbers of responses coded by each coder, with the smaller total divided by the larger total; and multiplied by 100%). The intercoder agreement in the two target categories "Therapist" and "Dog/Doll" was found to be 98% and 98.5%, respectively. In

the two broad behavioral categories, namely, "Social Behavior" and "Non-Social Behavior," the intercoder agreement was found to be 97.9% and 99.3%, respectively.

**Qualitative Data:** Videotapes of the therapy sessions were reviewed to identify examples of social and nonsocial behaviors that were coded in the observational system for the children in both treatment groups. Relevant examples are cited in the discussion section to illustrate significant quantitative results.

*Procedure*

Invitation letters were sent to targeted schools in Hong Kong that provided specialized educational services for students with intellectual disabilities. A large portion of the students in these schools were children with autism. The principal of the participating school was the first to accept the invitation. Ten children met the selection criteria at the participating school, and they were all invited to participate. Parents provided written consent for their children to participate in the study.

The therapy dogs were recruited by the Animal Asia Foundation, an animal welfare organization that has provided Animal-Assisted Activity (AAA) in Hong Kong for nearly 20 years. Qualified doctor dogs are at least two years old and have been spayed/neutered. In addition, they have

passed an evaluation for temperament, obedience skills, and ability to cope with stress. Two golden retrievers named Lu-Lu and Co Co were the therapy dogs in this study. They were sisters, nine years of age.

All therapy sessions were conducted by a female therapist who had a master's degree in counseling and who had received training in both play therapy and animal-assisted therapy. Treatment manuals were highly similar in both treatment groups, with the exception that interactions were with the therapy dog in AAPT and with the doll in the comparison group. These manuals provided guidelines for each session, including instructions on time allocation, session content, and standard dialog. Sessions were conducted at the school in a multi-purpose room (approximately $64 \, m^2$) with which the children were already familiar. All sessions were videotaped by two cameras, one facing the child and one facing the therapist.

Each of the 10 participants attended 14 one-on-one treatment sessions, which were held three times per week. Structured, therapist-directed play therapy was used as the main treatment approach. The 14 intervention sessions were designed with the intention of establishing a play context of structured social interaction that was therapist-directed, with the child following the therapist's lead. These 14 intervention sessions were further divided into 4 phases, each with its own focus. Phase 1 focused on the child's interaction with the dog or the doll, with the assistance of the therapist. Phase 2 focused on interaction between the child, the dog, or the doll and the therapist. Phase 3 focused on the child-therapist interaction in the presence of the dog or the doll. Phase 4 focused on the child-therapist interaction with the fade-out of the dog or the doll.

All play activities were interactive in nature. Play with a small ball, a balloon, toy bowling ball, and toy basketball appeared quite frequently in the intervention sessions. To strike a balance between physical games and nonphysical games, activities such as brick tower building and puzzle playing were also selected.

## Results

The social performance of the children with autism is reported under the two broad categories of behavior - social and nonsocial. The child's interactions with the social object and with the therapist during treatment were analyzed. The Mann-Whitney $U$ test was conducted to analyze between-group differences in each of the social performance subcategories and in each of the social performance items. Examples from the qualitative data are

presented in the discussion section to illustrate the nature of changes in social performance in the AAPT group.

### Social Behavior

### SVB

The positive behaviors reflected in social verbal behavior (SVB) were organized as social verbal behaviors toward the social object (five items), and social verbal behaviors toward the therapist (five items). The following results show that there were no significant group differences in these positive verbal behaviors overall for either target. Analyses at the item level also showed no significant differences.

**SVB Toward the Social Object:** For scores reflecting social verbal behaviors toward the social object, the AAPT group had an average rank of 6.30, and the comparison group had an average rank of 4.70. The occurrence of verbal behavior toward the therapy dog did not differ significantly from the occurrence of verbal behavior toward the baby doll ($z = -0.841$, $P = 0.401$). Further analysis was made to determine if there was a group difference on any of the five verbal items during the treatment stage. Mann-Whitney $U$ tests were conducted. No significant difference was found on any item. The occurrence of the five social verbal behaviors toward the social object shown by children in the two groups is shown in Fig. 1.

**Figure 1.** Mean frequencies of the five items that assessed social verbal behavior (SVB) toward the social object (doll/dog) for the comparison ($n = 5$) and the animal-assisted play therapy ($n = 5$) groups.
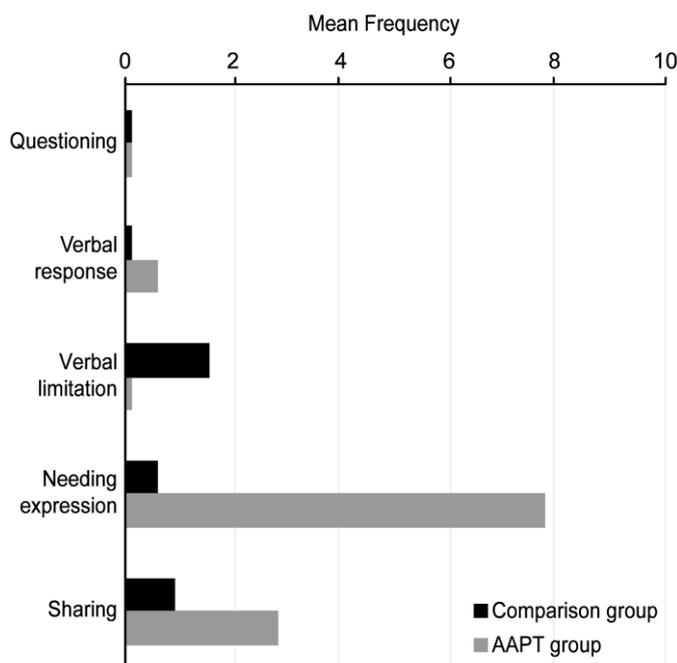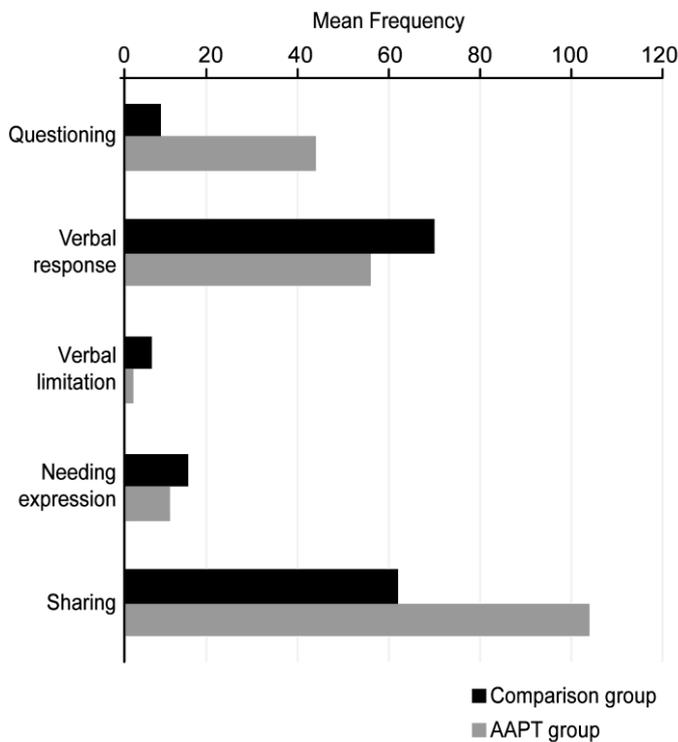
**Figure 2.** Mean frequencies of the five items that assessed social verbal behavior (SVB) toward the therapist for the comparison ($n = 5$) and the animal-assisted Play therapy ($n = 5$) groups.



**SVB Toward the Therapist:** The average ranks of the AAPT group (5.00) and the comparison group (6.00) were found to be very similar in the analysis of social verbal behavior toward the therapist. The occurrence of verbal behavior toward the therapist was not found to be significantly different between the two groups ($z = -0.522$, $P = 0.602$). Mann-Whitney $U$ tests were conducted to further analyze the group differences on each of the five verbal items during the treatment stage. The results of the statistical tests showed no significant between-group difference on any of the items. The occurrence of the five social verbal items toward the therapist in both groups during treatment is shown in Fig. 2.

*SNVB*

The children's social nonverbal behavior was represented by behavior toward the social object (eight items) and behavior toward the therapist (eight items). The following results show that contrary to the hypotheses, the AAPT group showed significantly lower initiation toward the social object and significantly lower rates of following the therapist's instructions relative to the comparison group.

**SNVB Toward the Social Object:** The AAPT group and the comparison group did not differ significantly in the occurrence of social nonverbal behavior toward the social object ($z = -0.731$, $P = 0.465$). The

**Figure 3.** Mean frequencies of the eight items that assessed social nonverbal behavior (SNVB) toward the social object (doll/dog) for the comparison ($n = 5$) and the animal-assisted play therapy ($n = 5$) groups.
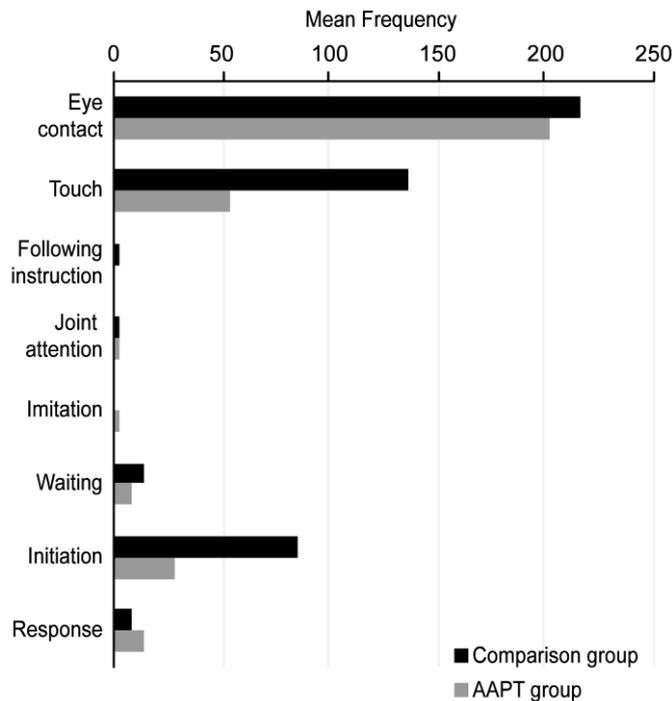


average rank of the AAPT group was 4.80, and the average rank of the comparison group was 6.20. Further statistical analyses were conducted to determine if there was a group difference on any of the eight items that represented social nonverbal behavior toward the social object. The results of a series of Mann-Whitney $U$ tests showed that only the item "initiation" was found to be significantly different between groups ($z = -1.99$; $P = 0.047$, $\delta = 0.76$) in the treatment stage. Contrary to the hypothesis, the children with autism initiated significantly more activities toward the baby doll than the therapy dog. The occurrence of

the eight nonverbal items toward the social object in both groups is shown in Fig. 3.

**SNVB Toward the Therapist:** The group difference in the social nonverbal behavior toward the therapist was not found to be significant ($z = -0.313$, $P = 0.754$). The AAPT group had an average rank of 5.20, and the comparison group had an average rank of 5.80. Mann-Whitney $U$ tests were performed to determine if there were any group differences in the eight nonverbal behaviors toward the therapist throughout the treatment sessions. A significant group difference was found in only one of the eight social nonverbal behaviors. Specifically, the comparison group showed

significantly higher rates of following the therapist's instructions ($z = -2.40$, $P = 0.016$, $\delta = 0.92$). Figure 4 shows the occurrence of the eight social nonverbal behaviors toward the therapist.

### Non-Social Behavior

#### Isolation

There was no significant difference between groups in isolation during treatment ($z = -0.73$, $P = 0.47$). The average rank of the AAPT group was 6.20 and that of the comparison group was 4.80.

#### Autistic Features

The between-group comparison for autistic features was not significant ($z = -0.53$, $P = 0.60$). The occurrence of autistic features was very low in the treatment stage in both the AAPT group (M = 1.4, $SD = 1.1$) and the comparison group (M = 5.4, $SD = 10.6$).

#### Negative Behavior

Negative behavior constituted two types of coding: negative behavior toward the social object and negative behavior toward the therapist. The following results show that the presence of the therapy dog was associated with significantly lower rates of negative behavior toward the social object but not toward the therapist.

**Negative Behavior Toward the Social**

**Figure 4.** Mean frequencies of the eight items that assessed social nonverbal behavior (SNVB) toward the therapist for the comparison ($n = 5$) and the animal-assisted play therapy ($n = 5$) groups.
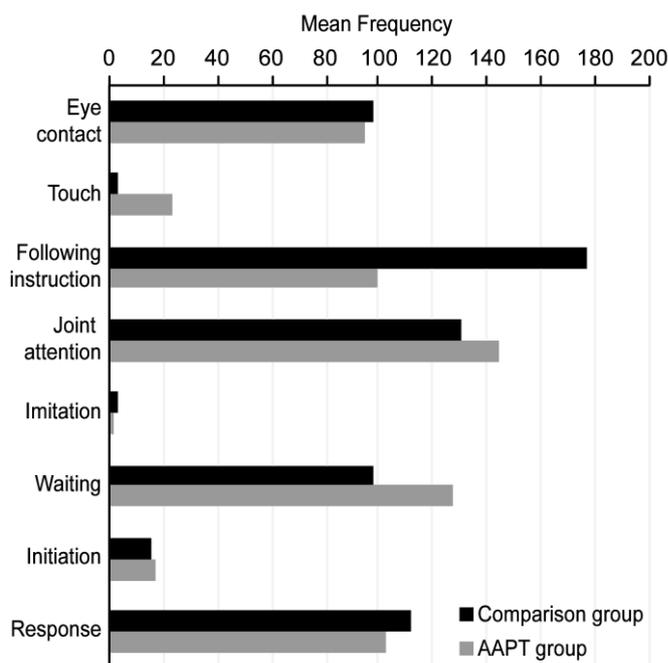
**Object:** Consistent with the hypothesis, children in the AAPT group showed significantly fewer negative behaviors toward the therapy dog than the comparison group showed toward the doll ($z = -2.12$, $P = 0.034$, $\delta = 0.76$). The AAPT group had an average rank of 3.60, whereas the comparison group had an average rank of 7.40.

**Negative Behavior Toward the Therapist:** There was no significant difference between groups in terms of negative behavior toward the therapist ($z = -0.524$, $P = 0.600$). The average rank of the AAPT group was 5.00, and that of the comparison group was 6.00.

**Discussion**

The current study examined the mechanisms by which the incorporation of a therapy dog in the context of AAPT could facilitate positive treatment outcomes for children with autism. A group-comparison treatment design was employed to investigate the differences between child-dog interactions in AAPT and child-doll interactions in the comparison group during the course of treatment. The child-therapist interaction in the groups was also examined. The results showed that during treatment, the children in the two groups showed similar verbal social behaviors but they differed significantly in a number of specific nonverbal social and nonsocial behaviors. Thus, although there is mixed support for the superiority of AAPT relative to the alternate treatment, the preliminary findings provide valuable data to for understanding the AAPT treatment mechanism. The qualitative data are presented here to help illustrate the nature of the social performance changes seen in the AAPT group.

The similarity in children's positive social behaviors during the two interventions suggests that there may have been important commonalities in the AAPT and comparison groups. It is possible that the structured, therapist-directed play modality used in both treatments shaped the children's interactions with the social object (the dog or the doll) and with the therapist in both intervention groups. In the present study, the two treatment manuals were similar, except for the social object. The treatments in the manuals did contribute to the internal validity of this study, but the structured treatment design may have limited the utilization of the therapy dog and the baby doll in ways that would have allowed them to play unique therapeutic roles. Despite the structured treatment design, there were a number of significant between-group differences in the children's behavior during treatment. One significant

difference was in the occurrence of negative behavior with the social object (the therapy dog in AAPT group or the baby doll in the comparison group). Only one child in the AAPT group behaved negatively with the therapy dog, and even this child showed a low occurrence of negative behavior (three occurrences over the course of treatment). By contrast, four out of five children in the comparison group were found to have behaved negatively toward the baby doll, behaviors that occurred throughout treatment. This result suggests that AAPT could be a valuable approach in cultivating a positive play environment for children with autism.

The significantly lower negative behavior toward the social object in the AAPT group compared with the comparison group may have occurred for three reasons, each of which suggests a possible mechanism by which AAPT might be effective. First, the therapy dog is alive and can thus provide more opportunities for therapeutic interactions than can the doll (Levinson, 1997). For example, the therapy dog can provide feedback to the child, whereas the baby doll cannot. As noted by some AAT researchers (Brooks, 2001; Nebbe, 1991), animals can provide immediate and unambiguous feedback to children on pleasurable as well as aversive stimuli. The following are two examples of the therapy dog's responses to a child's initiation.

*Example One: Co Co was lying beside the therapist, while William lay down in front of Co Co. Co Co let William hold her paw as the child wished. William held Co Co's hand for 20 seconds. (William, Session 5, 19:08 – 19:28).*

*Example Two: Charles fed Lu-Lu water but Lu-Lu didn't want to drink. Lu-Lu turned her head away to respond to Charles. Charles then fed Lu-Lu a small piece of biscuit instead. Lu-Lu ate it immediately. (Charles, Session 5, 6:28 – 7:36).*

In these examples, the therapy dog responded to positive and pleasurable initiation with compliance. By contrast, in response to negative and unwanted initiation, the therapy dog rejected the children. The feedback from the therapy dog was instrumental in increasing the children's positive and affectionate behavior as well as decreasing their negative behavior. It is also possible that although the children appeared to be generally comfortable with the therapy dog, the fear of unfavorable responses from the dog might have prevented the children from behaving negatively.

Compared with the living and novel therapy dog, the baby doll could not provide the children with any favorable or

unfavorable responses. The baby doll's unresponsiveness, on one hand, can explain the significantly higher rate of initiation in the comparison group; on the other hand, the nonliving baby doll can be much more easily approached and manipulated, both positively and negatively, than can an animal. Although the children initiated more play with the doll, they also exhibited more negative behaviors, such as sitting on or throwing the doll, using the doll to play bowling, and pulling the doll's hair.

The second possible reason that the children showed less negative behavior toward the social object in the AAPT group than in the comparison group is that the therapy dog could model positive social behavior for the children, whereas the baby doll could not. In the present study, the therapy dog and the AAPT therapist together modeled behaviors that cultivated a positive play environment, something that would be harder for the therapist in the comparison group to accomplish with the doll. A typical scenario in the AAPT intervention is described in the following to demonstrate modeling by the therapist and the therapy dog:

*Co Co left the play area during the play. The therapist immediately called her back: "Come back, Co Co." When Co Co came back, the therapist petted her head and praised her, "Good boy." The therapist also gave Co Co instruction: "Sit" (sit down). Co Co did what the therapist instructed her to do. The therapist responded to Co Co by praising her verbally and giving her treats. (Tracy, Session 7, 16:20 – 17:56).*

It is important to note that the positive interaction between the therapist and the therapy dog was manifested spontaneously in the course of the AAPT intervention. If the children learned to interact positively with the therapy dog in the therapy environment through modeling (Bandura, 1977) it could have been because therapist to therapy dog communication seems particularly easy for children with autism to understand. Their communication has two characteristics. First, positive reinforcement, such as praise, petting, and giving treats, was given immediately and consistently by the therapist to the therapy dog when the therapy dog responded positively to the therapist's instruction. Second, the verbal language of the therapist to the therapy dog was direct and simple, such as "sit," "down," "up," and "good boy." The cause and effect of appropriate social interaction were clearly demonstrated to the children in the AAPT group. By contrast, the modeling of positive social interaction (not solely therapist verbalizations) was not available in the comparison group.

The third possible reason that children showed less negative behavior toward the social object in the AAPT group than in the comparison group is that the comparison group required symbolic play skills, which children with autism do not have. In the present study, play activities were designed to facilitate human-animal interaction, especially in the initial stage of the treatment. Examples of these activities are "naming body parts," "cleaning up and feeding milk," and "petting." The therapy dog is alive. It makes sense for the children with autism to involve themselves in play activities with a real play partner. An interaction with a baby doll, however, is completely different. Children with autism lack imaginative play. They may not attribute human activities or feelings to the baby doll. They see the doll as an object, similar to a ball or a toy car. It is very likely that to children with autism, there is no difference between throwing the baby doll and throwing the toy car. They could not experience social interactions with the baby doll.

Another significant between-group result was found in following the therapist's instructions (operationally defined as doing what is being asked by the therapist). Children in the comparison group followed more therapist instructions than did the children in the AAPT group. Because the coding system registered the number of occurrences within a certain time frame, the significant difference in compliant behaviors possibly resulted from more instructions being given by the therapist in the comparison group in response to the higher frequency of negative behavior. Therapist behavior was not coded in the current study. In future research, the social behavior of the therapist in the therapeutic play context should be coded. The data would not only be useful for establishing the internal validity of the study but also for revealing the social dynamics of the interaction.

There were no significant group differences in any of the positive verbal behaviors for either target (therapist or social object). However, trends did appear for more positive verbal behaviors in the AAPT group on two items. By visual data analysis, the item "needing expression" (operationally defined as asking for an activity, toy, or object) toward the social object was comparatively frequent in the AAPT group throughout the treatment stage. Meanwhile, the occurrence of "questioning" was 4.4 times higher than that in the comparison group. The trends for needing more expressions from the therapy dog and asking more questions of the therapist in the AAPT group suggest that incorporating a therapy dog in a play context may help elicit

more positive verbal behaviors from children with autism. Future studies could investigate whether recruiting children with autism with higher verbal ability than seen in the current sample would lead to significant improvements in social speech. In the present study, homogeneous groups of verbal children with autism with mild intellectual disability could not be formed. In this study, the participants were recruited in a local school that provided special education to the population of interest. Although many parents were eager to join the present study, only a limited number of participants met all the selection criteria. As a result, two children with autism with moderate intellectual disability and low verbal ability were accepted and randomly assigned to two groups in this study. Their poor verbal ability unavoidably led to the low rates of social verbal behavior in both the AAPT and the comparison groups. This limitation may have kept the increased verbal behaviors from reaching a significant level.

Another limitation of this preliminary study was the small sample size. With the very small comparison groups, there is a large chance that the expected effect will not be detected even if it is true. With a sample size of 10 divided into two groups, this study had only a 19% probability of detecting a group difference (Siegel &

Castellan, 1988). Future studies would have required at least ten participants per group so that they would have more than 50% probability of detecting statistically significant group differences (Siegel & Castellan, 1988). Larger scale group-based and clinical trial designs of AAPT studies should be conducted to provide evidence that AAPT is a viable intervention for ASD.

This preliminary comparison study took a systematic approach to comparing the social behaviors of children with autism during two types of intervention in a play context, one involving a therapy dog and one involving a doll. Although there was mixed evidence in support of AAPT, the current study makes a unique contribution to the literature by providing preliminary evidence that a therapy dog can cultivate a positive therapeutic environment for children with autism by reducing negative interactions and possibly increasing positive verbal behaviors. The results of the present study not only have applied value but also illustrate how the therapy dog's unambiguous feedback regarding children's behaviors and the therapy dog's role in modeling could be mechanisms of AAPT's treatment effects.

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