
Occupational Therapy Incorporating Animals for Children With Autism: A Pilot Investigation

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This investigation compared language use and social interaction in children with autism receiving two forms of occupational therapy: occupational therapy using standard techniques, and occupational therapy incorporating animals. Twenty-two children between the ages of 7 and 13 received both forms of therapy in a school-based occupational therapy program for children with autism. Results suggest that the children demonstrated significantly greater use of language and significantly greater social interaction in sessions incorporating animals when compared to sessions using exclusively standard occupational therapy techniques. Findings are discussed in the context of recent research that has highlighted the importance of enhancing the motivation of children with autism to engage actively in therapeutic and learning processes.

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Introduction

Autism is a profound developmental disorder characterized by severe impairments in social behavior and in communication, and by restricted or stereotyped interests and behaviors (American Psychiatric Association, 1994). Disturbingly, there is evidence that the number of children with autism has been increasing over the past decade (Merrick, Kandel, & Morad, 2004). Such trends in the prevalence of autism, and the profound and lifelong impairments with which it is associated, point to the need for the continued investigation and development of innovative techniques to treat this disorder.

Occupational Therapy for Children With Autism

Within the field of occupational therapy, one of the most commonly used frameworks for treating autism is sensory integration theory, developed by Dr. A. Jean Ayers (Ayers, 1972). In fact, one survey found that 99% of occupational therapists working with children with autism spectrum disorders reported using a sensory integration framework (Watling, Deitz, Kanny, & McLaughlin, 1999). According to sensory integration theory, problems with sensory perception and integration interfere with the ability to attend and respond appropriately to complex stimuli in the environment, making organized behavior difficult.

Research has supported the existence of sensory processing and motor problems in persons with autism, as well as problems with complex information processing. Sensory deficits have been found to involve both over-responsiveness and under-responsiveness to sensory stimuli. Motor deficits have been identified in the realm of skilled motor functioning, particularly with respect to *praxis*, the planning and execution of complex motor sequences. Problems with praxis affect the ability to plan conventionally meaningful or purposeful interactions with the physical environment, including the ability to carry out motor imitation (Minschew, Goldstein, & Siegel, 1997; Rogers, 1998).

Researchers have also suggested that neurological deficits within the limbic system of persons with autism may create impairments in motivation, such that

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behaviors and stimuli that are reinforcing to most children are not reinforcing to those with autism (Bauman & Kemper, 1994). A combination of these and other neurological problems may particularly affect social interactions in children with autism; human movement and motivation is complex and difficult to predict, and frequently requires the interpretation of subtle verbal or nonverbal cues that are difficult for persons with autism to perceive or process (Mailloux & Roley, 2001).

Unfortunately, recent reviews of the literature have not found overwhelming support for the efficacy of interventions designed to address sensory, motor, and sensory integration problems in children with autism, and this has even been the case for interventions based specifically on sensory integration theory. In her thorough review, Baranek (2002) concluded that available sensory and motor interventions for children with autism lacked adequate scientific bases. She also found that the studies investigating these approaches had methodological limitations that made it difficult to draw firm conclusions, and that longitudinal studies often reflected that any gains that were made were short-lived. Similarly, Dawson and Watling (2000) reviewed the literature addressing interventions to facilitate auditory, visual, and motor integration in autism. They found only four small-scale studies of the use of sensory integration therapy for children with autism, and no studies on the use of traditional occupational therapy for this population. These authors concluded, therefore, that the occupational therapy and sensory integration techniques currently in use had not thus far been well validated by empirical research.

Though sensory and motor integration approaches typically used by occupational therapists in the treatment of autism have not received clear support in the literature to date, the emphasis of sensory integration therapy on facilitating the “inner drive” of the child has recently received support from research in the area of applied behavior analysis. Central to Ayers’s conceptualization of sensory integration therapy is the emphasis on child-directed sessions that encourage active participation by the child, and which deliver a “just-right level of challenge” to address the target goal in the context of play (Ayers, 1972; Mailloux & Roley, 2001).

Consistent with Ayers’s perspective, Lynn and Robert Koegel, in their investigations of “pivotal response” interventions within an applied behavior analysis framework, have found that interventions that enhance intrinsic motivation to participate and learn dramatically increase success rates in children with autism. Specifically, these researchers advocate that children with autism should be “recruited as active participants in the habilitation process” (Koegel,

Koegel, & Brookman, 2005, p. 634), primarily through arrangement of therapy environments to capitalize on the children’s own motivation. Examples of such techniques include allowing children to choose the stimulus items, making accessible age-appropriate items naturally occurring in the children’s environments, engaging in play with the children with the stimulus items, and pairing natural reinforcers (such as the opportunity to play with the items) with social reinforcers (Koegel et al., 2005). Through identifying skills that provide a foundation for children to elicit further learning opportunities from the environment, and then using motivational techniques to teach these skills, these researchers have found that children with autism were able to quickly learn target behaviors, decrease disruptive behaviors, and generalize and expand their skills outside of the therapy sessions. In sum, Koegel et al.’s (2005) emphasis on involving children with autism as “active participants” in pivotal response interventions mirrors Ayers’s focus on activating children’s “inner drive” in sensory integration therapy.

The Biophilic Hypothesis and Animal-Assisted Therapy

In recent years the use of animals in medical and mental health treatment has become increasingly common. According to the “biophilia” hypothesis, humans have adapted to be attentive to both human and nonhuman life forms in their environment (Kellert, 1997). With respect to child development, an increasing number of developmentalists have begun to adopt a “biocentric” perspective. Such an approach departs from the more traditional anthropocentric (human only) focus in theory and research, and suggests that children exhibit a natural interest toward animals and other nonhuman aspects of their environments.

One of the most profound and moving examples of the potential power of the biophilic approach to understanding human development in general, and autism in particular, comes from the writings of Temple Grandin, a PhD and professor of animal science who is herself diagnosed with autism. Her writings about her life have provided insights into an inner world of autism that until recently medical science thought could not exist, while simultaneously describing a unique and sensitive understanding of animal behavior. In her 1995 book, *Thinking in Pictures: And Other Reports from My Life with Autism*, Dr. Grandin wrote, “Being autistic has helped me to understand how they [animals] feel . . . People often fail to observe animals” (p. 155). She attributes her success in animal science to her connection with animals; in discussing her discovery of one specific approach she developed to calm cattle at a slaughter plant, she explains, “All it took was a cow’s eye view” (p. 156).

Empirical research also supports a biocentric approach to development. For example, a study of 68 5-year-olds found that 42% of the children spontaneously identified their pets as sources of emotional support when they were “sad, angry, happy or wanting to share a secret.” Parents of these children rated them as less anxious and withdrawn when compared with age-matched children who did not use pets for support (Melson & Schwartz, 1994). Other studies have found that 5- and 6-year-olds who were more attached to their pets expressed more empathy toward peers (Melson, Peet, & Sparks, 1992), and that 7- to 10-year-olds who reported that they had more “intimate talks” with their pets also had more empathy toward their peers (Bryant, 1985). Therefore, to ignore the component of child development that involves interactions with nonhuman creatures may be to artificially constrict the realm of scientific investigation, and to potentially eliminate effective treatments that promote healthy development in children (Melson, 2003).

Fortunately, the scientific investigation of the human–animal bond and its potential for medical and mental health interventions has increased in recent decades. Consistent with the biophilia hypothesis, research suggests that therapies using human–animal interactions may provide a wide range of physiological and psychosocial effects, including lowered blood pressure in patients with hypertension (Schuelke et al., 1991), higher survival rates after discharge from a coronary care unit (Friedmann, Katcher, Lynch, & Thomas, 1980), reductions in anxiety among patients with psychotic and mood disorders (Barker & Dawson, 1998), and increased socialization among elderly residents of care facilities (Fick, 1993).

With respect to the use of animal-assisted therapy in programs designed for persons with autism, Redefers and Goodman (1989) found that children with autism demonstrated fewer stereotyped behaviors such as hand-posturing and humming, and increased socially appropriate behavior such as joining the therapist in simple games, when a friendly therapy dog was introduced into the sessions. The children’s behavior remained almost 3 standard deviations above baseline levels one month after the introduction of the therapy dog, even when the dog was not present. Martin and Farnum (2002) found that children with Pervasive Developmental Disorders demonstrated a more playful mood, greater focus, and greater awareness of their social environments when in the presence of a live dog than when in the presence of a stuffed dog or a nonsocial toy (e.g., a ball). Finally, studies of therapeutic horseback riding in both adults and children with a range of handicapping conditions repeatedly demonstrate that this intervention produces improvements in balance, muscle tone, coordination, and posture (Biery & Kauffman, 1989). For example,

DePauw (1986) analyzed data collected over a 10-year period from a therapeutic horseback riding program for physically and mentally handicapped children in Washington, D.C. She found that participants in the program showed improvements in motor skills, language skills, emotional control, peer relations, and self-concept.

Given that recent developmental research suggests that both normally developing children (Melson, 2003) and children with autism (Martin & Farnum, 2002; Redefers & Goodman, 1989) exhibit a natural interest toward animals and other nonhuman aspects of their environments, the incorporation of animals into occupational therapy may be a natural extension of the philosophy of the sensory integration approach. Importantly, such an extension of a widely used occupational therapy approach would be consistent with recent research that suggests the importance of using naturally motivating elements in the environment to encourage children with autism to become active partners in their therapeutic and learning processes (Koegel, Carter, & Koegel, 2003; Koegel et al., 2005).

Method

Purpose

To begin testing the effectiveness of occupational therapy incorporating animals with children with autism, this pilot investigation was designed to examine the frequency of social interactions and language use in occupational therapy incorporating animals compared with occupational therapy sessions using standard techniques. It was hypothesized that the children would engage in significantly more social interactions and would make significantly more use of language in the occupational therapy sessions incorporating animals than in the occupational therapy sessions using exclusively standard techniques.

Participants

Participants were 22 children with autism receiving school-based occupational therapy services as part of a regional grant program through the Roanoke County Public Schools in Roanoke, Virginia. The children ranged in age from 7 to 13 years ($m = 9.6$, $SD = 1.7$). Two of the participants carried a secondary diagnosis of cerebral palsy. Inclusion criteria for participation in the study were defined as the following: school age and participating in the school-based program, primary diagnosis of autism, and informed consent from parents. The study was approved by and conducted under the auspices of the Institutional Review Board of Carilion Roanoke Memorial Hospital in Roanoke, Virginia.

Procedure

Each child received, on average, one session of standard occupational therapy per week and one session of occupational therapy incorporating animals per week. The study was conducted over 15 weeks, but because of situational factors (i.e., absence from school, different start dates in the program, school holidays), the children varied in the number of sessions of therapy they received (between 2 and 12 sessions of each form of therapy). The number of standard versus animal-assisted sessions was kept proportional for each child. The average length of standard occupational therapy sessions was 26.3 minutes ($SD = 6.0$), and the average length of occupational therapy sessions incorporating animals was 28.5 minutes ($SD = 5.3$).

Therapeutic activities in both the standard occupational therapy sessions and in the occupational therapy sessions incorporating animals were geared toward facilitating sensory integration, language use, sensory skills, and motor skills. In the standard occupational therapy sessions, the techniques and tools included: teeter-totters and swings for proprioceptive and vestibular input; stretchy play clay, mechanical toys, sensory balls, creative artwork, and puzzles for sensory and motor skills development; and letter magnets, GeoSafari® educational systems (Educational

Insights®, 18730 S. Wilmington Avenue, Rancho Dominguez, California 90220) and LeapPad® Learning Systems (LeapFrog® Enterprises, Inc., 6401 Hollis Street, Suite 100, Emeryville, California 94608) for language training. In the occupational therapy sessions incorporating animals, the techniques and tools included: riding in wagons drawn by llamas, riding on the backs of llamas, and guiding llamas through an obstacle course including hoops and tunnels for proprioceptive and vestibular input; brushing and feeding llamas, petting or stroking dogs and rabbits, carding llama wool, throwing balls for dogs, and loading and unloading llamas for sensory input and motor skills development; and responding to and issuing directions in training llamas for competition, asking to interact with specific animals, talking to animals, and talking about animals for language training. During the course of therapy, children were encouraged to train llamas to compete in an obstacle event in a biannual “llama show” (See Table 1).

Data Collection and Analysis

During each session individual children were observed by trained research assistants, and each instance of language use and social interaction was recorded on a behavioral rating form. The rating forms were divided into “Prompted”

Table 1. Therapeutic Activities in Standard Sessions and in Sessions Incorporating Animals

Target Domain	Standard Occupational Therapy Sessions	Occupational Therapy Sessions Incorporating Animals
Proprioceptive, vestibular functioning	<ul style="list-style-type: none"> • Teeter-totters • Swings • Bean bags for climbing • Hanging bars 	<ul style="list-style-type: none"> • Riding in wagons drawn by llamas • Riding on backs of llamas • Guiding llamas through obstacle courses, including hoops, tunnels
Sensory, motor functioning	<ul style="list-style-type: none"> • Stretchy play clay • Mechanical toys • Sensory balls • Creative artwork • Puzzles 	<ul style="list-style-type: none"> • Brushing, feeding llamas • Petting, stroking dogs and rabbits • Carding llama wool • Throwing balls for dogs • Loading and unloading llama carts
Language	<ul style="list-style-type: none"> • Letter magnets • GeoSafari educational systems • LeapPad learning systems • Asking for toys • Responding to directions • Repeating occupational therapist utterances 	<ul style="list-style-type: none"> • Responding to and issuing directions in training llamas for competition • Asking to interact with specific animals • Talking and signing to or about animals
Social Interaction	<ul style="list-style-type: none"> • Observing, interpreting, responding to occupational therapist behavioral cues • Communicating with therapist, peers about toys • Participating in community outings with peers • Communicating with therapist, peers about thoughts, feelings 	<ul style="list-style-type: none"> • Observing, interpreting, responding to animal behavioral cues (graded experience) • Responding, adapting to natural consequences of behaviors toward animals (graded experience) • Communicating with occupational therapist, peers about animals • Interacting with others at school through animals (i.e., facial, verbal behaviors to others who are petting animal) • Communicating to animals ideas intended for an observing human • Participating in llama shows: cheering for peers in llama shows, interacting with community at llama shows, receiving awards, and social reinforcement • Communicating with animals about thoughts, feelings

and "Spontaneous" columns, with rows for "Signing," "Sound," "Word," "Sentence," and "Interaction." Use of Language was defined as discrete instances of spontaneous, meaningful use of sign language, words, or sentences. Sounds that were not decipherable words or sentences were not considered language. Each instance of Use of Language was considered to have started at the onset of one meaningful communication initiated by the child. The communication was considered to have terminated at the completion of that communication, regardless of the length of time it took the child to convey the intended information. Because the functional abilities of children with autism can vary enormously, a single instance of communication could range from a single signing of the word "dog" in reference to one of the therapy animals (in the case of a nonverbal child), to a more complex expression of feelings of affection about one of the animals to the occupational therapist or to the animal itself (in the case of a child with more sophisticated verbal skills). For example, one child who rarely engaged in language was observed to be capable of making prompted verbal requests for items he was sufficiently motivated to obtain. Another child who made frequent vocalizations, many of which were meaningless or unintelligible, would demonstrate focused language use to obtain and maintain access to the animals. For this child, prompting was not necessary; but a focus for shaping her energetic expression was useful and helped her to organize her vocalizations to make them more meaningful.

Social Interaction was defined as either spontaneous or prompted appropriate interaction with humans or animals. As with Use of Language, a single instance of Social Interaction was defined as starting at the onset of an observable effort on the part of the child to engage with a human being or an animal, and as terminating at the cessation of that interaction. The topography of the behavior was obviously different for children at different functional levels, and included a range of social behaviors such as petting and hugging an animal while smiling, engaging in a conversation with the occupational therapist, or hugging the therapist or an animal hello or good-bye. Some interactions were prompted, such as when the occupational therapist initiated eye contact with a child during a shared activity. Others were more clearly child-initiated. For example, on entering the therapy room, one young man would proceed directly to the Great Dane and would smile as he lay next to the dog, pressing his cheek to her face. Later this same young man would often request that the Jack Russell terrier be present to observe while he read to the therapist using his LeapPad learning system.

It may be argued that including social interactions with animals artificially inflated the incidence of this variable.

However, a biocentric theoretical approach would assert that interactions with animals should be conceptualized as meaningful social interactions in and of themselves. In addition to the inherent meaningfulness that opportunities to connect with animals may hold in their own right, such interactions may provide children with autism a bridge to more complex and sophisticated interactions with other human beings. Children with autism often prefer interactions with objects to interactions with people because of the difficulty in predicting the movement patterns and reactions of people (Mailloux & Roley, 2001). Interactions with animals, with their less complex, less subtle, and more predictable social cues, may provide a medium for persons with autism to learn to interact with other sentient beings in a more easily understood yet consistently natural context.

Senior undergraduate occupational therapy field study students were trained to observe and record Use of Language and Social Interaction. Before actual data collection, each assistant viewed videotaped occupational therapy sessions and rated the variables of interest using the rating forms designed for this study. They then compared their ratings, and discussed how they arrived at their decisions with each other and with the occupational therapist. This process was continued until each research assistant was able to reliably observe and record the variables of interest according to the definitional criteria set forth in the study design.

Thirteen sessions were observed by two raters, and the interrater reliability was established through Pearson correlations of these observations. For Use of Language, $r = 0.98$, $n = 13$, $p < 0.01$; and for Social Interaction, $r = 0.91$, $n = 13$, $p < 0.01$.

To control for the varied length of sessions, the total number of each behavior per session was divided by the total number of minutes in that session, to obtain an average number of behaviors per minute.

Results

Using paired-sample *t*-tests, the average number of behaviors per minute for Use of Language and for Social Interaction was compared between standard occupational therapy sessions and occupational therapy sessions incorporating animals. Results indicated that the children engaged in significantly greater Use of Language ($t(21) = 2.18$; $p < 0.05$), and significantly greater Social Interaction ($t(21) = 4.21$; $p < 0.01$) in the occupational therapy sessions incorporating animals than in the standard occupational therapy sessions. The mean Use of Language per minute for standard sessions was 0.98 ($SD = 0.72$), and the mean Use of Language per minute for sessions incorporating animals was

1.27 ($SD = 1.10$), resulting in an effect size of $d = 0.31$. The mean Social Interactions per minute for standard sessions was 0.17 ($SD = 0.09$), and the mean Social Interactions per minute for sessions incorporating animals was 0.27 ($SD = 0.10$), resulting in an effect size of $d = 1.0$.

Discussion

These data support the hypotheses that children with autism would demonstrate significantly more social interactions and would make significantly more frequent use of language in sessions incorporating animals than in sessions exclusively using standard occupational therapy techniques. Using Cohen's (1988) rough guidelines to interpret the effect sizes, the increase in language use in sessions incorporating animals would be considered to be between small and medium, and the increase in social interaction in sessions incorporating animals would be considered to be large. These findings are consistent with recent research suggesting that enhancing children's motivation to become active partners in the therapeutic process results in greater treatment gains. As opposed to being rewarded for engaging in a therapeutic activity by being presented with a reinforcer that is unrelated to the task, the children were able to engage in therapeutic activities where the reward was intrinsic to the activity itself. Further, and consistent with the philosophy of the widely used sensory integration approach, all of these elements of therapy took place in a naturalistic environment, in that the animals responded spontaneously and genuinely to the children's behaviors.

The results of this study lend support to the biocentric view of development, in that it was demonstrated that this sample of children with autism responded positively to the presence of nonhuman living creatures in their environments. Such a natural tendency for the children to interact with animals allowed the occupational therapist to engage creatively with the children, and to encourage inherently reinforcing activities that facilitated their growth and development at an appropriate level of challenge. Finally, incorporating animals in the occupational therapy session was unique in that it allowed the children to learn to interpret and respond to the less complex social and behavioral cues of animals, which may provide a bridge to learning to interpret the more subtle behavior of human beings.

The results of this study suggest that occupational therapy incorporating animals in the treatment of children with autism is an area that warrants further research. Although the findings reported here are promising, this study had some important limitations. First, the occupational therapist involved in the study implementation was not blind to the purpose of the study. Although every effort was made to

provide the highest level of treatment in both types of therapy sessions, it is impossible to rule out all possibility of bias. Second, whereas the effect sizes calculated were promising, the large effect size observed in social interaction during sessions incorporating animals may, in part, result from the increased opportunity for social interaction afforded by the presence of animals. Whereas a biocentric perspective would not view interactions with animals as inherently less meaningful than interactions with humans, this perspective may not be universally accepted. However, qualitative observations of children's behavior during sessions did not suggest that the increase in social behavior was entirely accounted for by interactions exclusively with animals, but that instead the children were also more motivated to interact socially with the humans present (perhaps to gain access to animals, or to talk about animals). Further, a preliminary analysis of interview data collected from family members of the participants has indicated that the gains associated with the involvement of the animals were valuable and observable in the children's daily lives. Nonetheless, additional quantitative research will be necessary to support the practical relevance and the generalizability of the findings reported here.

Although it may not be practical for all occupational therapists to incorporate animals in their practice, the results of this investigation suggest that the introduction of animals into therapy for children with autism may be useful for those who work with this population. These findings presented here add to the growing body of evidence that the therapeutic use of animals may be an effective way to engage a wide variety of therapy clients, as well as to enhance the effectiveness of established occupational therapy techniques. ▲

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