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Creating a Template of Nonverbal Cues for Immobile Recipients to use in Communicating with Service Dogs

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Abstract

For people with physical disabilities, it is often frustrating and embarrassing to have to constantly ask for assistance with everyday tasks. Service dogs not only provide constant companionship, but they also act as the arms and legs of their disabled owners. By performing tasks such as opening and closing doors, pulling wheelchairs and retrieving various items, they provide their owners with independence and confidence. I made this observation when I worked for 6 months on coop at Canine Assistants in Alpharetta, Georgia, just outside of Atlanta. However, for the more severely immobile people, such as those with Muscular Dystrophy, Cerebral palsy, and Duchennes Syndrome, communication with their dogs can be difficult if not impossible, due to their hindered mobility and lack of vocal ability. If these people cannot rely on gestures or speech to give their service dogs commands, the only form of communication they can utilize is that which is nonverbal.

The majority of a canines' communication with one another consists of body language and nonverbal communication. It is my belief that service dog trainers can use this natural ability to their advantage. Training the dogs to understand and respond to the trainer's nonverbal cues can enable service dog owners to give their dogs commands without using gestures or speech. I plan to implement and explore the phenomenon of training service dogs to respond to nonverbal communication by taking advantage of a canine's natural instincts, by researching canine communication and psychology, by studying similarities in human and animal brain structures, by studying various training methods, and by actually training the subject to respond to up to eighty commands.

The idea for this research came from my co-op experience in the spring of 2006, where I was an intern at a service dog training facility. Canine Assistants is an organization that trains service dogs for physically and mentally disabled children and adults. Founded in 1991 by Jennifer Arnold, they aim to ease the lives of the disabled by training service dogs to assist the disabled with everyday needs. Some of the disabilities that can qualify one for a service dog include, but are not limited to, Cerebral Palsy, Epilepsy, Muscular Dystrophy Para/Quadriplegia, and Duchennes Syndrome. The dogs are bred, born and trained on-site at the center's headquarters in Alpharetta, Georgia, and they are trained to perform such tasks as opening doors, turning on lights, pulling wheelchairs, retrieving dropped items, and carrying items for their recipients. The dogs are trained over the period of eighteen months and are taught approximately eighty commands. While the training can cost about \$15,000, the dogs are placed with their owners free of charge.

Canine Assistants frequently receives applications requesting service dogs for children with Duchennes Syndrome. This is the most severe form of childhood muscular dystrophy, occurring in one out of every 5,000 male births (Pearce, 2005). It is a degenerative disease characterized by muscle weakness and atrophy, loss of ambulation, imbalanced gait, paralysis and early death (Pearce, 2005). This disease is also known to cause scoliosis and progressive weakness of the respiratory muscles, which can lead to respiratory or cardiac failure (Jay & Vajsar, 2001). All boys who suffer from this disease will die by their mid-twenties.

Because of the severe and quick progression of this disease, applications for service dogs from the families of these boys who suffer from Duchennes syndrome are likely to be accepted. Not only is this disease extremely tragic because of its debilitating nature, but also because its sole victims are young boys. I believe that those people who experience such muscle weakness and loss of movement, especially those who are paralyzed, could greatly benefit from learning to communicate with their service dogs through nonverbal cues. Since moving their muscles requires great effort and energy on their part, using minor facial and eye movements would ensure that they do not waste much of their energy on moving other body parts and limbs. For those who have been rendered paralyzed, using nonverbal communication would not only allow them to give commands to their dog, but also to form the bond and independence that is gained from the partnership with the service dog.

Cerebral Palsy is one of the more prevalent diseases afflicting service dog recipients at Canine Assistants. It is a neurological condition that often results from a brain injury that occurs before the completion of cerebral development (Kriger, 2006).

In 2001, the United States Cerebral Palsy Foundation estimated that 764,000 children and adults in the United States had been diagnosed with the condition (Kriger, 2006). Two to two and a half out of every 1,000 children born in the United States are affected by this disability (Kriger, 2006). Symptoms of this disorder include spastic features such as tremors, weakness, difficulty walking, and muscular tonicity (Kriger, 2006). Other symptoms include intellectual impairment, growth problems, sensitivity to pain, and impaired vocal communication (Kriger, 2006). The impaired oral-motor functions in patients diagnosed with Cerebral Palsy can result in communications difficulties causing impaired vocal communication (Kriger, 2006).

For recipients with Cerebral Palsy who experience impaired vocal ability, it can be near impossible for them to communicate with their service dogs. Verbal directives, along with physical guidance, are the main ways in which service dogs are trained to respond to commands. If a person is unable to give verbal commands, he or she must then rely on the physical guidance of targeting. But what if that, too, is impossible due to the physical constraints of Cerebral Palsy? Without the use of vocalizations or body movements, nonverbal communication may be the only way to give a service dog a command.

The more severely disabled recipients are often assisted and accompanied by a parent or caregiver when they arrive at Canine Assistants for the two week training camp to be placed with a service dog. When observing these training camps, I noticed that the more severely disabled, especially the children, rely on that caregiver to communicate to the dog what it is they need the dog to do for them. While this is effective in getting the dog to work for them, it eliminates the bond that comes from the person giving the

commands him or herself. When the disabled person comes to the camp, he is taught how to effectively give the dog the commands and how to reward the dog for performing the command correctly. If the person is not directly giving the command, but rather going through another person to give the command, he is potentially eliminating the special bond that is created through communicating to the dog what he wants it to do. That bond is one of the most special aspects of having a service dog, and the more severely disabled recipients miss out on that special experience when they cannot communicate to their own dogs. I propose in my thesis project that by using nonverbal communication to convey the commands, the disabled person would eliminate the need for the caregiver to communicate with the dog for them and they would gain independence and confidence in the process.

Historical Canine-Human Relationship

When discussing the relationship between humans and canines, it is important to consider how and why that relationship originally formed, and how it evolved to the state in which it exists today.

The earliest form of the domestic dog can be linked to the tame wolf, *Canis lupus familiaris*, which existed during the Tertiary period (Olsen & Olsen, 1977). Upon examination of fossils, this determination was made due to the evidence of a shortened face and reduced tooth size, which are the first physical signs of domestication in canids (Olsen & Olsen, 1977).

Hundreds of thousands of years ago, it is believed that dogs first started loitering around the primitive humans' campsites because they learned they could eat without hunting by feasting on the remains of the humans' meals (Coren, 2000). Dogs were used by these humans for protection, tracking and hunting, to dispose of leftovers, and even to help prepare food (Coren, 2000). Additionally, the dogs' high level of sociability led them to associate with humans and eventually accept human ownership and direction (Grandin, 2005).

Because of the dog's acute senses, it is theorized by some experts that our early ancestors used the dogs to their advantage by having the dogs hunt for them (Coren, 2000). In turn, they believe that the facial structure of humans evolved into a flatter, more flexible configuration because they no longer needed those structures that facilitated smelling and tracking (Coren, 2000). Although it is difficult to know whether or not this is the case, it certainly makes sense that humans and dogs cohabited and cooperated to ensure the survival of each species.

Some anthropologists believe that the many years of association with humans and the integration into their society led to co-evolution, based on geographical and temporal similarities between the emergences of *canis familiaris* and certain forms of communication and cooperation in humans (Coren, 1994).

The ability of *Canis familiaris* to comprehend human body language is attributed to the long standing social relationship that has formed from their close contact with humans and their immersion in the social environment of humans (Miklosi & Soproni, 2001). In other words, because they spend so much time around humans, domestic dogs have become sensitive to human gestures.

Because the adaptational demands of the dogs were similar to that of the humans, *canis familiaris* adapted to the human environment. As a result of this co-evolutionary relationship, dogs have developed traits and behaviors comparable to those of humans. In turn, today's domestic dog is responsive to social cues and communicative signs emitted by humans (Miklosi & Soproni, 2001).

In many species, it is imperative for the animal's survival that they be able to detect body movements and gestures of others that signify intention (Csanyi et al., 2004). These cues which reveal the direction of one's intention are important not only to predict each other's future actions (Csanyi et al., 2004), but also to find out about one's proximity to a predator, to food, or to a mate.

In humans, attentional focus is often suggested by the eyes in the form of a gaze or a glance. But the head and body positioning can also provide sufficient information as to the focus of the individual's attention (Csanyi et al., 2004). Many studies have been done on the gaze perception and recognition in humans and non-human primates, but little research has been done on these abilities in other mammals. What research has been done shows that animals from different species are sensitive to the visual orientation of others (Csanyi et al., 2004), and there is increasing interest in the abilities of the domestic dog to perceive the attentional focus of humans (Csanyi et al., 2004). Csanyi et al (2004) names three possible reasons that dogs may possess these social skills. One reason is that canines are social creatures and share many characteristics of the complex social system known in primates (Csanyi et al., 2004). Another reason why attention-reading abilities are expected in dogs comes from the overwhelming evidence showing that the dog was

the first species to cohabit with humans, which means that they must have acquired some special skill to transform from the wild and untamed wolf to the dog that possesses the ability to interact and communicate with humans (Csanyi et al., 2004). And, the fact that dogs did cohabit with humans for so long makes them habituated to human social settings and signals (Csanyi et al., 2004). Previous studies suggest that in primates, this enculturation can facilitate the emergence of social skills in a more sophisticated level (Csanyi et al., 2004). This opens the possibility that a similar effect can be had on domestic dogs.

Every species is subject to the effects of evolution, a continuous and infinite process. As the more advanced of the species, humans can have a great impact on the selection process of domestic animals, as we create the environment that the animals live in (Grandin, 2005). Because they are constantly interacting with us, over the course of time our actions and emotions change the development of these animals (Grandin, 2005). In addition, we make the decisions as to which dogs get to reproduce and which do not (Grandin, 2005). Therefore, we can control what traits emerge in dogs, both physically and behaviorally.

People who breed dogs for specific traits are participating in intentional selection. They breed dogs with desirable traits to create offspring who will embody those traits. However accidental selection occurs as well, and over time, can produce dramatic changes in the bodies and emotions of domestic animals (Grandin, 2005). Without being aware of it, humans can completely reshape a behavior or a group of behaviors in an animal (Grandin, 2005).

It is when humans intentionally breed for a specific trait that can cause seriously damaging physical and emotional problems (Grandin, 2005). Single-trait breeding is selectively breeding animals to increase or decrease one or two traits (Grandin, 2005). But breeding for only one or two traits does not come without a cost: other traits are often changed unintentionally in the process, which can produce very negative unintentional outcomes (Grandin, 2005). When humans breed for a physical characteristic, they often don't realize the behavioral changes that occur as well (Grandin, 2005). Deliberately breeding albino Doberman pinschers is one example. Although they may look appealing visually, these dogs have physical impairments such as poor vision, intolerance to sunlight and skin lesions (Grandin, 2005). In addition, owners report problems with aggression (Grandin, 2005), one behavioral side effect that was certainly not intended to emerge.

Breeders are constantly changing the genetic makeup of an entire breed, which can be good for show dogs, but can be terribly debilitating to both the physical and mental health of the animal (Grandin, 2005). One example is the way breeders have changed the appearance of the collie. Today's collie has a much thinner face, compared to the wide, flat faced collies from the earlier twentieth century, leaving less space in the skull for the brain (Grandin, 2005). Some believe that the Collie has gotten less intelligent as a result of this evolutionary process (Grandin, 2005).

These are some examples of the way certain breeds have been negatively impacted by the selection process imposed on them by humans. But there are beneficial ways that humans can select for certain traits, whether its intentional or unconscious.

Today's domestic dog has been neotenized by humans, meaning they are bred to stay immature forever (Grandin, 2005). Behaviorally, dogs are the equivalent of wolf puppies, and their genetic makeup is that of a juvenile wolf (Grandin, 2005). Robert Wayne, a UCLA researcher who has studied mitochondrial DNA of both dogs and wolves, found that there is only a .2 percent difference between the genes of the two (Grandin, 2005). In her research comparing dogs to wolves, Dr. Deborah Goodwin found that dogs that look less like wolves have lost more elements of wolf like body-language (Goodwin, 1997). She concluded that dogs stop developing emotionally and behaviorally at the wolf equivalent of thirty days (Grandin, 2005). Therefore, a domestic dog can exhibit any behavior that a thirty day old wolf can do, but nothing further (Grandin, 2005).

This evolution of the dog was most likely due to the fact that humans preferred more puppy-like wolves. Over time, they probably bred wolves until they got the young, playful, submissive characteristics that they desired. This leaves open the possibility of future advantages for humans through the selection of dogs. I do not condone the single-trait breeding process for physical traits, but I do believe that it is possible to breed for a more emotionally intuitive dog, which can come in handy for a service dog. If a facility has a male and female who are both known to be particularly "in-tune" to humans' emotions and communicative signals, breeding the two would likely create offspring with the same characteristics.

Why do people find dogs "cute"? One area to consider is the similarity between dogs and humans in facial expressions and nonverbal communication of emotions. Some dogs were bred specifically for their affectionate appearance, for example, many toy

breeds were bred for their large eyes and pupils, which signify affection to humans (Coren, 2000).

According to naturalist and Nobel-prize winner Konrad Lorenz, humans and animals express an affinity for the young of their species that is likely due to the appealing appearance of large eyes, small faces, and facial expressions (Coren, 2000). Such traits that attract affection and nurturing may facilitate survival for the young, invoking the adults in the group to protect them (Coren, 2000).

Whether or not dogs experience emotion is an ongoing controversy among experts, but it has been proven that dogs possess a heightened sense of intuition in certain aspects. Consider the dogs that have been known to detect seizures long before their onset. Seizure response dogs are specially trained to respond when its owner has a seizure: some of these dogs lie down on their owners, some bring medicine and some bring a telephone (Grandin, 2005). While the actions of the dogs appear noble and heroic, they are simply the result of years of conditioning to respond to a seizure. Canine Assistants also trains such dogs, and they have proven to be very beneficial to their owners. However, some seizure response dogs can detect and respond to the onset of a seizure ahead of time, a quality that is virtually untrainable. Some of these dogs lie down on their owners when they sense a seizure coming; others nudge the person's hand with their muzzles. These are called seizure alert dogs, because they alert the person to the onset of a seizure. Canine Assistants does not guarantee that their seizure response dogs will detect seizures ahead of time because it is difficult to train for since we do not know where it comes from. No one knows how this incredible phenomenon occurs because there aren't visible signs of the onset of the seizure thirty minutes away (Grandin, 2005).

But it does prove that dogs possess an extreme sense of intuition and perception, and possibly another sense that has never been discovered.

Canine Communication

When training a dog, communication is vital, so we must refer to the canine's method of communication to best get our message across and to understand what they are telling us. Training cannot be successful without efficient communication.

The majority of canines' communication with each other is through body language and nonverbal communication. Body language is imperative for survival in the wild because it is silent and can be seen from far distances (Coren, 2000). An abundance of information can be communicated with a simple look or gesture, and complex messages can be encoded in simple visual signals (Coren, 2000).

Originally, dogs did not bark when they hunted because the sound would scare away prey (Coren, 1994). Early humans selectively bred for "barkers" to keep away intruders (Coren, 1994). This is a possible explanation for the vocal divergence between early wolves and domestic dogs (Coren, 1994). Small nuances in a dog's vocalization can drastically change the meaning of the message, and vocalizations can communicate to all species through variations in pitch, duration and frequency of the sounds (Coren, 1994).

Unlike humans, dogs display only those movements and expressions that are important for their survival (Coren, 2000). Every gesture or movement a dog makes has a specific purpose (Coren, 2000). Since they do not have the capability to speak, they

must rely on body language to convey their message. Dogs are not able to laugh or cry like we are because these are behaviors that would not benefit them in the wild. The major ways a dog communicates is through body positioning, including movements of the eyes, ears, head and tail (Coren, 2000). Therefore, when we analyze a dog's nonverbal communication we must consider how they use these communicative methods in the wild.

Humans do much of their communication with their faces and are able to project intentions and emotions without ever using sound (Coren, 2000). Humans have two neural systems that control the muscles in their face, one of which is voluntary and the other involuntary (Coren, 2000). The voluntary system is associated more with the mouth and the areas surrounding it (Coren, 2000).

Conversely, dogs do not have as wide a range of control over the muscles near the mouth, and therefore cannot use the mouth to show the same expressions as humans (Coren, 2000). A dog's facial expression is limited in comparison to humans because dogs, like most vertebrates, have muzzles (Coren, 2000). Those animals that evolved with muzzles use them to find, obtain, and kill food, if need be (Coren, 2000). So, while humans evolved with flatter faces, they possess the ability of speech. Animals, then, must do the best they can in communicating with their muzzle. Yet, the dog's mouth is one of its main tools in nonverbal communication (Coren, 2000).

All living beings have been afforded by nature the tools necessary for that specie's survival. For humans, a smile is used as a greeting or a sign of contentment; when we see a person smiling, we can assume that they come in peace and mean us no harm (Coren, 2000). A dog cannot smile because a smile would not benefit dogs in the

wild, nor do they possess the muscles or the muscle control to do so (Coren, 2000).

However, a dog can send multiple messages by positioning the muscles around its mouth in various ways, and can use its mouth to convey its feelings, such as anger, relaxation and interest (Coren, 2000).

Similarly, humans do not have control over the movement of their ears, and cannot use them to convey messages, nor would they ever need to. Dogs, on the other hand, have a much wider range of control of the movement of their ears. In addition to aiding their acute sense of hearing, their ears can also communicate a great deal of information (Coren, 2000). So, although dogs may not have as much flexibility and control over certain areas of the body, they compensate through the use of other body parts that humans do not have or do not use for communication (Coren, 2000).

Canine Behavior & Interaction- “The Pack”

Genetics play a key role in animal behavior, especially when considering instinctive behaviors. When training service dogs at Canine Assistants, we take advantage of the dog’s natural behavior to use to our benefit. Understanding instinct and inherited behaviors can be important when working with environmental stimuli. Fixed action patterns are innate, complex behaviors triggered by stimuli. Biting and prey holding is an example of such a behavior. Sign stimuli trigger such behaviors. Some of the communication can involve sign stimuli (i.e. natural instinct for the dog to carry prey in its mouth can be utilized when asking a dog to “get it” and “hold it”). When training bomb detecting dogs, every find is rewarded to successfully stimulate the idea of the

hunt. When a dog hunts, his food is the reward. Here, operant behavior is supported by instinctive behavior.

Another key aspect of animal behavior comes from the way their ancestors interact in the wild. Rather than ignoring the fact that domestic dogs are descendants of wild animals, we try to simulate their natural experiences. One of the most salient features of the wild dog is the concept of the pack. Wolves and wild dogs are social animals, and they have complex social hierarchies that ensure all members of the pack submit to the leader, or alpha dog (Coren, 1994). The alpha dog is always a confident leader and constantly provides physically, mentally, and emotionally for the pack. The goal of the pack is to ensure harmony and happiness within the pack, while nurturing the young, sick and injured (Coren, 1994). The pack communicates through a complex system of smells, vocalizations, posture, and body movements (Coren, 1994).

In training a service dog, we try to simulate the idea of the pack. In essence, the trainer or owner is the alpha dog, or pack leader. Therefore it is expected that the dog will submit to the leader and is always motivated to please her. To ensure this, we encourage the dog's natural instinct to follow the leader's orders and to take care of all pack members.

Communicating with Canines

When we think about "speaking dog" many would think of the movie character Dr. Doolittle, a vet who was known for his ability to communicate with animals.

Although inter-species communication may seem laughable to some, it is actually an area

of great interest to many and there is much to be discovered about this topic. When I say inter-species communication, I am not talking about speaking to animals. I mean we can take advantage of their natural means of communication to effectively understand what they are trying to tell us, as well as sending a message of our own to them.

Although dogs did not evolve with the physical ability to produce speech, studies have been done that show they do have the capacity to develop receptive language ability, which means that they can understand our words, but cannot produce them (Coren, 2000). In addition, it is believed that because dogs rely on nonverbal communication in the wild, they are especially receptive to the body language of humans.

Research has suggested that domestic dogs have the unique ability to read human social and communicative behavior, and studies have shown that they are able to do so more accurately than our closest relative, the ape (Hare, 2005). Experts believe that this capability may be a result of convergent evolution between *Canis familiaris* and *Homo sapiens*. Two species that share a common trait may be reason to believe that the two species evolved the trait in a similar process (Hare, 2005). If the domestic dog evolved a communicative skill similar to humans that a chimpanzee did not, this could imply that the skill was developed for adaptive purposes, maybe to interact socially with human beings (Hare, 2005).

Numerous studies have been conducted in which researchers have studied whether or not domestic dogs can be receptive to human visual directives in order to locate a reward, or target. Most studies incorporate the same method, which is hiding a piece of food in one of several containers, then look or point at the correct container to guide the subject to find the hidden reward (Hare, 2005). All studies showed that the

majority of the canine subjects are able to locate the reward by using the humans' gestures as a guide.

Povinelli et al. (1999) did such a study revealing dogs' sensitivity to human gestures in which the canine subjects were able to comprehend and respond accordingly to various gestures, using them as a guide to find hidden food. Using a two way food choice tasks, the subjects were directed toward the reward by the experimenter's use of four kinds of facial gestures (Bierschwale, Cech & Povienlli, 1999). The gestures used were pointing and gazing at the target, nodding his head directly at the target, turning his head toward the area above the target, and simply glancing at the target (Bierschwale, Cech & Povienlli, 1999). They found that the dogs were most successful at finding the food when the experimenter gazed and directed their head at the target (Bierschwale, Cech & Povienlli, 1999). These results imply that the dogs understood the significance of the head's positioning as a communicative device.

It is important to note that the dogs were only able to use eye and head direction to find the hidden food when the experimenter gazed directly at the object. The dog failed to locate the food when the person gazed at the space above the target, which could suggest that dogs discriminate the human's communicative behaviors from other behaviors (Hare, 2005). Another explanation for the dog's failure to perform when directed by the experimenter's above-target gaze could be that the dog recognized the gaze into empty space as a sign of inattention (Miklosi et al, 2001). However, Miklosi et al. (2001) concluded that with substantial training, dogs are able to use the head-turn as a guide to find a reward (Miklosi & Soproni, 2001).

The performance of the dog in reading the gestures of the humans was comparable to that of a two year old human (Miklosi & Soproni, 2001). They even performed better than a chimpanzee, which is though to be the most intelligent animal next to humans (Miklosi & Soproni, 2001). Because chimpanzees are our closest relative genetically, it would seem likely that it would have the highest rate of performance after a human. Surprisingly, the results show that the chimpanzees show little proficiency in finding the hidden object by means of the human's directives (Hare, 2005).

It should be noted that the higher performance of the children and dogs in comparison to chimpanzees may be attributed to the extensive amount of time they spend with humans on a day to day basis (Miklosi & Soproni, 2001). Long standing social bonds with humans may have caused dogs to become more sensitive to human communicative gestures (Miklosi & Soproni, 2001). Therefore, it is likely that a chimp that has been raised among humans would also develop sensitivity toward comprehension of human gestures (Miklosi & Soproni, 2001). However, the domestic dog was able to use the directives and find the rewards with ease from the very first trial, which suggests that they possessed the necessary skills to read the communicative gestures before the experiment began (Hare, 2005).

The results of all the aforementioned studies support my belief that it is possible to give direction to a dog nonverbally. But these results do not reveal anything about whether or not the dog can comprehend the human's mental state or intention. In other words, although I may be able to direct a dog to pick up a pencil by gazing at the pencil, how do I know that he understands that I want him to bring it back to me? And more importantly, how does he know to do this every single time? Further research on the

cognitive capacities is needed to conclude if the dog is reading our body language or if they actually understand our needs and wants.

In interacting with any working dog, it is important to recognize the interaction itself as a process. The dog is expected to attend to the message its handler sends, and the handler or trainer must, in turn, “read” the dog, or interpret the message he is sending and respond accordingly, as explained by Ashford and Cox (1998).

Dogs are extremely intuitive to body language, and a lot can be said if the message is sent the right way. For example, when trying to avoid conflict with a dog, a person must look away and cock his head (McConnell, 2002). This signifies to a dog that you are relaxed and are not a threat.

If it is in a dog’s nature to communicate through body language, it seems logical to use that ability to our advantage when dealing with severely immobile recipients. If it possible to teach a dog to rely solely on gestures and eye movements, then a service dog could potentially be taught to do the same in order to work for their disabled owner. If a person is in desperate need of a service dog, but is so debilitated that they cannot move from their seat, I believe it is possible for them to tell the dog what they need the dog to do with a simple movement of the face or eyes.

The Role of Brain Mechanisms

Some researchers believe that the limbic system in canines have a significant role in their decision making process, as it does in humans. A major debate surrounding intelligence is whether or not animals have a conscious. Rene Descartes said that “No

animals other than humans have consciousness, real intelligence, or any sort of higher mental abilities” (Coren, 2000). Of course, many pet owners and animal lovers would wholeheartedly disagree with this statement, and even respected scholars and researchers have argued with this idea. Aristotle and Darwin both agreed that humans and animals differ only in the degree to which their mental abilities express themselves rather than in the actual nature of those mental processes (Coren, 2000).

Whether or not animals have emotions is a hot topic of debate among social scientists and biologists alike. While almost any pet-owner can attest to having sensed that his or her pet was “happy to see them” or that their animals feelings were hurt, these types of assumptions are ridden with anthropomorphosis. We are only able to label emotions whose meaning is derived from our language, and we attribute human emotions to animals because they are emotions that we are familiar with and that we can empathize with (Fellous, 2004). However, animal’s behaviors almost always have an evolutionary purpose, and no behavior is elicited without a specific reason, usually for survival (Coren, 1994). So, while most people perceive the wag of a dog’s tail as a sign of his emotional state, its underlying purpose is more deeply rooted in instincts and evolution (Coren, 1994). Dogs do not wag their tail simply because they are happy but instead to communicate to others a variety of messages.

Although the root of certain animal behaviors may not coincide with those of humans, there is scientific reason to believe that animals possess the ability to experience emotions, just maybe not in the same way as humans do. It has been found that when non-human primates are shown emotionally charged videos, they elicit brain activity patterns similar to those in humans (Hopkins & Parr, 2000). Experimenters found

patterns of physiological changes related to emotion in the chimpanzee brain that mirrored those in a human brain (Hopkins & Parr, 2000), suggesting that apes and humans may process emotion in a similar manner. In reference to the comparison of brain functioning of animals and humans, Paul MacLean (1990) suggests that if brain tissues found in a variety of species correspond in connections and construction it is not unlikely that they function in similar ways between species.

It was Darwin's belief that because animals have similar expressions, behaviors and brain structures to those of humans, there is a strong likelihood that they do experience emotions (Fellous, 2004). Neurologist Paul MacLean developed the concept of the triune brain, a theory that has been widely accepted within the field. This is the idea that all mammals have essentially three types of brains in one, each of which is anatomically different but interconnected (MacLean, 1990). These brains layer on top of one another, and are called the reptilian, the paleo-mammalian and the neo-mammalian brains, correspondingly (MacLean, 1990). The paleo-mammalian brain is home to the limbic system, which is the source of all emotions (MacLean, 1990). If this structure is found in all mammals, then the capacity to develop more complex cognitive functions lies within all mammals.

Training Service Dogs

Training a service dog is much more complex than training a pet dog to do "tricks". Rather than relying solely on associations and conditioning, Canine Assistants expects their dogs to think about what they are doing, a process known to the

organization as “brain training”. The dogs are initially trained to perform behaviors on cue by relying first on their natural ability to figure out what makes for a successful “hunt” or positive result. Later, as the relationship develops between dog and trainer, behavior performance on cue becomes increasingly motivated by the dog’s hope for a reward and his desire to please his “pack leader” and to work well within the “pack”.

The animals’ instincts can be very instrumental in the training process, arguably one of the strongest mechanisms involved in the training process. Personal experience with the subject of this research has shown me that Labrador Retrievers were born to retrieve. It is in their genes and in their blood. Labs were originally used by hunters to retrieve birds that the hunter had shot. The dogs were trained to use a soft mouth to carry the kill, so as not to puncture the animal.

I have found that the subject is very motivated to retrieve. One of the first commands Kaya learned was the command for retrieving an object, which is “get it.” In training sessions, she expresses an obvious affinity for retrieving items that are placed or dropped and she now automatically retrieves any item I drop, regardless of whether I ask her to with a command or not. I believe her affinity for retrieving objects for me is largely due to the behaviors of her ancestors.

Another mechanism that is vital to the training process is operant conditioning. Reinforcement, shaping, reinforcement schedules, and discrimination all play key roles in service dog training. Reinforcement is the basis of any dog training. Whether the behavior appears on its own or through the trainer’s guidance, reinforcing the desired behavior is an effective way to ensure the behaviors’ emergence in the future.

Positive reinforcement involves adding something to the situation that strengthens the behavior (Skinner, 2006). Positive reinforcement can come in the form of food, vocal expressions and affection. It may be argued that with certain dogs, the work itself can act as the positive reinforcement. For dogs that are driven to work and enjoy having a task to complete, the mental stimulation of the behavior is enough in itself to strengthen the behavior.

Schedules of reinforcement play an important role in maintaining the behavior. When beginning the training, it is important to consistently reward the desired behavior to make it clear to the animal what it is you wish for it to do. As time passes and the dog becomes more familiar with the commands, the reward can be used more intermittently, such as in a variable ratio time schedule of reinforcement. With this schedule, the reward is not given after each successful completion of the desired behavior but is instead given sporadically and unpredictably (Skinner, 2006). This is to ensure that the dog does not expect the reward every time he elicits the behavior, and therefore does not depend on the reward in order to complete the behavior. In other words, if the dog does not know when the reward is coming, the belief is that he will consistently perform the behavior in hopes that the next time he will be rewarded. This is the method I used in my training and I have found it to be effective in encouraging the subject to perform successfully on a consistent basis.

Shaping is done by reinforcing successive approximations of the behavior into the desired series of events (Skinner, 2006). If the dog displays approximations toward accomplishing a desired behavior, rewarding his progress can encourage him to continue in that direction. The more complex commands rely heavily on shaping in order to

establish the relationship between the various components of the command (Skinner, 2006).

Various service dog organizations have different ways of training their dogs. Canine Assistants relies on the use of continuous and intermittent reinforcers. Dog treats, peanut butter, and easy cheese are used as continuous reinforcers by rewarding every success with a treat. Once the command is learned, the reward is given only occasionally, and thus encourages the dog to retain the motivation to work. The use of intermittent reinforcement assists in “brain training” process. The dog must learn to perform a command without relying on the reward, because a reward may not always be readily available. The dog must always be willing to work, and cannot rely on food. For many of the dogs, the actual work is a reward in itself.

At Canine Assistants, trainers use methods outlined in the “SMART” dog training program to ensure the most efficient and effective training process. “SMART” is an acronym that stands for shaping, modeling, association training, reflex training and targeting. Shaping is guiding or shaping the dogs behavior into desirable patterns through the use of rewards and eliminating undesirable patterns through reprimand. Modeling entails physically moving or placing the dog into the desired position, then rewarding him when he is in the proper place. The command “sit” is often taught this way by placing light pressure on the dog’s rear end, forcing him to sit his bottom on the ground. Association training requires catching the dog in the act of performing the desired behavior, rather than actively initiating the behavior. Once the dog completes the behavior, a vocal command is introduced to establish an association between the action and the word. Trained service dogs then develop an enhanced ability to make those

associations with few repetitions. “Going Potty” is a command that is most commonly associated with this method of training. When the dog is caught in the act of relieving himself, the trainer will reward him by saying “good, go potty!” to get him to associate the behavior with the command. Reflex training relies on the trainer applying an appropriate and effective technique to cause a resulting reflex in the dog. When the reflex is executed, a vocal command is given to create the association between word and action. One command that uses this technique is “shake” which involves the trainer holding a treat to either side of the dog’s head. When the dog turns his head to the side to smell the treat, he instinctively raises the paw that is opposite to the side of the head being turned. The trainer then grasps the paw and tells the dog “good, shake!” Targeting is one of the essential ways that service dogs are trained to learn the commands. This is the act of luring the dog into a physical response or posture through the use of motion, sound or smell. Clapping or whistling for a dog to come is a commonly used example of targeting. Each service dog command is most effectively taught using one of these techniques; however all of the methods rely on reinforcement and consistency in order to be effective.

It is very important for service dog trainers to develop a strong bond with the dog he or she is training. In order for the dog to trust the trainer, he must first show the dog that he is a worthy leader. The trainer must figure out what captures and holds the dog’s attention, and what it is that he is willing to work for. He can then use that to his advantage when rewarding the dog for a job well done.

When giving a service dog a command, organization of the training process is crucial. The timing, consistency and clarity of the commands are of the utmost

importance. Another major element in the training process is to understand the dog's motivations, instincts and language. A trainer must provide consistent cues and reinforcement in order for the dog to understand what is required of him. Without these elements, it is likely the dog will be confused and will lack the motivation and confidence needed to complete the task.

One huge difference between training a dog to perform tricks and training a service dog is that the service dog will have to be able to work and perform at any time in any situation or environment. This can be challenging because dogs cannot make connections between things the way humans can. The neocortex is where the brain makes associations and connections between objects, actions and events (Grandin, 2005). This part of the brain is noticeably larger in humans and primates than it is in other animals (Grandin, 2005). This is one reason why humans are able to make generalizations between situations, and animals are not (Grandin, 2005). Despite this anatomical barrier, the service dogs must learn to generalize from the training environment to any and every other environment that his disabled owner may encounter. In many cases, the dog is like an extension of the owner's body, so the owner must be able to rely on his dog at any time and place.

To ensure that the dog is accustomed to performing in any situation, volunteers at Canine Assistants take all dogs in training on "outings" each week. This entails that the dog accompany a volunteer into a public facility to practice working outside the training center. The dogs are exposed to loud noises, strange objects, and people of all ethnicities so that nothing comes as a surprise once the dog is out in public with his owner.

Problems with Current Training Methodology

One major problem with the use of service dogs becomes salient when observing the most severely disabled recipients. Current training methods rely on confidence in both voice and body language. This includes using a commanding tone of voice and a strong, upright, confident posture. Many disabilities, however, make these feats impossible due to physical constraints. For those who suffer from paralysis, seizure disorders and muscular dystrophies it can be difficult or impossible to move or gesture (Kriger, 2006). Even the process of vocalizing the commands can be unfeasible for some recipients, as muscle weakness can extend to the throat and tongue, making speech difficult or impossible (Kriger, 2006). When a recipient faces these physical constraints, communication with the dog is extremely limited. Since the dogs are trained to respond to gestures and vocal commands, the person has no choice but to rely on a third party such as a parent or caregiver to give the command to the service dog. Although the dog will still perform the command effectively when the third party gives the command, the bond that is formed between owner and service dog through the direct use of commands is eliminated.

It is my belief that it may be possible for recipients to communicate their needs to service dog nonverbally through the use of eye movements, subtle facial movements, and minor sounds. If a dog possesses the innate ability to read the body language of other dogs, I believe it is possible for them to perceive a human's nonverbal communicative signals. Therefore, speaking and moving may not be necessary for a recipient to give his dog a command.

My Research

The subject of this research is a two year old black Labrador retriever mix named Kaya. She was attained in Alpharetta, GA at an adoption fair in April 2006. Jennifer Arnold, the founder and director of Canine Assistants, assisted me in selecting a suitable dog for the research. Ms. Arnold has many years experience in assessing shelter dogs for their suitability as service dogs, and is an expert in dog behavior. After spending a few minutes with Kaya and evaluating her behavior, responsiveness and personality, Ms. Arnold deemed her as an appropriate subject for this study.

The goal of the study is to train Kaya to respond to all of the service dog commands when they are given nonverbally. My training methodology is to teach her each command as a trainer normally would, using words and gestures. As she becomes familiar with the command, I gradually decrease the use of words and progress to the use of only moderate motions. Then, we advance to her responsiveness to the use of minimal motion and eventually eliminate all body motion and rely solely on facial cues, eye movements, or sounds. To get Kaya accustomed to looking at my face, I rely heavily on the command of “watch me”. This informs her that she will need to look at my face in order to learn what I expect her to do.

For each command, I have trained Kaya the same way Canine Assistants would, by using the “SMART” technique. The difference is that for each vocal command, I match to it a physical gesture instead of relying on solely the use of my voice to give the

command. Every command is partnered with a nonverbal cue, whether it is a slight nod of the head, a minor facial movement, a small sound or a glance or stare (Table 1). In its earliest stage, the command is partnered with a vocal directive and a gesture, usually a hand signal or a body or facial movement. Once the dog is familiar with the movement associated with the command, the use of the voice is gradually mitigated and the command is associated only with a movement.

Command	Application	Nonverbal Cue
Sit	Tells the dog to put its rear on the ground	Glance at the ground
Down	Requires that the dog lower its entire body to the ground	Stare at the ground for 3-4 sec.
Up	Tells the dog to put its front paws on a designated item	Glance at the object with a slight nod of the head
Get it	Instructs the dog to take hold of an item with its teeth	A look at the item
Lap	Instructs the dog to put its front paws on your lap	A small lean back in the chair
Shake	Tells a sitting dog to offer its paw in greeting	Extend hand toward dog
Back	Instructs dog to step backwards as far as directed	Nod of head until dog reaches desired spot
Speak	Dog is to bark on command	Raise of eyebrows
Visit	Instructs dog to rest its head on your lap	Look at your lap

Table 1 Examples of some service dog commands and corresponding nonverbal cues

For example, the simplest command for Kaya is “sit” which is conveyed by a quick glance at the ground. To tell her to “lay” I stare at the ground for a few seconds longer. After enough experience, she is able to discriminate between sit and lay by judging the amount of time I am looking at the ground.

Some of the commands rely on the user’s ability to move his head. To get Kaya to “back up” involves a jerking, repeated nod of my head upwards. Similarly, the

command “jump” involves a jerking nod of the head in a sideways manner. For a person who cannot move his or her head in such a manner, an alternative cue would have to be developed.

For many of the commands, a glance in the right direction is all she needs. Because she has grown accustomed to studying my facial movements for guidance, she has learned to follow my gaze to figure out what needs to be done. If I am looking at the door, which has a handkerchief tied on it, she knows that she is expected to open it. When I drop my keys, all I need to do is look at them, look at her, and she will retrieve them for me.

If each command is matched with a corresponding eye or facial movement, even the most severely disabled will be able to convey a command to his or her service dog with a simple look. For them, I believe this could be a liberating revelation. For a person who has no control over or use of their body whatsoever, I can only imagine how it would feel for them to be able to use what little movements they have to their advantage. They would finally be able to use what mobility they have as a tool and as a way of communicating to a being who truly understands what they want or need.

Thus far, Kaya is responsive to approximately thirty five nonverbal commands and approximately sixty verbal commands. The goal is to train her to respond to all eighty service dog commands nonverbally. If this feat is accomplished, this training methodology could potentially be put to use at Canine Assistance and possibly other service dog organizations around the country. The goal is to distribute a template of nonverbal cues to various service dog organizations to be used industry-wide. I am hoping that this research will improve communication between existing and future

service dog teams. For the service dog owners who are so severely disabled that they are unable to move, this project could provide them with hope that they may someday communicate with their dogs. I believe that with more time and research, all service dog owners will be able to communicate with their dogs, no matter how severe or debilitating their disability. In addition, I hope that this template can allow immobile recipients to rely less on their caregivers, thus strengthening the bond between recipient and service dog. From my experience, there has been little to no research or studies on this particular subject, and it is my hope that this research can enhance our knowledge of canine communication.

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