

SOCIAL FAMILIARITY AS A PREDICTOR OF OBSERVATIONAL
LEARNING IN THE DOMESTIC DOG
(*CANIS FAMILIARIS*)

by

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ABSTRACT

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Experiments utilizing observational learning in dogs are becoming more frequent, but few investigate the familiarity relationship between model and observer. Two experiments were designed to explore the familiarity relationship between conspecifics and heterospecifics. The first experiment utilized a heterospecific-conspecific training dynamic and the conditions of the experiment varied how familiar (familiar or unfamiliar) observing dogs were to the heterospecific and conspecific models. Forty-eight dogs were assigned to four conditions varying in familiarity of the

human demonstrator and model dog. A separate control condition (n=12) were trained with operant techniques and did not receive demonstration or familiarity variables. Analysis of data concludes that effects of learning were not due to observational learning, rather, dogs were learning more efficiently due to familiarity relationships. More in-depth analysis reveals that dogs only learned due to the familiarity relationship with the human demonstrator. The conspecific demonstrator did not influence performance according to the analysis of variance. The second experiment replicated apparatus from another experiment (Pongracz, Miklosi, Kubinyi, Gurobi, Topal, Csyani, 2001) to determine if demonstration by a socially familiar or unfamiliar demonstrator (human or conspecific) influenced learning rates in a V-shaped fence task (n=48). Dogs did not show learning rates that differed from the control condition (n=12). Two tasks were given where dogs had a more difficult task (n=35) or an easier task (n=30). While significant task differences were exhibited, regression analysis reveals that these are not due to familiarity effects. Dogs did appear to utilize observational learning in the more difficult task, but individual learning took precedence in the easier task.

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CHAPTER 1

INTRODUCTION

1.1 Background

Then the Woman picked up a roasted mutton-bone and threw to Wild Dog, and said, “Wild Thing out of Wild Woods, taste and try.” Wild Dog gnawed the bone, and it was more delicious than anything he had ever tasted, and he said, “O my Enemy and Wife of my Enemy, give me another.”

The Woman said, “Wild Thing out of the Wild Woods, help my Man to hunt through the day and guard this Cave at night, and I will give you as many roast bones as you need...”

Wild Dog crawled into the Cave and laid his head on the Woman’s lap, and said, “O my Friend and Wife of my Friend, I will help your Man to hunt through the day, and at night I will guard your Cave.” –Rudyard Kipling, *Just So Stories* (1912)

The domestic dog (*Canis familiaris*) is considered to be “man’s best friend” and has reportedly coexisted with modern humans for the last 100,000 years (Vila, Savolainen, Maldonado, Amorim, Rice, Homecutt, Crandall, Lundeberg, and Wayne, 1997). The proportion of dog-owning homes is considerable and indicates that the human-canine bond may be worthy of investigation. Forty percent of Australian, 38% of American and 34% of British households own at least one dog (BIS Shrapnel Global Marketing Intelligence and Forecasting, 1999, pp.9-15). The Pet Food Institute (1999) has reported that approximately 57.6 million dogs live in American and that 37.8% of all household have at least one dog. This paper will review the literature investigating the

history of the human-canine relationship and if this relationship has an impact on canine learning.

The human-canine relationship can appear to be complex and there are many dogs that are abused, neglected, or abandoned. However, in many cases, pet owners treat their dogs as members of their family, lavishing their dogs with toys, beds, grooming, and medical care. Many pet owners report feeling attachment towards their pets and often feel attachment from their pet. Research indicates that domestic dogs are known for forming strong attachments with their owner (Topal, Miklosi, Csanyi, and Doka, 1998) and it is even reported that dogs often rely on the visual cues of humans (Miklosi, Polgardi, Topal, and Csanyi, 1998) and make use of these cues. When dogs that are fully socialized with humans are given the choice between interacting with another dog and a human, dogs often prefer social interaction and proximity with the human (Tuber, Sanders, Hennessy, and Miller, 1996). This study will attempt to test these claims regarding human-canine social attachment. If dogs prefer social interaction with the human, perhaps dogs can learn from humans more efficiently than from their own conspecifics.

Social learning among dogs is not a subject that has been investigated frequently (Pongracz, et. al., 2001), but there are reports that naïve puppies may learn via observation from an experienced puppy to solve simple food manipulation tasks (Adler and Adler 1977). Many pet owners have had to train the family dog and typically use traditional operant training methods. These methods can be time consuming and costly if using a professional dog trainer. According to McKinley and Young (2003), dogs are

social animals and should be predisposed to learn from social stimuli. We will investigate if observational learning could be an alternative training method for dogs. In addition, we will review literature investigating dogs' strong bonds with humans (Tuber et.al, 1996; Gent and Mellgren, 2005) and we will utilize these findings to determine if dogs can learn directly from a heterospecific.

This study will expand on the work of Pongracz et al. (2003) and Gent and Mellgren (2005) to investigate the human-canine relationship. These studies indicate that dogs are able to learn by watching humans. We will investigate if dogs learn more efficiently by observing humans than by observing conspecifics. As well, we will investigate the human-canine familiarity relationship and the canine-canine familiarity relationship to determine the influence of familiarity of subject and model in a social learning situation.

1.2 Evolution of the Human-Canine Relationship

1.2.1 Domestication of the Wolf

Dogs belong to the family Canidae which also includes wolves, dogs, jackals, and foxes. It is believed that dogs are a new species that formed from domesticated wolves (Schwartz, 1997). It is suggested that domestication occurred when wolves began living in human settlements over 12,000 years ago; this led to a separate species of domesticated wolves, now known as dogs. Domestication involves a cultural component, such as humans breeding animals that they own, and a biological component, where the animal becomes different in form and behavior from its ancestor. An evolutionary approach to domestication posits that dogs were able to survive and

have greater reproductive success when living with humans, and so a coevolutionary relationship between wolves and humans led to the creation of the domesticated dog. Dogs are believed to have originated from wolves, but dogs are not simply domesticated wolves – there are many physiological and morphological characteristics that are quite different. Domestic dogs engage in behaviors that are not found in wolves such as barking, group howlings, face licking, secondary social bonding, and trainability. Although dogs can interbreed with wolves, their sexual behavior is different. Dogs reach sexual maturity around 6-9 months compared to wolves at 2 years. As well, female dogs have a biannual estrus whereas female wolves have an annual estrus. Male dogs have constant spermatogenesis while male wolves have seasonal spermatogenesis (Lindsay, 2000).

1.2.2 Paedomorphosis in the Domestic Dog

Domestic dogs also have morphological differences from wolves known as paedomorphosis which is the retention of perpetual puppy-like behavior such as puppylike and other characteristics into adulthood (Lindsay, 2000). Fox (1967) reports that adult dogs behave and look like a juvenile wolf (soft coat, curled tail, skinfolds, floppy ears, and short legs). It is possible to domesticate a wolf, but the end product still differs from the domestic dog in both form and behavior. For example, wolves never have the full range of social responsiveness to humans. The behavior of the adult dogs is seen as more juvenile than the behavior of the domesticated adult wolf. It has been suggested that domestic dogs have been made in the image of the idealized infant, a creature that needs attention, protection, and nutrition from their caretakers. These

needs facilitate a strong affectional bond between dog and human (Frank and Frank, 1982).

The important effects of domestication can be seen in the research of Balyaev (1979) who conducted a long-term genetic project which selectively bred silver foxes for tameness. The breeding program carefully selected foxes that were neither fearful nor aggressive and who exhibited a tame response to human contact and handling. Balyaev found that after fewer than 20 generations, foxes began to have morphological and behavioral changes that differed in comparison to randomly bred silver foxes. These “tame” foxes were not only tolerant of human contact, they sought human contact and appeared to enjoy the human interaction. Balyaev also reported that tame foxes engaged in “doglike” behaviors such as hand and face licking, jumping up, tail wagging, and barking. Morphologically, silver foxes had a more paedomorphic and doglike appearance such as lop ears, turned-up tail, piebald pelage (white spotting seen in domesticated species indicating tameness).

1.2.3 Historic Importance of Domestic Dogs

Despite our evolutionary past with the dog, not all humans have dogs as pets. Many researchers have dismissed this relationship to be something more utilitarian rather than affection-based (Serpell, 1987; Tuan, 1984). It has been only recently that the human-canine relationship is beginning to gain scientific focus, which is intriguing considering the poignant portrayal of the human-canine relationship from Konrad Lorenz in 1965. Dogs were not only kept as pets by our ancestors, they were also often highly regarded (Schwartz, 1997). Our ancestors often buried their dogs and also had

many myths to accompany the importance of dogs in the afterlife. Sirius, the Dog Star, lies on the eastern horizon before sunrise during the “dog days” of August in the Northern Hemisphere. It is believed by the early native Americans that this star is connected to the opening of the gates of the dead. Stories such as this illuminate that humans have had affection for dogs for thousands of years. In addition, dogs have been buried in North America, Mesoamerica, Panama, and South America. Some of the most moving excavations revealed that humans were sometimes buried with their dogs, further indicating the importance of canines in the early Americas (Schwartz, 1997)

1.2.4 Social Cognition in Dogs

Studies of social cognition have been mainly interested in the evolution of human cognition, resulting in much of the research being conducted on our closest genetic relatives, apes and monkeys (Miklosi, Topal, and Csanyi, 2004). So much attention was focused on ape and monkey cognition and little attention was given to other species that this movement was termed *chimpanzism* (Beck, 1982). Today, *chimpanzism* is diminishing and focus on social cognition in other species is increasing, even more recently is a new look at dog cognition. In the past, dogs were considered an ‘uninteresting’ species since they were domesticated animals and were often viewed as a control species from ‘real’ wild canid species like the wolf (*Canis lupus*), jackal (*Canis aureus*), and coyote (*Canis latrans*) (Miklosi et.al, 2004). There is a genuine plea by some researchers of dog cognition (Csanyi, 2005; Miklosi et. al, 2004) to acknowledge that dogs are not some “artificial animal” that is a product of human desire, but rather an artifact of the parallel evolution of human and dog.

It has been argued (Buss & Kenrick, 1998) that social psychology is central in the emergence of evolutionary psychology. Our human ancestors had adaptive problems that were social in nature such as forming cooperative dyadic alliances, negotiating complex social hierarchies, forming large coalitions, socializing children, and selecting, attracting, and maintaining mates (Buss and Kenrick, 1998). It seems as though dogs have evolved and adapted to their role as human companions because they possess sophisticated social skills not seen in other domesticated beasts (Pennisi, 2003). It has been argued (Csanyi, 2005) that at one time wolves were the reigning predators in the Northern Hemisphere who were both social and intelligent. Around 130,000 – 150,000 years ago, humans of African origin settled in the Northern Hemisphere and were not only larger predators, but they were more social and intelligent than the native wolves. Somehow, the evolution of the human-canine relationship had to depend on some mutual advantages. For humans, advantages of keeping “tame” wolves include clean-up of unwanted animal carcasses and waste, their pelts were of great use, and humans had a willingness to sleep with tame wolves on cold nights. Examples of this behavior are seen in modern times where Aborigines will use dingoes as living blankets for warmth (Gould, 1970)). Of course, wolves also had a benefit by living in the human environment since they were offered plenty of food, a comfortable place to live, and through the process of domestication, these “tame wolves” had made a new protector and friend (Csanyi, 2005)

Humphrey (1976) argued that the primary driving forces in the evolution of human intelligence were the challenges in the social environment and the interaction

with individuals of the same species. This argument can be extended to the evolution of animal cognition (Cooper et al. 2003). It is argued that the social environment has more challenges than the physical environment and highly social animals are likely to evolved mental abilities that help them to predict and exploit the actions of others. It has been reported that after primates, dogs are the most commonly reported species to engage in apparent tactical deception (Byrne & Whiten, 1988). There are three reasons why dogs might possess the capacity for social cognitive skills (Cooper et. al 2003). First, dogs (*Canis familiaris*) are believed to originate from wolves (*Canis lupus*), and wolves form stable social bonds and engage in cooperative behavior such as hunting. Second, dogs have undergone two selective processes in human societies, domestication and breed diversification, they believe that these processes may have involved selection (intentionally or unintentionally) for social intelligence in dogs. Lastly, since dogs live with humans in human society, the human social environment may aid in developing social skills in dogs. (Cooper et. al, 2003)

The arguments toward canine social cognition (Miklosi et. al, 2004) posit that since dogs have adapted to the human niche, they should have developed novel social skills. This relationship may have led to novel abilities to form attachment, to adopt a communication system with humans, and to recognize the human species as a source of social information (interspecific social learning). They also argue that the study of dogs could be a useful alternative to the study of human traits in the view of evolutionary processes. In the past, research has focused on our most genetically similar relatives like the great apes (remember chimpantrism), however, analogues to human behavior

through our closest social “friend,” the dog, are beginning to gain scientific focus. New movements in the study of animal behavior (Povinelli & Giambrone, 1999) posit that we should not argue by homology through the behavior of chimpanzees, that is, arguing that behavioral mechanisms underlying similar behavior traits are the same in the two species (chimpanzees and humans) simply because they are close genetically. Some argue (Csyani, 2005) that it is not by mere coincidence that the domestication of dogs and the appearance of Homo sapiens occurred around 130,000 to 150,000 years ago. Humans must have gained a competitive advantage by accepting tame wolves into their society, thus revealing that human’s genetic make-up may have changed through domestication as well. In addition, dogs are prepared (in an evolutionary sense) to live in the human social environment. They are enculturated as part of their natural environment. This is quite different for chimpanzees and other apes that are not prepared to live with humans and have to be “enculturated,” or individually socialized with humans in the human environment, in order to be researched. (Miklosi et al., 2004). It seems plausible that the human need for dogs in the past has modified the human behavioral framework such that there is an innate “need” to have contact with a dog. Arguing for the important stages of human evolution by homology may ignore the behavioral mechanisms that appeared in response to new evolutionary pressures (Csyani, 2005).

1.3 Human-Canine Familiarity

With over 50 million companion dogs in the United States (Marston and Bennett, 2003), dogs are one of the most popular pets in the United States. The human-

canine relationship is reported to have been in existence for at least 12,000 years (Clutton-Brock, 1996) and it is reported (Vila et al. 1997) that the relationship goes back 100,000 years. Many pet owners describe their dogs in terms of acceptance/trust, love/friendship and intelligence/obedience, or as their companion, protector confidant and playmate (Salmon & Salmon 1983).

While the evidence suggests humans are close to their dogs, research is indicating that dogs are close to their humans. There is a report that full socialized dogs often prefer social interaction and proximity with the human over social interaction with a conspecific (Tuber et.al., 1996). Data from domestic dogs that were separated from their home environment indicated that glucocorticoid levels (a measure of stress reactivity) rose significantly when dogs were placed in a novel situation apart from any conspecifics or humans. Their glucocorticoid levels were significantly lower when they entered a novel situation with a conspecific and even lower when their caretaker was present (Tuber et al., 1996). In addition, there have been many independent studies (Hare, Call, & Tomasello, 1998; Hare & Tomasello, 1999; McKinley & Sambrook, 2000; Miklosi, Polgardi, Topal, & Csanyi, 1998; Soproni, Miklosi, Topal, & Csanyi, 2001) that report that dogs are exceptionally good at responding to human pointing gestures whereby a dog will find food or a toy at place that is indicated by a human.

Recent genetic analysis indicates that dogs have been under human domestication for 100,000 years--longer than any other domestic species (Vila et al., 1997). Dogs have an intense social interaction with humans and it is conceivable that dogs may have evolved some special predisposition for interacting with and

communicating with humans (Lorenz, 1964; Miklosi, Polgaardi, Topal, &Csanyi, 1998; Mitchell & Thompson, 1986). Research also suggests that dogs are actually attached to their owners (Topal, Miklosi, Csanyi, Doka,1998). Dogs have been found to perform better when solving novel problems in the presence of their owners than in the presence of strangers or when isolated. This finding was present even when the owners had no actual knowledge of the task to be solved. During these tests the dogs were reported to frequently glance toward the owner as if it was monitoring the behavior or even soliciting help with the task. This research concludes that the formation of strong social bonds is important for the behavioral development of the dog (Topal et al. 1998). The social bond between humans and canines result in a form of imprinting which can be seen both in situations where dogs are protective of family members, and in situations where dogs greet familiar people with enthusiasm (Cooper et al, 2003).

Studies have also found that dogs may be using an alternative strategy to solve problems by waiting for their owner to solve problems for them. Highly socialized young wolves and dogs were put in a similar rope pulling situation. Each species was trained to pull on a rope with a piece of meat attached at its end. The acquisition of this rope did not reveal species differences, however, after the rope was pulled, it was then fastened to the bars of the cage and the animals were allowed to try to get the meat. The dogs began to look at the human behind them much sooner and longer than the wolves. Since both species were reared in similar social environments, it s appears that the tendency to look at human faces could be genetic (Miklosi et al., 2003).

Dogs have also been found to be sensitive to the attentional states of humans, particularly with the role of the eyes and body orientation during social interactions (Call, Brauer, Kaminski, and Tomasello 2003). Twelve dogs were given a series of trials where they were forbidden to take a piece of food. The human looked at the dog throughout the trials in the control condition. In the other trials, the human left the room, turned her back, engaged in a distracting activity, or closed her eyes. The dogs' behavior was different in most of the trials where the human did not watch them, compared to when she did. Behaviors that differed when the human looked at the dogs included retrieving less food, approaching in a more indirect way, and sitting down more often than in the other conditions. The dogs appeared to know that the human could see them if she was looking at them and that she could not see them if she was out of the room, her back was turned, eyes were closed, or if she was distracted.

Attachment behavior in dogs has also been investigated through a modified version of Ainsworth's Strange Situation Test (Gacsi, Topal, Miklosi, Doka, and Csanyi, 2001). Dogs living in rescue centers were found to have a great need for human social contact and this need was found to lead to a rapid attachment bond to a potential attachment figure. Only three short handling sessions by a human was sufficient to evoke attachment behavior in rescue dogs. It was also noted in an observational learning experiment (Gent and Mellgren, 2005) that the reward of human praise was at least as effective as food based rewards.

1.4 Social Learning

1.4.1 History of Social Learning

The first discussions (Galef, 1988) of social learning begin with debates among early scientists in the late 19th century discussing if animals are capable of learning by imitation. Charles Darwin (1871) believed that there was difficulty in trapping wild animals because they have learned by seeing their conspecifics trapped or poisoned while Wallace (1870) noted how young birds learn how to build a nest by viewing their parents. Darwin and Wallace (Galef, 1988) differed regarding whether to employ the principles of evolution as a way of understanding the human mind. Romanes (1884) believed that imitation in lower animals was evidence of the evolutionary origins of intelligence in man and man's capacity for culture. Morgan (1900) discussed that imitation occurred in two type of either "instinctive" or "reflective". Reflective imitation was defined as "deliberate and intentional imitation...directed to a special end more or less clearly perceived as such" (Morgan, 1900, p. 193). These definitions gave us the concept of "intelligent imitation." Morgan's terms of "instinctive" and "reflective" imitation have more modern terms that are analogues to social facilitation and imitation.

Edward Thorndike (1911) was more cautious about interpreting imitation in animals from anecdotal examples. He was unable to provide experimental evidence that chickens, cats, dogs, or monkeys could "from an act witnessed learn to do an act" (p.79). Thorndike reported that social interaction among conspecifics may increase similar behavior into what he called "pseudo-imitative" acts which are qualitatively

different from true imitation seen in man. In Thorndike's view, imitation should only be used as an explanation after all other alternative explanations had been excluded.

1.4.2 Definitions

Galef (1988) reports that by the twentieth century the terminology of imitation went beyond the nineteenth century vocabulary (imitation, intelligence imitation, reflective imitation, instinctive imitation, and pseudo-imitation) to include true imitation, allelomimetic behavior, mimesis, protoculture, tradition, contagious behavior, social facilitation, local enhancement, matched dependent behavior stimulus enhancement, vicarious conditioning, observational conditioning, copying, modeling, social learning, social transmission, and observational learning. Galef describes this vocabulary through descriptive terms (social learning, social enhancement, and social transmission) meant to describe certain behaviors rather than explain them.

Social learning. Galef groups imitation and observational learning into the descriptive category of social learning. Morgan (1900) used the term imitation as a generic term for all learning in which social interaction increased the probability that a naïve individual would exhibit the demonstrated behavior. Since the term imitation is so generic the term observational learning was suggested by Hall (1963) to avoid the difficulty of using the loaded term of imitation. Social learning was introduced by Box (1984) as a generic term that specifies learning that is influenced socially as opposed to learning that is acquisition without social influence.

Social enhancement. Galef uses the term social enhancement as a generic that refers to all instances of social facilitation and coaction. Social facilitation was term defined by

Clayton (1978) to refer to the increased frequency or intensity of an animal's response when in the presence of others engaged in the same behavior at the same time. Clayton makes the term distinctive because social facilitation requires that the behavior is already in the animal's repertoire. Galef finds problems with this specific definition because it excludes the increase of frequency or intensity of behaviors based on the simple presence of others. In addition, Clayton's definition of social facilitation includes descriptive and explanatory connotations. Galef suggests social enhancement as a term to encompass all instances where the "simple presence of others, presence of behaving others, or presence of residual cues emitted by other could each, at least in principle, enhance performance of responses already in an individual's repertoire" (p. 13).

Social transmission. This is the last descriptive term and Galef uses this to include protoculture, subculture, preculture, and tradition. These are instances where social interactions facilitate the spread of characteristic behaviors of an individual through a population.

Galef also discusses explanatory terms are similar to Thorndike's "pseudo-imitative" behavior that can produce social learning. Galef finds that explanatory terms are extensive and are often contradictory, vague, and have little use for the phenomena of social learning. While these explanatory terms have failed in the past to provide underlying mechanisms for social learning, they have served as a heuristic for "suggesting experimental approaches to analysis of social learning phenomena" (p. 15) and are worthy of discussion.

Local enhancement. Galef reports that the most frequently used term in the analyses of social learning is Thorpe's (1956, 1963) term of local enhancement. Thorpe defined this term (1963) as "apparent imitation resulting from directing the animal's attention to particular object or to a particular part of the environment" (p. 134). This term is restrictive because it refers only to direct interaction between conspecifics. Galef prefers Spence's (1937) term of stimulus enhancement because it extends the restrictive definition of local enhancement to include all instances when an individual's observation of a demonstrator's behavior leads to an increase in the frequency of the observer's behavior that is directed toward the location or object of the demonstrator's activity.

Social facilitation. Social facilitation is described above as a type of stimulus enhancement, but it has been used as an explanatory model to explain how the simple presence of others has "energizing" effects on one's behavior. Social facilitation may play a role in the processes resulting in social transmission when combined with individual learning (Galef, 1988).

Contagious behavior. Contagious behaviors occur when one individual elicits an instinctive behavior that acts as a releaser for the behavior in others. Examples of contagious behaviors include yawning in humans (Thorpe, 1963) and barking in dogs (Humphrey, 1921). These type of behaviors have been termed instinctive imitation (Morgan, 1900; Washburn, 1908), mimesis (Armstrong, 1951; Verplanck, 1957), allelomimesis (Scott, 1958), imitation (Mower, 1960; Humphrey, 1921) and social

facilitation (Thorpe, 1963). Contagious behaviors are able to produce social enhancement, but are insufficient to produce social learning or social transmission. *Observational conditioning*. Berger (1962) introduced the term vicarious instigation into the social learning literature. Vicarious instigation occurs when an observer elicits an emotional response due to a demonstrator's unconditioned emotional response. Vicarious instigation is not a contagious emotional behavior, rather it is the perception of the unconditioned emotional response that elicits the vicarious behavior. Galef uses the example that a scream does not elicit fear in an observer; it is the perception of the fear of the screamer that leads to fear in the observer. The term observational conditioning (Cook, Mineka, Wolkenstein, and Laitsch, 1985) is preferred by Galef to vicarious instigation because the latter term involves complex inferences that animals are unknown to make.

1.4.3 Observational Learning

Early experiments on observational learning in animals compared the performance of animals allowed to observe a demonstrator performing for an object of food with that of animals never given this opportunity using a nonexposed control (Heyes et al., 1992). If the observing animal learned the response faster or more efficiently than the non observer animal (Zentall et al., 1996), it was concluded that they had observationally learned the demonstrator's behavior.

Observational learning has also been viewed to be a means of facilitating social cohesiveness by maintaining a group 'identity' for conspecifics and as a vehicle for communicating useful information between conspecifics (Davey, 1981). Research also

indicates that observational learning is adaptive and that individual pups can learn a new response without having to undergo lengthy and possibly hazardous periods of trial and error learning (Adler & Adler, 1977). This leads to the benefits of allowing a group of pups to learn from the experience of one of its members. Adler and Adler (1977) believe that much of learning in dogs is acquired through observation of other dogs. Observational learning in dogs often occurs when a number of dogs are kept together, such as before they are separated from their litter. When an animal that has viewed an experienced 'demonstrator' learns the response in question more rapidly than an animal that has viewed a 'naïve' demonstrator (one that is not skilled at carrying out the appropriate response) (Slabbert & Rasa, 1997), then observational learning is said to occur.

Human social learning has been widely investigated (There is evidence that observational learning is widely scattered among species (Byrne & Russon, 1998), but some suggest that only the great apes are capable of learning a behavior by seeing it done (Byrne & Tomasello, 1995). There are many reports of social learning among conspecifics. Sparrows and chaffinches were found to approach a feeding bird more often than a nonfeeding bird. Chicks that were 16-30 hours old were found to peck at the same color grain that a cardboard hen was pecking at (Tuner, 1964). Cronhelm (1970) reported that chicks as young as seven-day-old will observe and perform the behavior of another chick that has had to perform an operantly conditioned response. Hummingbirds have been found to use observational learning when feeding from a novel nectar source (Altshuler & Nunn, 2001).

The literature on social learning has been mixed on whether to allow observing animals to be familiar with the demonstrating animal (Valsecchi, Choleris, Moles, Guo, and Maindardi, 1996; Valsecchi & Galef 1989) or whether familiarity is necessary at all (Galef et. al. 1998).

1.4.4 Observational Learning through a Detour Experiment

Observational learning was demonstrated through two experiments using a detour task (Pongracz et. al (2001). They constructed a V-shaped fence where a target object (food or toy) was placed in the crux of the V or outside the tip of the V. They found that performance rates were better when dogs were inside the crux of the V and detoured around the fence to the target compared to dogs that were outside of the V and detoured inward. Performance did not improve through repeated detours, but did improve when they had a demonstration of the task from a human demonstrator. They found that there was no significant difference between performance rates in dogs using owners and strangers as demonstrators. In addition, this study found that dogs did not copy the exact path, but they did copy the pattern of detour shown by the human.

The interaction between individual experience and social learning in domestic dogs has been investigated in two experiments using detour tests (Pongracz et al., 2003) where an object or food was placed behind a transparent, V-shaped fence. The dogs were able to obtain the reward by going around the fence. In some groups they opened the doors to the fence as an alternative and more efficient way to retrieve the target. In experiment 1, doors were open in trial 1 and then closed during trials 2 and 3. In experiment 1, all dogs retrieved the reward by utilizing the open doors on trial 1, but

their detouring performance was poor after the doors had been closed, if the dogs had to solve the task on their own. The dogs that observed a detouring human demonstrator after the doors had been closed showed improved detouring ability compared with those that did not observe a human demonstrator. In experiment 2, other dogs were first taught to detour the fence with the doors closed after they had observed a detouring human demonstrator, then the doors were open for three trials. The dogs tended to utilize the demonstrated route, by detouring along the fence even if the doors were opened. The findings of this experiment reveal that dogs can use information gained by observing a human demonstrator that may overcome their own preferred solution. This study used the dog's owner as its human demonstrator, thereby not varying familiarity, but holding the variable constant.

In subsequent studies using the V-shaped fence (Pongracz, Miklosi, Vida, Vilmos, and Csanyi, 2005), breed and age of dogs were not found to be variables that affected social learning from a human demonstrator. Breed groups that included ten different breeds of dogs were classified into more general groups of "utility dogs," "shepherd dogs," and "hunting dogs." They found that the ten common dog breeds performed the detour task with similar latencies and they found no differences between the three general groups of utility dogs, shepherd dogs, and hunting dogs. Further, all three classes of these dogs learned equally well when they observed a human demonstrator. The study also found that age was not a significant variable since older dogs learned equally well from the human demonstrator as younger dogs. In this study,

the human demonstrator was the dog's owner, so the variable of familiarity was not manipulated in this experiment.

1.4.5 Observational Learning through Training Commands

Observational learning has also been investigated through dogs observing a human-canine interaction. Gent and Mellgren (2005) trained a shelter dog to respond with the behavior 'sit' using the command "squat" and this model dog performed the behavior while naïve shelter dogs observed. There were four conditions that varied whether the dog was Familiar or Unfamiliar with the model dog and trainer and whether the naïve dog observed the model dog perform the command (Observation or No Observation). Dogs that were Unfamiliar with the model dog and trainer and who received No Observation learned the command the least efficiently; this dynamic is similar to traditional operant training procedures. Dogs that were able to view the model dog (Observation) learned more efficiently than the standard operant procedure. Dogs that received Observation and were Familiar with the trainer and model dog learned the behavior command the most efficiently. The variable of Familiarity was found to be more effective at predicting more rapid learning than Observational learning. The results indicate that the variable of familiarity needs to be considered, at least when investigating dogs. In contrast to Pongracz et al.'s (2005) study, they did find that the breed of dog influenced observational learning ability, but did not find that variables such as gender, color, or size (small, medium, large) affected observational learning ability. They conclude that this method could be used to socialize and

stimulate shelter dogs making their stay in the shelter less stressful and possibly making the dogs more attractive to potential adopters.

1.5 Animal Shelters and Adoption

The human-canine relationship can be quite volatile, appearing to be loving and compassionate for some and abusive and neglectful for others. Approximately 15 million dogs are either turned out as strays or released to animal-welfare agencies by their owners in the United States each year (Moulton, Wright, and Rindy, 1991). Of these 15 million discarded dogs, animal welfare agencies are only able to obtain and place a small percentage of homeless dogs. The stay for a dog in an animal shelter can subject the animal to psychological stressors which include novelty, isolation from any former attachment figures, exposure to intense and unpredictable noise, disruption of familiar routines, and a general loss of control over environmental contingencies. These stressors may contribute to problem behaviors in dogs that are able to find a second home. They are often relinquished from their new home and this makes up about 20% of the population of dogs at shelters. Many dogs are subject to euthanasia, despite the best efforts of the animal shelters (Tuber et al., 1999).

1.5.1 Why are Dogs Relinquished?

Shelter dogs are often reported to have behavior problems including exhibiting unruly or excitable behavior towards people, not being well housebroken, and they have reactions to separation from their owners. However, these problems never seem to get corrected during the animal stay in the shelter. Instead these problems are passed along to a new owner. Also, due to the stressful environment, dogs that arrive at shelter

without any behavior problems will likely acquire one. Many dog owners report that they have disobedient dogs in that they have trouble handling their dogs for routine procedures (Lund et al., 1996; Patronek et al., 1996; Ledger and Baxter, 1997). The Regional Shelter study (Salman et al., 1998) identified 71 reasons for companion animal relinquishment, the most common reasons being accommodation issues, behavior (not aggression) issues and lifestyle issues.

1.5.2 Problems with Shelters

The primary role of animal shelters is to care for distressed and abandoned animals until they are either reclaimed, adopted or euthanized (Marston & Bennett 2003). Many dogs are euthanized every year due to shelters limitations in terms of funding, staffing and space. The dogs that are not euthanized are made available for adoption and are housed in the stressful environment of shelter facilities. Many animal shelters were built many years ago and funding limitations meant that little attention was paid to anything other than physical containment. The shelter environment also exposes animals to various stressors and these stressors generate adaptive physiological and behavioral changes in most mammals. Chronic stress can modify an organism's long-term stress response with a continual prolonged elevation of basal cortisol (Marston & Bennett, 2003).

Some efforts have been investigated as to the time course of the basal cortisol response in dogs admitted to shelters (Marston & Bennett 2003). For most individuals the initial cortisol levels rise significantly for the first 2-3 days, up to almost three times

of pets sampled in the homes of their owner and then these levels gradually decline over time (Tuber et al. 1999).

Stress responses in animal shelters are elicited differently for varying breeds. Stress responses in beagles include urinating when stressed whereas wire-haired terriers tend to show tachycardia (rapid heart rate), hyperpnoea (rapid breathing) and increased salivation. General responses in dogs include responding to stress with increased vocalization and behavioral displays associated with fear and submission. Besides stress, once admitted into a shelter, dogs may extinguish socially acceptable behaviors such as house-training that were well-established prior to their stay in a shelter (Marston & Bennett, 2003).

1.5.3 Adoption Selection Factors

Most shelters use temperament tests to evaluate dogs that are safe and suitable for general adoption, so that they may return to the community. A set of behavioral tests that sought to measure aggression, fear, obedience and separation related behaviors in dogs were found to be twice as effective in predicting problem behavior when compared to staff opinions (Van der Borg et al., 1991). However, behavioral tests are time consuming and reported to take approximately an hour and a half to administer. Temperament tests that are found to be valid and reliable could provide a method of profiling individual dogs in animal shelters and help to facilitate owner-canine matching (Marston & Bennett, 2003).

Potential adopters reported several factors in their adoption decision that relate to a particular dog such as breed, size, coat color, and whether the dog is considered an

'inside dog' or 'outside dog'. Potential adopters reported being attracted to dogs that are in the front of their cage, dogs that are quiet and alert when viewed, and dogs that interact in a friendly manner and are housed in a complex environment (Wells & Hepper 2000). Social interaction with humans has the most significant effect upon adoption selection and even minimal interaction can generate a significant change (Marston & Bennett 2003).

1.5.4 The Importance of Adopting Dogs to Humans

While the human-canine relationship can be unstable and often lead pets to live in animal shelters, many studies have been published supporting the claim that owning a pet can enhance a person's physical and psychological well-being. Pets enhance social interactions among people and this has been suggested to increase or strengthen social networks and thus elevate psychological well-being. Physical health enhancements for pet owners across age and sexes include lower risk for cardiovascular disease, lower levels of plasma triglycerides, lower cholesterol levels and lower systolic blood pressure levels (McNicholas and Collis, 2000). Albert and Bulcroft (1988) conducted a survey and found that pet attachment has been found to be important among divorced, never married, widowed people; childless couples; newlyweds; and empty-nesters. They also found that pet-human bond was highest among dog-owners. The human attachment toward dogs could be because dogs both give and receive affections and have been found to be an emotional substitute when people are alone or in transition. Interestingly, companion animals in the modern urban world make no economic sense and furnish no financial profit, yet owners spend vast amount of time and money on

their pets. Pets must be behaving in ways that let their owners feel needed and this need is 'worth' something to pet owners.

1.5.5 Service Dogs from Animal Shelters

Dogs serve more roles in human society besides being a faithful companion; dogs can also service humans who are physically or mentally challenged or be trained as police dogs, search and rescue dogs, or even work for federal agencies to detect food and drug contraband. The selection of a dog for a particular task is often based on matching a task to a particular breed, but there are also characteristics that need to be found in particular service dogs. The use of service dogs from pounds and animal shelters is quite new in the service dog industry; in the past selective breeding was most often used. The cost of training a service dog is quite high and using a shelter dog reduces costs by eliminating the cost of breeding and the many hours needed for raising a puppy (Weiss & Greenberg, 1997).

Service dogs have also been found to be psychologically beneficial to individuals with disabilities. Service dogs have been found to increase self esteem, internal locus of control, psychological well being, community integration, school and part-time employment attendance and a decreased amount in paid and unpaid assistance with the use of service dogs for individuals with ambulatory problems (Allen & Blascovich, 1996). Individuals with spinal cord injuries who used the assistance of service dogs had a significant increased in mobility and social scores (Zapf, 1998).

1.6 Conclusions

The literature reviewed in this study leads to three major conclusions: (1) the human-canine relationship is important to dogs as well as humans; (2) dogs can learn via observational learning; and (3) shelter dogs are useful subjects for investigation of the human-canine relationship and observational learning. With these three major conclusions in mind, this study will be drawing from the implications and methods of the study by Pongracz et al. (2003) by examining the effect of observational learning through interactions with a heterospecific and the implications of Adler and Adler (1977) regarding the effects of observational learning through interactions with a conspecific. As well, we are expanding on Gent and Mellgren's (2005) method of conspecific and heterospecific learning. This study also draws support from various reports that social interactions with humans are important to dogs (Marston & Bennett, 2003, Tuber et al., 1996).

In this study, we are manipulating the familiarity of the subject dogs with the human experimenter and the model dog to determine if this familiarity relationship has any impact on observational learning ability in dogs. This study advances Gent and Mellgren's study a step further by separating effects of conspecific familiarity and heterospecific familiarity. All experiments in this study will use observational learning methods. Since Gent and Mellgren (2005) found that observational learning does occur in dogs through observation of operant training procedures and since Pongracz et al. (2001, 2003) found that observational learning occurs through a detour task, both of these methods will be used in the current study. These methods may have more general

ramifications: if dogs can learn from an experienced littermate or any experienced dog, then perhaps training could be easier and more effective than traditional operant conditioning methods. We are investigating if learning is more effective if dogs are learning from a familiar heterospecific rather than a familiar conspecific. As well, control conditions in these experiments allow dogs to solve the problem situation on their own. These conditions determine if observational learning and familiarity are effective at increasing the rate of learning in dogs.

1.7 Hypotheses – Experiment 1

To test for the occurrence of observational learning in dogs, two studies were conducted. In Experiment 1, a 2 X 2 between subjects design was used to assess the human-canine and canine-canine familiarity relationship via observational learning following the methods of Gent and Mellgren (2005). Two independent variables were used: 1) the degree of familiarity the dog had with the human experimenter and 2) the degree of familiarity the dog had with the model dog. The independent variables consist of two levels (familiar or unfamiliar). Dogs that were Familiar with Human and Familiar with the Model Dog (FH FD) had 10 minute play interactions with the human experimenter. Dogs that were Familiar with Model Dog (FD UH) had 10 minute play interactions with the Model Dog while an assistant supervised but had little interaction. Dogs that were Familiar with the Human but not the Model dog (FH UD) had 10 minute play interactions with the human demonstrator and Dogs what were Unfamiliar with the Human and Model Dog (UH UD) or in the Control Condition had 10 minute supervised acclimation periods. The model dog was trained by the human experimenter to be

proficient in a command and was socially familiar with the human experimenter. Forty-eight dogs (n=48) were randomly assigned to the four conditions. A separate control condition (n=12) was implemented and dogs were trained using traditional operant methods. No observational learning or familiarity occurred in the control condition.

The main hypothesis predicted that dogs who were both familiar with the human experimenter and familiar with the model dog would learn the command in the fewest number of trials. Essentially, we predicted that the compound influence of the human experimenter and model dog would lead to more rapid learning than the other conditions. We also evaluated the influence of familiarity with the human versus familiarity with the model dog in two of the conditions and based on previous research (Gent and Mellgren, 2005) we predicted that the human influence would produce more rapid learning in observing dogs. We also hypothesized that dogs that were familiar with the human demonstrator would be more likely to respond to the “squat” command by another trainer in another environment compared to dogs that are unfamiliar with the human demonstrator. Finally, we predicted that dogs who were unfamiliar with the model (human or dog) would still learn more efficiently through observational learning than dogs in the control condition who did not have the benefit of observational learning.

1.8 Hypotheses – Experiment 2

In Experiment 2, we used the methods of Pongracz et al. (2001) by allowing dogs to learn by observation of how to detour a V-shaped fence. We used the outward V-shaped fence method as the detour task because we wanted the task to be more

difficult than the task in Experiment 1. We did not utilize the route of detour as described in Pongracz et al. (2001) where the human detours toward the right of the fence and exits toward the left of the fence. Instead, we detoured toward the right and returned from the right so that focus was only on the right side of the fence. We utilized a 2 X 2 X 3 Repeated Measures Mixed Design that evaluated 2 independent variables: 1) Demonstrator (Human or Conspecific) 2) Familiarity with the Demonstrator (Familiar or Unfamiliar), and these measures were repeated in 3 consecutive trials. Dogs that were Familiar with the Human Demonstrator had ten minute play sessions with the human while dogs who are Unfamiliar with the Human Demonstrator did not have these play sessions. Similarly, dogs that were Familiar with the Model Dog Demonstrator had ten minute play sessions with the model dog with an assistant supervising but not interacting; dogs that were Unfamiliar with the Model Dog did not have these play sessions. During these play sessions, a red food bowl was presented to the dog containing a ½ inch portion of a hot dog. This was designed to help the dog to familiarize itself with the target (food reward) when he detoured the fence.

Dogs either watched a human detour the fence or the model dog detour the fence to retrieve the target (food in red bowl). The latency to exhibit retrieval was recorded and our procedure was repeated for three trials. We stopped trials after 60 seconds according to the methods of Pongracz et al. (2001). We also used two different tasks, an easier and more difficult version of the V-shaped fence to determine if learning was confounded by task difficulty. The first hypothesis of this experiment predicted that dogs would exhibit a shorter latency when observing the familiar human

(FH) demonstrator versus the familiar model dog (FD) demonstrator indicating a stronger relationship with the human than the conspecific. The second hypothesis predicted that detour latencies would decrease when dogs were familiar with their demonstrator compared to when they were unfamiliar with their demonstrator. Third, we hypothesized that learning would increase as the trials progressed, indicating that increased observation leads to more efficient detouring performance. Fourth, we predicted an interaction between the two independent variables: Dogs would learn more efficiently from a familiar human than a familiar dog, but would learn more efficiently from an unfamiliar dog than an unfamiliar human. Fifth, we hypothesized that dogs in the control condition who received no observational learning or familiarity would take the longest time to detour the fence, compared to the other experimental conditions. Sixth, we predicted that dogs that were in the easier task would complete the task in less time than dogs in the more difficult task. Lastly, two model dog demonstrators were used for the Shortened Fence version of the task. We expect no significant differences between the model dog demonstrators.

CHAPTER 2
EXPERIMENT 1

2.1 Method

2.1.1 Subjects

The subjects were sixty (n=60) dogs of various ages, sexes, and breeds. These dogs were sheltered at the Arlington Animal Services and the Fort Worth Care and Control Center. All subjects lived and were maintained according to the shelter's regulations.

One additional dog was used as the model dogs trained by the human experimenter to be proficient in performing the behavior 'sit' using the command 'squat.' Forty-eight dogs were assigned to four conditions that differed in familiarity with the human experimenter and familiarity with the model dog and were tested on their ability to perform the command 'squat' after observing the model dog. The remaining twelve dogs were used in a control condition that received no benefits of familiarity or observational learning.

2.1.2 Materials, General Procedure, and Data Collection

A data collection sheet was used to record information for each of the thirty dogs including name, breed, coat color, size (small, medium, large), number of trials to learn the command, and time to learn the command. A stopwatch was used during the experiment to time the trials. Beef treats called Canine Carryouts® were used as

rewards for successfully performing the behavior ‘sit.’ A Sony digital camcorder was used to record the trials. After all data were collected, these tapes were converted to DVD format and due to tape quality issues, only forty dogs were successfully captured on tape. The data for each of the forty dogs included the first three training trials that the dog received from the experimenter. We chose the first three trials so that performance levels for both the dogs and the human experimenter were consistent. Three independent raters were recruited and subsequently evaluated the DVD data using a Rating Checklist (see Appendix A). The raters evaluated consistency of training by measuring the latency between the command “squat” and the push on the dogs using a stop watch. For Item 1 (“For the first “squat” behavior the latency was”), Item 2 (“For the second “squat behavior the latency was”), and Item 3 (“For the third “squat” behavior the latency was”) raters recorded the number of seconds. For Item 4 (“Count how many times the command “squat” was said without the trainer pushing the dog’s behind”) raters judged each clip(1 = never; 2 = once; 3 = twice; 4 = three times; 5 = over three times). Raters used Item 5 (“After viewing the whole clip, how many total verbal reinforcers did you hear after the “squat” behavior was elicited?”) to judge the consistency of positive reinforcement for secondary (praise) reinforcers (1 = none; 2 = less than three; 3 = 3 to 6; 4 = 7 to 10; 5 = over 10). The trainer’s enthusiasm was measured on Item 6 (“Rate the overall enthusiasm of the trainer”) as 1=very enthusiastic; 4=not enthusiastic at all. Lastly, Item 7 (“How hyperactive was the dog?”) measured the activity level of each dog (1 = very hyperactive, 2 = somewhat hyperactive; 3 = somewhat calm; 4 = very calm). See Appendix I for complete

questionnaire. The independent raters that viewed the DVD data from each of the forty dogs were blind to the experimental conditions. Once the rating evaluations were completed SAS statistical software was used to input and analyze the data.

2.1.3 Procedure

This experiment was conducted outside of the animal shelters in the fenced area and all dogs were restrained using leashes. Arlington Animal Services provided a tent that allowed for shading while no tent was used at Fort Worth Care and Control Center. Since the experiment was conducted outside, we encountered occasional interruptions by shelter personnel, potential adopters, and traffic noise. In general, the background noise was consistent across trials, but a few training sessions were discontinued because of severe distractions. All dogs were screened before use in the experiment to determine if they were novel to the command “sit.”

In all conditions only one dog was trained outside at a time. To train the dog to sit, the experimenter used the verbal command ‘squat’ and pushed the dog’s bottom towards the ground. The experimenter used beef treat rewards for the dog when he/she successfully sat. A behavior was considered learned when the dog sat to the command ‘squat’ without the experimenter touching the dog for three consecutive trials. Prior to training it was preferable for all dogs to have been on food deprivation in order to help stimulate performance. Since this experiment was not conducted in a controlled environment, food deprivation was not possible. However, the experiments were conducted at approximately the same time of day for the duration of the experiment to maintain consistency of food satiation across all dogs. Dogs were fed around 1800

hours each evening; our experiment occurred in the early afternoon between 1500 and 1800 hours. Since the training occurred within hours of the dog's daily feeding, they were, presumably, under conditions of moderate hunger. The observer dogs were assessed by trained assistants to determine responses to the commands 'sit' and 'squat', and to evaluate if the dogs responded well to treat rewards. Once the trained assistant determined that the dogs were naïve to the target behavior and that they were responsive to the reward, the dogs were given the training appropriate to their group assignment.

Play sessions. Prior to training sessions, some dogs had play sessions for ten minutes with the model dog, the experimenter, or both. Play sessions consisted of the experimenter petting the dogs, throwing a ball around, or generally socializing with the dogs prior to any training.

Acclimation periods. Dogs that did not have play sessions with the experimenter and/or model dog received a ten minute acclimation period. During these ten minutes, the dogs were supervised in the presence of the experimenter's assistants while they adjusted to the novel environment.

Training procedure. After play sessions or acclimation periods, the model dog was taken into the testing situation and the observer dog viewed a demonstration of the command given to the model dog and the response that the model dog elicited. The observer dog observed the model for five trials. It was important for consistency that the observer dogs actually viewed five trials. In instances where the dog looked away or seemed distracted, the trial was repeated. Once the observers viewed the model perform the command 'squat' for five trials and received rewards, the observer was

evaluated on the number of trials and the amount of time required to learn the target behavior. Training was terminated after the observing dog reached 20 trials. In order for the behavior to be considered ‘learned’, the dog must have achieved the ‘squat’ behavior for three consecutive trials.

2.1.4 Model Dog and Human Experimenter

One dog was trained using traditional operant conditioning methods to model the behavior ‘sit’ to the command ‘squat.’ The primary model dog, Harley, was originally obtained by Gifted Animal Programs (GAPs) to be used as a service dog. A GAPs member evaluated Harley and recommended him as a good candidate for use as the model dog in this experiment. This dog was extremely familiar with the experimenter and well socialized with the experimenter prior to any training. The experimenter cared for the model dog and socialized regularly with him in order to increase familiarity. Once the model dog was well socialized with the experimenter, he was trained with traditional operant conditioning methods to perform the behavior ‘sit’ with the verbal command ‘squat.’

The Human Experimenter had three tasks – to be as familiar as possible with the Model Dog, engage in play sessions in appropriate conditions, and to utilize the Model Dog to demonstrate the ‘squat’ command for five trials. The video data of the Human Experimenter was analyzed by Independent Raters on her training performance.

2.1.5 Familiarity with Human and Model dog (FH/FD)

In this condition there were twelve (n=12) observers. This group of dogs was familiar with the model dog and the experimenter and received play sessions with both the experimenter and model dog.

2.1.6 Unfamiliar with Human and Familiar with Model Dog (UH/FD)

In this condition there were twelve (n=12) dogs who were familiar with the model dog through a supervised 10 minute play session, but who were not familiar with the experimenter.

2.1.7 Familiar with Human and Unfamiliar with Model Dog (FH/UD)

There were twelve (n=12) observers in this condition that were familiar with the experimenter and unfamiliar with the model dog. These dogs did not have any interaction or play sessions with the model dog prior to observation, but did have ten minute play sessions with the human experimenter.

2.1.8 Unfamiliar with Human and Model Dog (UH/UD)

This group of dogs (n=12) was unfamiliar with the model dog and unfamiliar with the experimenter. These dogs had a ten minute acclimation period prior to training.

2.1.9 Control Condition

Twelve dogs (n=12) were trained according to traditional operant conditioning techniques. These dogs were not familiar with the model dog or experimenter and did not receive the demonstration that the other four conditions observed. These dogs received ten minute acclimation periods.

2.1.10 Statistical Analysis

An Analysis of Variance (ANOVA) was utilized with SAS Glim to assess differences between dogs that are familiar with the human (familiar and unfamiliar) and dogs that are familiar with the model dog (familiar and unfamiliar). In each condition, the dependent variable was the total number of trials to complete the target behavior for each dog with the minimum to reach criterion as 3 and the maximum to reach criterion as 20. Dunnett's test for multiple comparisons was used to compare individual conditions to the control condition. A chi-square analysis was utilized to determine if dogs were learning differentially by conditions. An Analysis of Covariance was also performed to determine the main effects and interactions of our independent variables after the dependent variable of 'Trials' is adjusted for differences associated with our covariates. Dogs were also measured on their response to the command 'squat' by a different trainer while in their kennel. We used an ANOVA to confirm effects between response performance (IV) and the original trials to learn (DV). Lastly, we used Cronbach's alpha to compare the raters' evaluations of the video data.

2.2 Experiment 1 Results

In this experiment we utilized a 2 X 2 Between Subjects Design. Two independent variables were analyzed, 1) Familiarity with human (familiar or unfamiliar) and 2) Familiarity with model dog (familiar or unfamiliar). We hypothesized that dogs would perform the 'squat' behavior more efficiently in the FH/FD condition than all other conditions. Dogs in FH/FD completed the task in a mean of 8.08 trials which was fewer than all other conditions indicating that our first hypothesis was supported. We

also hypothesized that the familiarity relationship with the human (FH/UD) would lead to more effective performance than familiarity with the model dog (UH/FD). This hypothesis was also supported by the data where FH/UD performed the command approximately 3 trials sooner than observers in UH/FD. The third hypothesis was that dogs in the FH/FD and FH/UD conditions would be more likely to respond to the command “squat” by another trainer in a different environment and this was supported by the data. Lastly, the fourth hypothesis was that dogs in UH/UD would learn more efficiently than the Control Condition which did not receive observational learning. This hypothesis had some credibility in the data, but did not reach significance in the ANOVA. See Table 2.1 for means and standard deviations by conditions.

Table 2.1 Mean and Standard Deviations for Trials to Demonstrate Command “Squat”

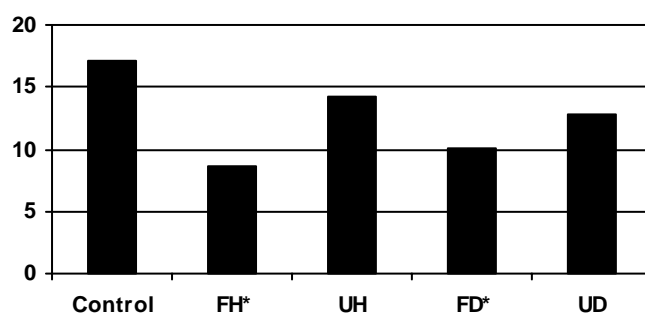
Familiarity with The Model Dog	Familiarity with the Human Demonstrator	
	Familiar	Unfamiliar
Familiar	8.08 (5.70)	12.17 (7.26)
Unfamiliar	9.25 (6.60)	16.42 (6.11)

Control Condition
18.78 (2.39)

2.2.1 Analysis of Variance

An analysis of variance (ANOVA) using SAS GLM determined that no interaction effects were found in this experiment $F(1, 55) = 0.76, p > .05$ for the variables of FH UH and FD UD. There were differences among the two independent

variables of Familiarity with human (FH and UH) and Familiarity with the model dog (FD and UD). A main effect did occur for FH and UH, $F(2, 55) = 9.08, p < .01$ illustrating that there were differences between being unfamiliar or familiar with the human when learning. Pairwise comparisons using Dunnett's test illustrates that dogs who were familiar with the human demonstrator (FH) learned more effectively compared to the control condition ($p < .05$). Dogs who were unfamiliar the human demonstrator (UH) had no significant differences from the control condition ($p > .05$). The FD UD variable did not reach the conventional level of significance, $F(1, 55) = 2.35, p = .06$, indicating that there were no differences between being familiar or unfamiliar with the model dog. However, Dunnett's test indicates that dogs that were unfamiliar with the model dog (UD) showed similar performance trials as the control condition ($p > .05$) while dogs that were familiar with the model dog performed in significantly less trials than the control condition ($p < .05$). See Figure 2.1.



Note: * $p < .05$

Figure 2.1 Mean number of trials using Dunnett's test across Familiarity and Unfamiliarity with Human and Model Dog Demonstrators

It is important to note that there is a possible ceiling effect occurring in the data. The maximum number of trials before training was terminated was 20, so it is possible

that this ceiling effect is allowing some conditions to appear more similar to the control condition. However, using a chi-square analysis, we found that dogs were learning differentially in conditions $\chi^2(4) = 11.39, p < .05$. The data indicate that 92% of dogs that were familiar with the human and model dog (FH FD) and 75% of dogs that were familiar with the human only (FH UD) learned the command “squat” in under 20 trials. FH FD and FH UD were the best predictors of learning than all other conditions. Fifty-eight percent of dogs that were familiar with the model dog only (FD UH) learned the command. Interestingly, dogs that were unfamiliar with the human and model dog (UH UD) learned the command somewhat less frequently (33%) than the control condition (42%).

2.2.2 Analysis of Covariance

Since there were variables for which we could not control, we used a Familiarity with Human (2: familiar, unfamiliar) \times Familiarity with Model Dog (2: familiar, unfamiliar) analysis of covariance (ANCOVAs.) Analyses were performed by SAS GLM with equal sample sizes for each condition (n=12). Categorical covariates in this analysis include breed (sporting, herding, other), gender (male or female), color (light, medium, dark), size (sm, med, lg.), and shelter (Arlington or Fort Worth). There were no significant effects in the ANCOVA analysis. See Table 2.2.

Table 2.2 Analysis of Covariance for Effects of Trials to Learn Command “Squat”

Source	Adjusted SS	df	MS	F
Breed	1.74	1	1.74	1.59
Gender	90.45	1	90.45	2.32
Color	4.35	1	4.35	0.10
Size	10.17	1	10.17	0.28
Shelter	0.03	1	0.03	0.00

*p<.05, **P<.01

2.2.3 Response Probability in Another Environment

We also investigated the response of all dogs by another trainer in a different environment. Out of 60 dogs, only 20 dogs performed the behavior sit to the command “squat” by another trainer in a different environment. We used Response (sat on command or did not sit on command) as an independent variable and the number of trials taken to learn as a dependent variable for an ANOVA. The dogs responding to the sit command learned the command in fewer trials than dogs who did not respond, $F(1, 41) = 24.53, p < .0001$. We hypothesized that dogs that were familiar with the human would be more likely to respond to the command from a different trainer in a different environment than all other conditions. This hypothesis was not supported. Dogs that were Familiar with the human (FH) did take fewer trials to learn (See Figure 2.1) and had more dogs to learn the command in under 20 trials (See Table 2.3), however, their overall response probabilities were roughly equal to dogs that were Familiar with the Model Dog (FD) and Unfamiliar with Human (UH). Dogs that were Unfamiliar with the Model Dog (UH) did show similar frequencies of learning as the above conditions, but they did not respond frequently to another trainer in a different environment. Dogs

in the Control Condition did not show high frequencies of learning and this translated to a poor overall response to a different trainer.

Interestingly, dogs that originally learned did appear to produce the target behavior by a different trainer in a different environment. All dogs that were Unfamiliar Human (UH) that originally learned the command “squat” in under 20 trials were able to show the behavior in to a different trainer. One dog in the UH condition that did not learn in under 20 trials spontaneously emitted the behavior to the different trainer. Out of the remaining conditions, Familiar with Human (FH), Familiar with Model Dog (FD) and the Control Condition had approximately 60% of dogs that originally learned reproduce the behavior to a different trainer. These data indicate that the majority of dogs were able to generalize the behavior to a different trainer. Dogs that were unfamiliar with the model dog were able to reproduce the behavior to a different trainer, but their percentages were not as impressive as the other conditions. (See Table 2.3).

Table 2.3 Frequencies and Percentages of Dogs that Responded to Command “squat” by Another Trainer

Variables	Number that Originally Learned (<20 trials)	Percentage of Dogs that Originally Learned	Number that Responded in a Different Environment	Percentage of Dogs to Respond	Percentage of Dogs that Learned and Responded
Familiar Human (FH) (n=24)	20	83%	12	50%	60%
Unfamiliar Human (UH) (n=24)	11	46%	12	50%	110%
Familiar Dog (FD) (n=24)	18	61%	11	46%	61%
Unfamiliar Dog (UD) (n=24)	13	52%	6	25%	46%
Control Condition (n=12)	5	42%	3	25%	60%

2.2.4 Video Data Analysis

The experimenter that trained the dogs could not be blind to the conditions of the experiment. Therefore, all trials were video recorded to evaluate the possibility of experimenter bias. Three independent raters viewed the recorded trials and answered a series of questions (see Appendix I). These raters were highly correlated as shown by Cronbach’s $\alpha = 0.88$. For each item refer to Table 2.4 for complete frequencies on each item.

Table 2.4 Frequency of Response on Questionnaire Items

Item	Response	Frequency
1. Latency between Command “Squat” and Push on Dog for Training Trial 1	Under 5 seconds	40
	Over 5 seconds	0
2. Latency between Command “Squat” and Push on Dog for Training Trial 2	Under 5 seconds	40
	Over 5 seconds	0
3. Latency between Command “Squat” and Push on Dog for Training Trial 3	Under 5 seconds	39
	Over 5 seconds	1
4. Number of Times Command said without Push	Never	17
	1-3 Times	22
	Over 3 times	1
5. Total Number of Verbal Reinforcers	Less than 3	2
	3-10	34
	Over 10	4
6. Experimenters Enthusiasm for Each Dog	Somewhat to very	39
	neutral	1
	Not at all	0
7. Activity levels of Dogs	Hyperactive	21
	Calm	19

For items 1, 2, and 3, Raters determined the latency between the verbal command “squat” and the push on the dog’s bottom. Out of 40 dogs, the Raters agreed that the human experimenter was consistent across conditions. Item 6 rated the human experimenter’s overall enthusiasm. Raters agreed that the human experimenter was somewhat to very enthusiastic across conditions. The remaining items were not as homogenous, see Table 2.5.

Table 2.5 Response Frequencies for Video Data Items by Experimental Conditions

	Question 4		
Condition	Never	1-3 times	Over 3 times
FH/FD	2	6	0
UH/FD	4	4	0
FH/UD	1	4	1
UH/UD	5	3	0
Control	5	5	0
Question	Question 5		
	< 3	3-10	Over 10
FH/FD	0	8	0
UH/FD	1	7	0
FH/UD	5	2	1
UH/UD	1	6	2
Control	0	8	2
Question	Question 7		
	Hyperactive	Calm	
FH/FD	5	3	
UH/FD	3	5	
FH/UD	5	1	
UH/UD	6	2	
Control	2	8	

For Question 4, Raters counted the number of times the command “squat” was said without pushing the dogs’ behind. They found that the human experimenter was fairly consistent across conditions, but she tended to say the “squat” command more frequently in conditions where she was familiar with the dog. For Question 5, raters counted the number of verbal reinforcers given to the dog by the human experimenter. These numbers tended to be fairly consistent across conditions. The human experimenter gave fewer praise rewards to the FH/UD condition than all other

conditions. Overall, we feel that items 1 through 6 captures that the human experimenter was consistent across conditions.

The last item rated did not assess the trainer's performance, but measured how hyperactive the dog was perceived by the Raters. The control condition had fewer "hyperactive" dogs while the FH/UD condition had only one "calm" dog. The frequency of dogs that learned the command in under 20 trials appeared to be consistent regardless of activity level. Dogs that were hyperactive (n=11) performed the command "squat" almost as frequently as dogs who were judged to be calm (n=8). Similarly, those dogs who did not perform the command "squat" in under 20 trials were similar between hyperactive (n=9) and calm dogs (n=12). These data indicate that hyperactive and calm dogs did not receive differential treatment from the human experimenter. This item was added as a covariate in SAS GLM. Dogs' performance rates did not differ by activity levels, $F(1, 40) = 0.00, p > .05$.

2.3 Discussion

In Experiment 1, the results supported the majority of our hypotheses. We found that observing dogs responded more to a familiar human demonstrator (heterospecific) rather than a familiar dog demonstrator (conspecific). These effects increased when observing dogs were familiar with both heterospecifics and conspecifics, but no interaction effect was present. The data followed the pattern of data found in Gent & Mellgren (2005). Our fourth hypothesis stated that dogs that were unfamiliar with the model dog and unfamiliar with the human (UH/UD) would perform more efficiently than the control condition (Control). This hypothesis was not

supported in the data. In the case of the dependent variable “Time”, the dogs were actually taking longer to learn the command in UH/UD than the Control Condition. The Control Condition and UH/UD were similar in all respects except Demonstration since UH/UD observed the model dog perform the command “squat” for five trials while dogs in the control did not observe the model dog. The data indicate that observational learning did not occur, rather, dogs learned more rapidly due to familiarity with the demonstrator. The model dog did appear to influence observational learning, but the ANOVA did not reach a conventional level of significance. Our first hypothesis was supported because familiarity, overall, increased performing rates in observing dogs. Dogs appear to be learning more efficiently from their familiar demonstrator versus unfamiliar demonstrator. Since the human experimenter was not only involved in the demonstration, but also in the training, this could have influenced the FH/UH effect. The model dog, by comparison, was only involved in demonstration. In future experiments, the human trainer and the human demonstrator could be separate individuals to control for this possible influence. The design of the experiment assumed that observational learning would take place based on the findings of Gent & Mellgren (2005), however, our own analysis proved that, at least in this sample, observational learning did not occur between the UH/UD and the control condition. However, observational learning did occur in this experiment and we believe that this effect could be due to familiarity with the demonstrator mediating observational learning. We believe that this explains why there is such a difference between performance rates between FH/UD and UH/FD. In addition, Gent & Mellgren (2005) were unsure which

demonstrator was influencing learning in dogs. We found in our analysis that the human demonstrator had a greater influence on performance than the model dog.

We also investigated an interesting variable of responsiveness to another trainer. We included this variable to help determine if these dogs were truly learning by observation, or if this was a more imitative response that was fleeting. More dogs were able to perform the command in fewer than 20 trials that were in FH/FD and FH/UD than the other conditions. In addition, more dogs in FH/FD and FH/UD responded to the command “squat” by another trainer in a different environment than the other conditions. Since dogs were learning the commands in FH/FD and FH/UD, then it is not surprising that these dogs were also performing the behavior by another trainer in a different environment. However, the interesting aspect of the response behavior is that it shows the command persisted and stayed in the animal’s repertoire. This persistent response is indicative that dogs were not simply imitating, they had observationally learned this behavior.

2.3.1 Video Data Analysis

The video data analysis showed a fairly high agreement between the three independent raters ($\alpha=.88$). The raters indicated that the human experimenter was consistent across all dogs and all conditions. When she trained dogs to “squat” the experimenter consistently gave the command and she pushed the dog’s bottom in under five seconds. In the majority of the dogs, she did not over use the term “squat” and always gave plenty of verbal reinforcers to all dogs. Her enthusiasm for training was consistent across dogs. Roughly half of the dogs were rated as somewhat to very

hyperactive and the other half were rated somewhat to very calm. These levels did not seem to affect the training procedures. Question 5 (rating total number of verbal reinforcers) was the only measure that showed statistical significance in the ANOVA. The ANOVA suggests that dogs that received less than three verbal reinforcers tended to learn at a faster rate than dogs who received more verbal reinforcers. This finding may be misleading. We showed only the first three training trials to the raters and asked for the total number of verbal reinforcers heard in the clip. Some dogs that learned quickly may have had only one or two trials on the video and since there were fewer trials to view, there were fewer verbal reinforcers by the human demonstrator. The ANOVA also suggested that dogs that had more verbal reinforcers learned in more trials. The finding may also be misleading since dogs that responded promptly to the training may have “required” fewer verbal reinforcers than slower learning, less prompt dogs. To compensate for slow learning, more verbal reinforcers were given.

2.3.2 Limitations to Experiment 1

Many factors could have contributed to the apparent lack of observational learning and subsequent lack of significant effects for Familiarity with the Model Dog. First, our model dog became progressively more aggressive (growling and barking only) as the relationship with the human demonstrator developed, apparently reflecting a protective/possessive manner on his part. Harley was evaluated as a good candidate for this experiment, but his aggressive behavior was spontaneously and erratically emitted. We noticed the protective relationship and we made certain that the human experimenter was not in Harley’s sight during play sessions that did not include the

human experimenter. In conditions when the human experimenter was involved in the play session (FH/FD), to curtail Harley's protective behavior we increased positive reinforcement (petting, treating) when his behavior was not aggressive towards other dogs. The experimenter's assistants supervised three of the five play sessions and in time the aggressive behavior resurfaced. We speculate that Harley developed a protective relationship with the assistants as well. Since a significant amount of data was collected and the protective relationship never crossed boundaries into biting, we continued the experiment and attempted to curtail Harley's behavior. Perhaps this aggressive behavior could be a factor that explains why the effect of Familiarity with the Model Dog was not significant. If observing dogs are threatened by another dog, perhaps their willingness to observe diminishes.

Experiment 1 confirmed the evidence found in Gent & Mellgren (2005) and further investigated the involvement of a familiarity relationship and learning in domestic dogs. The data suggest that dogs are more influenced by the familiarity with the heterospecific than the conspecific which is fascinating for both the areas of animal behavior and evolutionary psychology. This evidence not only illuminates the importance of humans to dogs, but also makes the evolutionary implications apparent when investigating the human-canine relationship. Canines must have evolved ways of understanding the importance of human cues for the benefit of their own survival.

Another limitation with Experiment 1 is that we did use shelter dogs. Shelter dogs enter an animal shelter for many reasons ranging from straying from their home, to owner relinquishment, to being the pet of an individual in prison who can no longer take

care of them. These dogs range from various breeds that are aggressive (Pit bulls) to dogs that stereotypically seem aggressive, but are generally quite calm (Rottweilers). Since most of these dogs are not purebred, it is difficult to determine whether the dogs are responding differently due to breed differences (which we did not find in the ANCOVA) or whether they are socially deprived and are responding at high rates for attention. In the future, it would be very beneficial to investigate learning rates in mixed breed dogs that have permanent homes. In addition, an issue in using shelter dogs is there is no definitive knowledge of the dogs' exact age. Perhaps some of these learning differences are due to age differences. Owners of pure-bred dogs (especially registered pure-bred dogs) know the exact age of their dog. We specifically chose dogs that were not presented as puppies (under 1 year), but were relatively young (under 7 years). Since the animal shelters could not provide age information, we do not know if there were age differences in performance in the dogs we tested.

We expected that observational learning would have been a significant influence in learning the command "squat", but we did not find this when we compared UH/UD to the Control condition. In some cases, the Control condition outperformed UH/UD. Since these conditions were exactly the same except for observational learning, these findings are puzzling based on Gent & Mellgren's (2005) findings and other findings (Pongracz et. al, 2003) that dogs can learn through observational learning. Future considerations could eliminate investigations of the familiarity relationship and isolate observational learning and increase sample size.

Lastly, there are limitations to this study since these experiments are conducted outside of animal shelters. There are disturbances due to traffic noise, interruptions by potential adopters, interruptions by shelter personnel, and interruptions by other dogs barking. We did not find shelter differences which was a little surprising. Dogs in the Fort Worth Shelter were located indoors in a huge shelter that comprised all offices and all kennels. The fenced area was at the back of the shelter, so we had relatively few interruptions since hardly anyone ever went outside. The disturbances of noise, people, and traffic were considerably less at this shelter. The Arlington Animal Shelter was designed so that there was a separate building for offices, separate buildings for dog kennels, and a separate building for cat kennels. The fenced in research area was in the middle of these three buildings. Shelter workers as well as visitors were frequently nearby. Also, the dog kennels were designed so that there were no exterior walls. Instead, the outside of the shelter building was made of wire so that dogs could be “outdoors”. While this feature is likely preferred by shelters because it allows a more diverse environment, it had adverse effects when conducting our experiment. Our testing area was outside of the shelter, but the kennelled dogs could view our testing area and this often lead to loud levels of barking when we brought out our model dog and observing dogs. In addition, the parking lot was outside of the fenced area, so there were also disturbances when vehicles entered and exited the shelter. While we did not find differences between shelters, any or all of these influences could have affected the data.

CHAPTER 3
EXPERIMENT 2
3.1 Method

3.1.1 Subjects

The subjects were sixty-five dogs (N=65) of various ages, sexes, and breeds. These dogs were sheltered at the Arlington Animal Shelter. All subjects lived and were maintained according to the shelter's regulations.

The model dog used in Experiment 1 was used as the model dog for this experiment trained by the human experimenter for a new task. This dog was trained to consistently detour an outward V-shaped fence on the right side and retrieve a food reward using the command "Go get it." The model dog was trained to return to the Starting Point toward the right using the command "Come back." During the Shortened Fence task, a second model dog was utilized because Harley became ill during the experiment. This model dog was trained as a back-up by the human experimenter for this purpose. This dog, Beatle, was the human experimenter's male Beagle that was extremely familiar to her and demonstrated for the remainder of the experimenter. The human demonstrator performed the demonstration exactly the same as the model dogs, but with without the command. Thirty-five dogs (n=35) completed the long-fence version of the task and assigned to one of five conditions. Twenty-eight dogs (n=28) were randomly assigned to four conditions that differed in Demonstrator (Human or

Dog) and Familiarity (Familiar or Unfamiliar). An additional seven dogs (n=7) were randomly assigned to a control condition. The remaining thirty dogs (n=30) complete the short-fence version of the task. Of the twelve (n=12) dogs who received conspecific demonstration, six (n=6) had Harley as their conspecific demonstrator and six dogs (n=6) had Beatle as their conspecific demonstrator. Twenty-four (n=24) dogs were randomly assigned to four conditions that differed in Demonstrator (Human or Dog) and Familiarity (Familiar or Unfamiliar). An additional six dogs (n=6) were assigned to a control condition.

3.1.2 Materials, General Procedure, and Data Collection

Information was recorded for each of the sixty-five dogs including name, breed, coat color, size, condition of experiment, latency to detour, and route of detour. After all data had been collected, the individual breeds of dogs were grouped into classifications of Sporting, Hound, Working, Terrier, Toy, Non-Sporting, Herding, and Miscellaneous Class (American Kennel Club, 2006). Color of dog was grouped into predominant color of White, Blonde, Grey, Brown, and Black. Size was classified as Small, Medium, and Large. A stopwatch was used during the experiment to time the dogs detouring latency. We recorded the route of detour as Left, Right, or No Preference. Hot dogs cut into ½ inch segments were placed in a red dog bowl and were used at the target in this experiment. A Sony digital camcorder was used to record the trials.

As described in Experiment 1, the trials occurred around the same time each day when the dogs were in a state of moderate hunger. Also, similar to Experiment 1, play

sessions consisted of ten minute intervals of general socialization with the dog. In conditions where the dog was familiar with the model dog, play sessions occurred in the fenced area and were supervised by an assistant. In conditions where the dog was familiar with the human experimenter, the dogs socialized (petting, playing, etc.) with the human experimenter for ten minutes. In conditions where the dog was familiar with both the model dog and human demonstrator, the play session was combined to include model dog, human experimenter, and observer dog. This play session was combined to help influence the observer dog's trust in both the human experimenter and model dog and may have avoided any primacy or recency effects of separate play sessions. Dogs that were in the Unfamiliar with Human, Unfamiliar with Model Dog conditions, and in the control condition had acclimation periods in the fenced area for ten minutes prior to observation of the detour.

All dogs in all conditions received gestural and verbal encouragement from the assistant who was holding the leash when they were allowed the detour the fence. A procedure used in a previous V-shaped fence experiment (Pongracz et al., 2001) had the human experimenter inside the V, verbally encouraging the observing dog to detour the fence. We did not utilize this procedure; instead, gestural and verbal encouragement occurred at the starting point of the fence and was operationally as defined pointing at the food bowl and saying "go get the food, girl/boy." The experimenter emitted gestural and verbal encouragement in all trials immediately before the assistant released the dog's leash and continued until the dog successfully detoured around the fence or the trial terminated at 60 s.

A V-shaped fence was used in this experiment. The fence was very similar in measurement to the Pongracz et al. (2003) V-shaped fence. In the first task, the fence was 3 feet high, with sides 8 feet long closing an angle of 80°. The fence was made of thin wire, set on to a steel frame. The fence was fastened into the ground through metal u-shaped pegs to avoid the fence from moving or dogs from digging under it. The experimenter and assistants made tracks in the grass along both sides of the fence after set-up ten times in both directions to equalize any scent marks. In order to reduce side bias, the fence was set up in the opposite direction for every five dogs. For example, the fence may have been set up where the tip of the V point North for five dogs on one day and then turned 180 degrees the next day for another five dogs so the tip of the V faced south. In the second task, the fence was shortened from 8 feet long to 2 feet long. All other aspects remained the same.

3.1.3 Procedure

This experiment was conducted outside of the animal shelters in the fenced areas and all dogs were restrained using leashes. Thirty-five dogs (n=35) detoured the long version of the V-shaped fence and thirty dogs (n=30) detoured the shortened version. All procedures were exact throughout the rest of the experiment.

In all conditions only one dog was trained outside at a time. Before the observing dog was brought out of the play area to the starting point, an assistant placed the target object (a treat in a red bowl) in the crux of the V. The bowls were cleaned for each dog and the target was visible through the fencing. The observing dog was then brought into the experimental situation and placed at the starting point.

3.1.4 Human Experimenter and Model Dog

The human experimenter and model dog had two roles in the experiment: (1) to be involved in play sessions in particular conditions and (2) to demonstrate to observing dogs how to detour around the V-shaped fence. A demonstrator (human or dog) entered the test situation at the starting point and stood to the right of the observing dog. As the observing dog watched, the Demonstrator detoured the fence to the right, retrieved the treat (the human touched the bowl; the dog ate the treat) and returned back to the starting point by detouring back to the right. The demonstrator was then removed from the experimental situation and the assistant covered the observing dog's eyes. While the dog was unable to view the V-shaped fence, the Human Experimenter tended to the food bowl (touching the bowl if the treat remained or replaced the treat). Scent marks were made on both sides of the fence 10 times to equalize any scent marks between the two sides. Once the assistant had left the fence, the observing dogs were brought back to the starting point. Once there, the assistant with the observing dog gave gestural and verbal communication and then released the leash. The latency to retrieve the target was recorded. Trials were terminated after 60 seconds. This procedure was repeated for 2 additional trials.

3.1.5 Familiar with Human (F/H)

In this experimental condition, dogs in the long-fence version (n=7) and short fence version (n=6) had ten minute play sessions with the human demonstrator. After the play session, these dogs viewed the human demonstrator detour the fence to the right. The procedure continued as described in 3.1.4.

3.1.6 Unfamiliar with Human (U/H)

Dogs in the long-fence version (n=7) and short fence version (n=6) did not have play session prior to testing, but did have supervised acclimation periods. These dogs were brought outside by the assistant and placed at the starting line after acclimation. They were then given the same treatment as described in 3.1.4.

3.1.7 Familiar with Model Dog (F/D)

In this condition, dogs in the long-fence version (n=7) and short fence version (n=6) had ten minute play sessions with the model dog prior to testing. An assistant was present for supervision, but did not interact. The model dog was then commanded by the human experimenter to detour the fence and he retrieved the food as his reward out of the red bowl. Once the model dogs were removed from the experimental situation, the procedure continued as in 3.1.4. In the shortened fence version, Harley demonstrated for three dogs (n=3) and Beetle demonstrated for the remaining three dogs (n=3).

3.1.8 Unfamiliar with Model Dog (U/D)

Dogs in the long-fence version (n=7) and short fence version (n=6) did not have play sessions, but each dog had supervised acclimation periods for ten minutes. After acclimation, each dog observed the model dog detour the fence and retrieve the food. The method continued as described in 3.1.4. In the shortened fence version, Harley demonstrated for three dogs (n=3) and Beetle demonstrated for the remaining three dogs (n=3).

3.1.9 Control Condition

Dogs in the long-fence version (n=7) and short fence version (n=6) had ten minute acclimation periods. However, they were not familiar with the human experimenter, they were not familiar with the model dog, and they did not observe any demonstrator detour the fence. Instead, these dogs were placed at the starting point by an assistant and navigated the fence to retrieve the target. The dogs were given three trials to navigate the fence and retrieve the food reward. The latencies to retrieve the target were recorded in all three trials.

2.1.10 Statistical Analysis

A Repeated Measures Analysis of Variance (ANOVA) was utilized with SAS Glm to assess differences between dogs that were familiar (familiar and unfamiliar) and between demonstrators (human and model dog). In each condition, the dependent variable was the total number of seconds to detour the fence and retrieve the target for each dog with the minimum to reach criterion as 0 seconds and the maximum to reach criterion as 60 seconds. A chi-square analysis was utilized to determine if dogs were learning differentially throughout the trials by conditions. A Repeated Measures Analysis of Covariance was also performed to determine the main effects and interactions of our independent variables after the dependent variable of 'Time' was adjusted for differences associated with our covariates. Lastly, a chi-square analysis was utilized to determine if dogs preferred the route of detour (left or right) demonstrated by their demonstrator (human or model dog). The method of analysis was identical for both long fence and short fence tasks.

3.2 Results

We utilized a 2 X 2 X 3 Repeated Measures Mixed Design. Two independent variables were utilized, 1) Familiarity with Demonstrator (familiar or unfamiliar) and 2) Demonstrator (human or dog). First, we hypothesized that dogs would have a shorter latency when observing the Human demonstrator versus the Model Dog demonstrator. The second hypothesis was that detour latencies would decrease when dogs were familiar with their demonstrator compared to when they were unfamiliar with their demonstrator. Third, we hypothesized that the time to complete the task would decrease as the trials progressed. Fourth, we predicted an interaction effect where dogs would perform better with a familiar human than a familiar dog, but would perform better with an unfamiliar dog than an unfamiliar human. Fifth, we hypothesized that dogs in the control condition who received no observational learning or familiarity would take the longest time to detour the fence. Lastly, we predicted that dogs that were in the easier task would learn more efficiently due to observational learning than dogs in the difficult task.

3.2.1 Long Fence Task

Repeated Measures Analysis of Variance. A repeated measures analysis of variance (ANOVA) was used in SAS GLM for the variables of Demonstrator (human or dog) and Familiarity (human or dog) for the dependent measures of three trials (Trial1, Trial2, Trial3). With the use of Wilks' criterion, the combined DVs were not affected by the IVs of Demonstrator $F(3, 28) = 1.58, p > .05$ or Familiarity $F(3, 28) = 0.05, p > .05$ or their interaction, $F(3, 28) = 0.95, p > .05$. None of our hypotheses were supported in

the data. Since so few dogs were able to detour the fence after three trials the data reflect a floor effect. Dogs were simply unable to complete the task in less than 60 seconds. (See Table 3.1).

Table 3.1 Long fence: Mean and Standard Deviations in Seconds to Complete Task and Route of Detour by Familiarity and Demonstrator

Level of Familiarity	Level of Demonstrator	N	Trial 1	Route of Detour		Trial 2	Route of Detour		Trial 3	Route of Detour	
				L	R		L	R		L	R
Familiar	Human	7	60.00 (0.00)	7	0	51.57 (22.30)	6	1	54.57 (14.36)	6	1
Familiar	Dog	8	58.88 (3.18)	5	2	57.38 (7.42)	6	1	47.88 (22.49)	5	2
Unfamiliar	Human	7	48.71 (20.04)	7	1	52.57 (19.65)	7	1	47.85 (21.45)	6	2
Unfamiliar	Dog	7	45.86 (24.20)	5	2	45.71 (24.40)	5	2	55.71 (11.33)	6	1
Control	Control	6	51.00 (19.26)	4	2	47.67 (19.27)	4	2	55.67 (10.61)	5	1

The number dogs that successfully completed the task (detoured in less than 60 seconds) and dogs that were unsuccessful (time terminated at 60 seconds) were evaluated using a chi-square analysis to determine if learning varied by condition throughout the trials. For Trial 1 $\chi^2(4) = 3.34$ $p > .05$, Trial 2 $\chi^2(4) = 1.55$, $p > .05$, and Trial 3 $\chi^2(4) = 0.77$, $p > .05$ dogs were not learning differentially by conditions. See Figure 3.1.

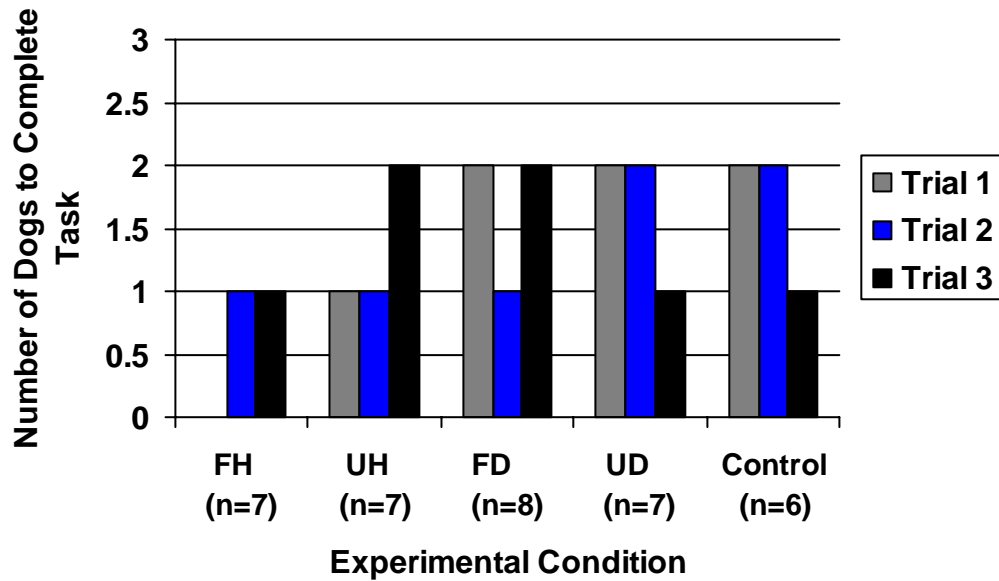


Figure 3.1. Long fence: Number of Dogs to Complete the Task by Condition

Repeated Measures Analysis of Covariance A repeated measures analysis of covariance (ANCOVA) was used by SAS GLM. Covariates in this analysis include Gender (male or female), Color (light, medium, dark) Shelter (Arlington or Fort Worth), Size (sm, med, lg.), and Breed (sporting, herding, other). None of these variables were significant covariates in the ANCOVA analysis across the three trials. See Table 3.2.

Table 3.2 Summary of Repeated Measures ANCOVA

Wilks' Lamda	Value	df	F
Breed	0.93	2	1.07
Gender	0.98	2	0.22
Color	0.86	2	2.31
Size	0.97	2	0.35
Shelter	0.91	2	1.53

*p<.05, **P<.01

Direction of Detour: Long Fence. Whether the dog or the human was the demonstrator in this experiment, both demonstrators detoured to the right of the V-shaped fence. While many of the observing dogs were not able to complete the task,

several were showing that they preferred the direction their model detoured. A chi-square analysis was performed on whether dogs completed the task (yes or no) and the direction of detour (right or left). On Trial 1 there were significant direction differences $\chi^2(1) = 4.43, p < .05$ for dogs that completed the task. On the first trial, more dogs completed the task on the left side ($n=6$) than the right side ($n=1$) of the fence. Of dogs who did not complete the task, more dogs showed a preference for the right side ($n=11$) than the left side ($n=7$). Out of the remaining dogs ($n=10$) none completed the task and showed no preference in direction. The second trial showed that there were no directionality differences, $\chi^2(1) = 1.89, p > .05$. On the second trial, more dogs completed the task on the left side ($n=5$) than the right side ($n=2$) of the fence. Of dogs who did not complete the task, more dogs showed a preference for the right side ($n=9$) than the left side ($n=6$). Out of the remaining dogs 13 dogs none completed the task and showed no preference in direction. On the last trial dogs did not show differences in direction, $\chi^2(1) = 3.04, > .05$. Dogs who were completing the task showed roughly equal preference for the left side ($n=4$) and the right side ($n=3$). Of the dogs who did not complete the task, but showed a preference, more dogs preferred the right side ($n=12$) than the left side ($n=3$). Thirteen dogs did not show a preference in direction and did not complete the task. As the trials progressed, more dogs preferred the right side of the fence than the left side when detouring, see Figure 3.2. This result supports our sixth hypothesis that dogs would show a preference for the detour route of their demonstrator.

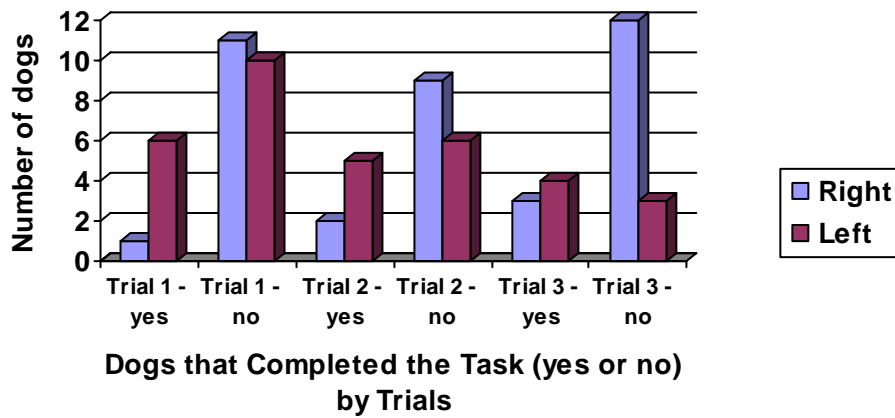


Figure 3.2 Long fence: Number of dogs to show a preference for direction of detour by Trials

3.2.2 Shortened Fence Task

Repeated Measures Analysis of Variance. Similarly to the long fence task, a repeated measures analysis of variance (ANOVA) was used in SAS GLM for the variables of Demonstrator (human or dog) and Familiarity (human or dog) for the dependent measures of three trials (Trial 1, Trial 2, Trial 3). With the use of Wilks' criterion the combined DVs were not affected by Demonstrator $F(3, 23) = 0.86, p > .05$ or Familiarity $F(3, 23) = 0.18, p > .05$ or their interaction, $F(3, 23) = 2.57, p > .05$. None of our hypotheses were supported in the data in the shortened fence data. Unlike the long fence task, more dogs were able to complete the task. However, the increase in learning is due to the task being easier rather than effects from our independent variables. Similarly to the long fence data, performance did not improve with repeated demonstration (See Table 3.3).

Table 3.3 Short fence: Mean and Standard Deviations in Seconds to Complete Task by Familiarity and Demonstrator

Level of Familiarity	Level of Demonstrator	N	Trial 1	Route of Detour		Trial 2	Route of Detour		Trial 3	Route of Detour	
				L	R		L	R		L	R
Familiar	Human	6	30.00 (25.31)	2	4	34.17 (22.56)	2	4	26.50 (26.64)	2	4
Familiar	Dog	6	35.17 (21.54)	2	4	27.83 (26.15)	2	4	28.50 (25.24)	2	4
Unfamiliar	Human	6	30.17 (24.89)	2	4	26.83 (26.47)	2	4	24.33 (27.78)	2	4
Unfamiliar	Dog	6	22.17 (11.92)	0	6	26.17 (25.98)	1	4	19.38 (21.84)	1	5
Control	Control	6	33.50 (29.06)	3	3	27.33 (26.55)	2	4	27.33 (25.77)	2	4

The frequency of successfully detouring dogs was subjected to a chi-square analysis to determine if learning varied by condition throughout the trials. For Trial 1 $\chi^2(4) = 3.80$ $p > .05$, Trial 2 $\chi^2(4) = 0.34$, $p > .05$, and Trial 3 $\chi^2(4) = 0.63$, $p > .05$ dogs were not learning differentially by conditions. See Figure 3.2.

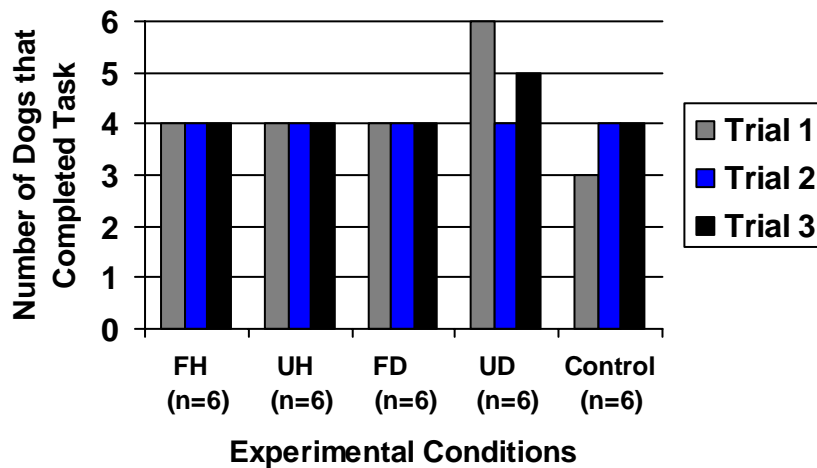


Figure 3.3. Short Fence: Number of Dogs to Complete the Task by Condition

Repeated Measures Analysis of Covariance. A repeated measures analysis of covariance (ANCOVA) was used by SAS GLM for the shortened fence task. Similarly to the long fence task, covariates in this analysis include Gender (male or female), Color (light, medium, dark) Shelter (Arlington or Fort Worth), Size (sm, med, lg.), and Breed (sporting, herding, other). None of these variables were significant covariates in the ANCOVA analysis across the three trials. See Table 3.4.

Table 3.4 Summary of Repeated Measures ANCOVA

Wilks' Lamda	Value	df	F
Breed	0.69	2	1.52
Gender	0.87	2	1.62
Color	0.93	2	0.45
Size	0.93	2	0.81
Shelter	0.89	2	1.31

*p<.05, **P<.01

Direction of Detour: Shortened Fence. The shortened fence task was exactly the same as the long fence task, but the task was easier since the distance was not as long. Different patterns occurred in the shortened fence task as compared to the long fence task. By definition, completing the task involved a “preference” in direction of detour; however, dogs could show a preference but still not complete the task. A chi-square analysis was performed on the variables of preference (left or right) and task completion (yes or no). All dogs that showed a preference in direction in Trial 1 completed the task. These variables could not be analyzed according to chi-square due to missing values. Of those that completed the task in Trial 1, more dogs preferred the right side (n=12) over the left side (n=9). The remaining 9 dogs did not show a preference in direction or complete the task. In Trial 2, all dogs that showed preference for the task completed the

task. Of those that did complete the task, twelve (n=12) preferred the left side and eight (n=8) preferred the right side. Ten dogs (n=10) had no preference in direction and did not complete the task. In the last trial there were no missing values, however, there were no significant differences in direction, $\chi^2(1) = 2.24, p > .05$. Every dog (n=15) that preferred the left side completed the task while only six dogs (n=6) completed the task and showed preference for the right direction. Only one (n=1) dog showed a preference for the right side (n=1), but did not complete the task. The remaining eight dogs (n=8) did not complete the task and showed no side preference. These data indicate that dogs in the shortened fence task did not choose the route of their demonstrator as we found in the long fence task. If anything, observing dogs increasingly preferred the left side of the fence which violates our hypothesis that dogs would exhibit observational learning by using the route of their demonstrator See Figure 3.4.

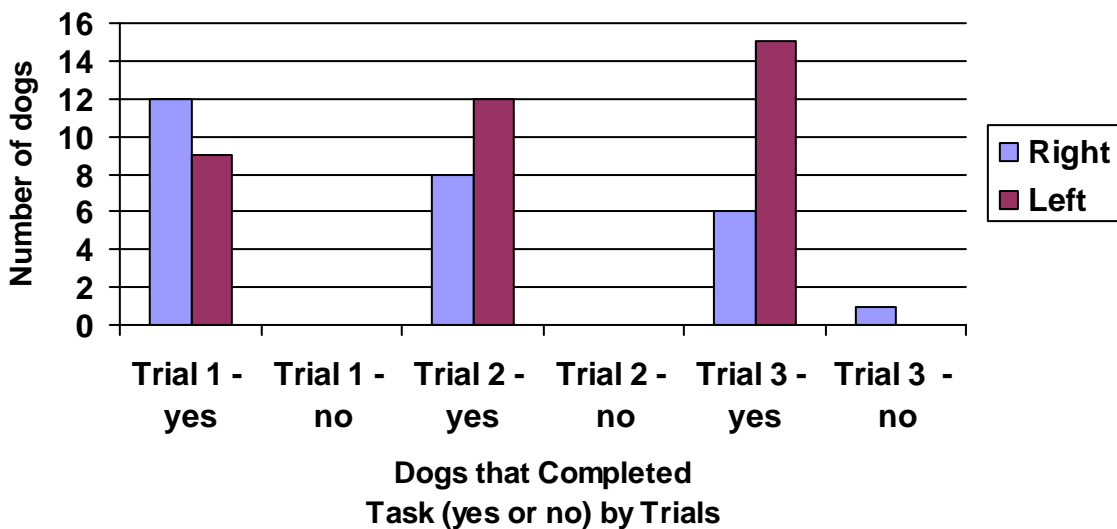


Figure 3.4 Short fence: Number of dogs to show a preference for direction of detour by Trials

Model Dogs. In the shortened fence task, two model dog demonstrators were utilized. Our analysis showed that observing dogs' performance in the task was consistent between both model dogs. An additional Repeated Measures ANOVA using Model Dog (Harley or Beatle) as an independent variable and the three trials for each observing dog (Trial1 Trial2 Trial3) as dependent variables was not significant. Wilks' criterion found that the combined DVs were not significantly affected by the Model dogs, $F(2, 26) = 1.34, p > .05$. See Table 3.5 for means for each model dog.

Table 3.5 Means and Standard Deviations for Observing Dogs by Model Dog Demonstrator

Model Dog	Trial 1	Trial 2	Trial 3
Beatle	30.67 (16.01)	29.44 (23.98)	26.06 (25.15)
Harley	26.67 (21.01)	25.50 (26.51)	22.00 (20.94)

3.3 Discussion

None of our hypotheses were supported in the analyses. We intended the experiment to include the long fence task only, but while we were collecting data we noticed poor learning performance and task difficulty issues. Most dogs would begin the task by leaving the starting point and then would attempt to dig under the tip of the v-shaped fence. Dogs appeared more interested in going under the fence or over the fence, but never seemed to go around. Eventually dogs would give up or become distracted after a few seconds of being unable to reach the target. We hypothesized that if we made the task easier by shortening the fence, improvements would occur. We were correct; the data became more interesting. Frequency counts show that in the

difficult task, only 26% of dogs were able to complete Trials 1, 2, and 3. This indicates that the majority of the dogs were giving up or becoming distracted while the human experimenter was attempting to verbally and gesturally encourage the dogs to go around. Since the percentages were equal between conditions, learning rates did not seem to improve with increased demonstration. Dogs in the easy task showed an ability to complete the task in Trial 1 (70%), Trial 2 (67%) and Trial 3 (70%). While the data collection became more interesting, overall significance levels did not change for our independent variables. Any differences in task performance between trials were likely because the task was easier, not because of effects from the independent variables.

In the Shortened fence task, two model dogs were demonstrators. This was a change in our methodology and was not planned, but brought about by necessity. However, the results from the difference between demonstrators are interesting. Harley continued to display protective behavior during Experiment 2 and when he became ill, it gave us a chance to determine if his behavior was confounding our results. Beatle was not protective of the human demonstrator and did not display the overt aggressive behaviors that Harley displayed (i.e.: occasional growling, barking). Our data indicated that observing dogs did not perform the task any more efficiently from Beatle than Harley. In fact, the means illustrate that dogs were performing slightly faster when Harley was the demonstrator. These results should be interpreted with caution since sample sizes were small for both dogs.

We are quite perplexed as to why we did not show any effects of observational learning in Experiment 2. We originally considered replicating a procedure in Pongracz

et al.'s (2001) study by allowing a human demonstrator to stand in the crux of the fence and verbally encourage the dog to detour the fence to reach her. We decided against this because we wanted to isolate the effects of familiarity between dogs and humans. Obviously the model dog would be unable to verbally encourage an observer dog to reach him. Also, it would have been extremely difficult to train the model dog to stay in one place through repeated trials. We determined that our version of this task took the important elements of Pongracz's study by replicating the V-shaped fence and then using some of their procedures and creating some of our own procedures for our independent variables. Our data indicates that the long fence task was too difficult. Before changing the task, we anecdotally tested one dog that was familiar with the experimenter in the manner of Pongracz et al (2001) by allowing the human demonstrator to stay in the crux of the V-shaped fence. While this was only one dog and hardly represents generalizability of performance in all dogs, the data was not encouraging enough to continue. The dog increased his rate of digging under the fence and made several attempts to jump over the fence to reach the human demonstrator. We let this task go on for 2 minutes and the dog never attempted to go around the fence, he only stayed at the tip of the V. After much deliberation, we decided to shorten the fence in the hope that the easier task would improve performance rates and show effects for our independent variables. The results of this manipulation indicate that this did not occur. Pongracz et al. (2001) found that the outward V-shaped fence task was more difficult for dogs than the inward V-shaped fence task. Our data confirms that the outward V-shaped fence task was difficult for the dogs we tested.

Pongracz et al. (2001) were able to demonstrate that human demonstration improved a dog's performance in the detour task. While we used a slightly different procedure, we were unable to replicate this finding. We are uncertain if procedural differences are the sole cause of the failure to replicate this finding or if other limitations played a role as well.

Limitations to Experiment 2. Overall the data for Experiment 2 was disappointing and showed no effects for our independent variables. We were not even able to show that dogs preferred the route of the demonstrator, since preference was roughly equal, if not even more in favor of the left side. It is worth noting that Pongracz et al. (2003) was unable show observational learning through side preference. However, there were several limitations to this study that could have influenced dog performance in this detour task.

In Pongracz et al's experiments (2001, 2003) they used primarily pure-bred dogs that were companion dogs. We used mixed-bred dogs that were shelter dogs. Perhaps genetic differences could have been a factor. Future studies should use this task between pure-bred dogs and mixed-bred dogs to find any genetic differences. Of course, many of our "mixed-breed" dogs could have been pure-bred, but there is no way of knowing. Probably the biggest difference in our study can be traced to the differences between a companion dog and shelter dog. Stress differences could play a significant role in performance variability. Future studies should test the cortisol levels in shelter dogs versus companion dogs to determine if these differences have any impact on performance rates. In addition, we attempted to replicate the human-canine

familiarity relationship through 15 minute play sessions with dogs. It is quite likely that the years of bonding between canine and owner in Pongracz et al.'s (2001, 2003) studies leads to better performance rates than only 15 minutes of play. We would like to replicate our experiment using pure-bred companion dogs in a two dog household. The human demonstrator would then be their familiar owner and the dog demonstrator would be the familiar conspecific.

Another limitation to this study compared to Pongracz et al (2001) is that they tested dogs by letting dogs detour the fence on their own and if detour performance was under 60s then they would assign dogs to additional conditions. We decided to use a control condition to compare dogs' individual learning rates to social learning rates, but we did not find any difference between these two conditions (UH vs. Control). Since we used dogs that may have otherwise been eliminated if we used Pongracz's procedure, this could explain why we did not find stronger effects for our independent variables. This could be a significant limitation to our findings. However, this does not explain why we did not find significant differences between our conditions. Even if dogs were included in our sample that would have otherwise been eliminated, due to random assignment, these dogs should have been evenly distributed throughout all conditions.

CHAPTER 4

GENERAL DISCUSSION

4.1 Conclusions

We conducted two experiments to test the effects of observational learning in domestic dogs and influences of familiarity with a heterospecific and conspecific on performance rates in dogs. The second experiment used a detour task to test observational learning and familiarity effects in dogs. We saw no effects of familiarity between demonstrators, nor did we find any effects overall. Since humans were present during the entire experiment, there could have been elements of social enhancement (Galef, 1988) across conditions. We speculate that, overall, this task was too difficult in the long fence version, which is why we did not show any effects. However, making the task easier seemed to only bring about individual learning and no social learning influences. In the future the V-shaped fence should be used in the inward position rather than the outward position to make the task easier. As well, dogs that do not complete the task on their own in under 60s should be eliminated in future studies.

The first experiment used a verbal command and a natural behavior (sit) in the dogs' repertoire to test observational learning. We were surprised that there were no effects of observational learning in this study between the control condition and UH/UD. There could have been effects of social enhancement (Galef, 1988) since humans (familiar and unfamiliar), especially the trainer, were present during the

experiment. Our findings in Experiment 1 were unable to replicate Gent and Mellgren's (2005) finding that observational learning does occur through verbal training commands. However, we did find that familiar heterospecific demonstrators influence learning at a greater rate than familiar conspecific demonstrators. While observational learning may not have occurred in experiment 1 between the control condition and UH/UD, a form of social learning certainly did occur in all other conditions. Social enhancement can occur when the simple presence of others motivates performance of responses already in an individual's repertoire (Galef, 1995). Social enhancement may have occurred since the human demonstrator was involved in all conditions during the training procedure. However, social enhancement does not explain why FH/FD performed at much higher rates than the control condition. While the control condition was not familiar with the demonstrators, the mere presence of these individuals still occurred. Some form of social learning occurred during our experiment. We speculate that familiarity with a demonstrator mediates observational learning so that increased learning will occur when dogs are familiar with their demonstrator and decreased learning will occur when dogs are unfamiliar with their demonstrator. This could explain the differences between FH/FD and UH/UD and the differences between FH/UD and UH/FD. Familiarity may mediate observational learning, but in order to determine this we need a comparison condition where dogs receive familiarity, but do not receive observational learning. Lastly, we found that observing dogs are learning at

a faster rate from a heterospecific than a conspecific and this illuminates the importance of the human-canine relationship. This data supports much of the evolutionary evidence (Lindsay, 2000; Frank and Frank, 1982; Lorenz, 1965; Miklosi et. al, 2004; Tuber et. al, 1996; Topal et. al, 1998) regarding the co-evolutionary relationships between humans and dogs.

We have conducted our research at animal shelters for several reasons, but one of the most important is to work with dogs that have otherwise been discarded by society. Many of these dogs are abandoned and awaiting euthanasia; approximately 80% of the dogs at our area shelters will be euthanized. Many of the dogs we worked with were euthanized on the same day we conducted our research or soon thereafter. If our work towards canine social learning in animal shelters is able to produce any form of contribution, we hope that it is to raise awareness of the importance of the human-canine relationship.

APPENDIX A

RATING CHECKLIST FOR DOG VIDEOS

Rating Checklist for Dog Videos

Directions: View each video clip and answer the following questions for each dog.

Report how many seconds there were between the trainer saying the command “squat” and the “push” on the dog’s behind. Use the provided stop watch to capture the actual time:

1. For the first “squat” behavior, the latency was:

2. For the second “squat” behavior the latency was:

3. For the second “squat” behavior the latency was:

4. After viewing the entire clip, did the trainer reward the “squat” behavior with a treat reward
a) always b) sometimes c) never

5. Count how many times the command “squat” was said without the trainer pushing the dog’s behind.
a) never b) once c) twice d) three times e) over three times

6. After viewing the whole clip, how many total verbal reinforcers did you hear after the “squat” behavior was elicited?
a) none b) less than three c) 3 to 6 d) 7 to 10 e) over 10

7. In the total clip, how long did the verbal reinforcers last?
a) less than a couple seconds b) under 10 seconds c) under 20 seconds d) under 30 seconds e) more than 30 seconds

REFERENCES

- Adler, L.L., Adler, H.E. (1977). Ontogeny of observational learning in the dog (*Canis familiaris*). *Developmental Psychobiology*, 10, 267-271.
- Adler, L. L., Adler, H. E. (1982). Comparison of problem-solving performance in six-week-old wolves and dogs. *Animal Behaviour*, 30(1), 95-98.
- Albert, A., Bulcroft, K. (1988). Pets, families and the life course. *Journal of Marriage and Family*, 50, 543-552.
- Allen, K., Blascovich, J. (1996). The value of service dogs for people with severe ambulatory disabilities: A randomized controlled trial. *Journal of the American Medical Association*, 275 (13), 1001-1005.
- Altshuler, D.L., Nunn, A.M. (2001). Observational learning in hummingbirds. *The Auk* 118 (3), 795-799.
- Armstrong, E.A. (1951). The nature and function of animal mimesis. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.
- Bandura, A., Grusec, J.E., Menlove, F.L. (1967). Vicarious extinction of avoidance behavior. *Journal of Personality & Social Psychology* 5(1), 16-23.
- Bandura, A., Menlove, F. L. (1968). Factors determining vicarious extinction of avoidance behavior through symbolic modeling. *Journal of Personality & Social*

Psychology 8(2, PT.1) 99-108.

Baylev, D.K. (1979). Destabilizing selection as a factor in domestication. *Journal of Heredity*, 70, 301-308.

Beck, B.B., 1982. Chimpocentrism: Bias in cognitive ethology. *Journal of Human Evolution* 11, 3–17.

Berger, S.M. (1962). Conditioning through vicarious instigation. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

BIS Shrapnel Global Marketing Intelligence and Forecasting. (1999) *Contribution of the Pet Care Industry to the Australian Economy*, third ed. pp.9-15

Boyd, R., Richerson, P.J. (1985). *Culture and the Evolutionary Process*. Chicago:University of Chicago Press.

Box, H.O. (1984). Primate behavior and social ecology. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Buss, D.M., Kenrick, D.T. (1998). Evolutionary social psychology. In. Gilbert, D.T.,Fiske, S.T., *The handbook of social psychology: Vol. 2* (4th ed., pp. 982-1026). New York: McGraw-Hill.

Byrne, R.W. and Russon, A.E. (1998). Learning by imitation: a hierarchical approach. *Behavioural and Brain Sciences*, 21, 667-721.

Byrne, R.W. and Tomasello, M. (1995). Do rats ape? *Animal Behaviour*, 50, 1417-1420.

Byrne, R.W. Whiten, A. (1988). *Machiavellian intelligence: Social expertise and the evolution of intellect in monkeys, apes and humans*. Clarendon Press, Oxford.

Call, J., Brauer, J. Kaminski, J., Tomasello, M. (2003). Domestic dogs (*Canis familiaris*) are sensitive to the attentional states of humans. *Journal of Comparative Psychology*, 117 (3), 257-263.

Clayton, D.A. (1978). Socially facilitated behavior. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Clutton-Brock, J. (1996). Origins of the dog: domestication and early history. In: Marston, L.C., Bennett, P.C. (2003). Reforging the bond – towards successful canine adoption. *Applied Animal Behavior Science*, 83, 227-245.

Cook, M. Mineka, S. Wokenstein, B., & Laitsch, K. (1985). Observational conditioning of snake fear in unrelated rhesus monkeys. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Cooper, J.J., Ashton, C., Bishop, S., West, R., Mills, D.S., Young, R.J. (2003). Cleverhounds: Social cognition in the domestic dog (*Canis familiaris*). *Applied Animal Behaviour Science*, 81, 229-244.

Cronhelm, E. (1970). Perceptual factors and observational learning in the behavioural development of young chicks. In; *Social behaviour in birds and mammals* (Ed.By J.H. Crook) 393-439. London: Academic Press.

Csyani, V. (translation 2005). *If dogs could talk: Exploring the canine mind*. New York: North Point Press.

Darwin, C. (1871). *The descent of man*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Davey, G. (1981). *Animal Learning and Conditioning*. Macmillan Education Ltd., London.

Fox, M.W. (1967). Influence of domestication upon behavior of animals. *Veterianarian Record*, 80, 696-702.

Frank, H. and Frank, M.G. (1982). On the effects of domestication on canine social development and behavior. *Applied Animal Ethology*, 8, 507-525.

Gacsi, M., Topal, J., Doka, A., Csanyi, V. (2001). Attachment behavior of adult dogs (*Canis familiaris*) living at rescue centers: Forming new bonds. *Journal of Comparative Psychology*, 115, 423-431.

Galef, B.G. Jr (1995). Why behavior patterns that animals learn socially are locally adaptive. *Animal Behavior*, 49, 1325-1334.

Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef

(Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28).

Hillsdale, NJ: Erlbaum.

Galef, B.G. Jr. and Whiskin, E.E. (2001). Interaction of social and individual learning in food preferences of normal rats. *Animal Behaviour*, 62, 41-46.

Gent, L.M. & Mellgren, R.L. (2005). "Social Learning: An Investigation into Observational Learning in the Domestic Dog (*Canis familiaris*)," paper presentation at the Southwestern Comparative Psychological Associations' conference in Memphis, TN.

Gerwolls, M.K. (1990). Effects of confiding, emotional expression, and additional pet ownership on adult adjustment to the death of a companion animal. In: Sable, P. (1995). Pets, attachment, and well-being across the life-cycle. *Social Work*, 40 (3), 334-341.

Gould, R.A. (1970). Journey to Pulykara. In: Csyani, V. (translation 2005). *If dogs could talk: Exploring the canine mind*. New York: North Point Press.

Hall, K.L. (1963). Observational learning in monkeys and apes. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Hare, B., Call, J., Tomasello, M. (1998). Communication of food location between human and dog (*Canis familiaris*). *Evolution Communication*, 2, 137-159.

Hare, B., Tomasello, M. (1999). Domestic dogs (*Canis familiaris*) use human and conspecific social cues to locate hidden food. *Journal of Comparative*

Psychology, 113, 173-177.

Heyes, C.M., Dawson, G.R. and Nokes, T. (1992). Imitation in rats: Initial responding and transfer evidence. *Quarterly Journal of Experimental Psychology*, 45B, 229-240.

Heyes, C.M. (1994). Social learning in animals: Categories and mechanisms. *Biological Review*, 69, 207-231.

Humphrey, G. (1921). Imitation and the conditioned reflex. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Humphrey, N.K. (1976). The social function of intellect. In: Cooper, J.J., Ashton, C., Bishop, S., West, R., Mills, D.S., Young, R.J. (2003). *Clever hounds: Social cognition in the domestic dog (Canis familiaris)*. *Applied Animal Behaviour Science*, 81, 229-244.

Johnston, A.N.B., Burne, T.H.J., Rose, S.P.R. (1998). Observation learning in day-old chicks using a one-trial passive avoidance learning paradigm. *Animal Behaviour*, 56, 1347-1353.

Kipling, R. (1982). *Just so stories*. Garden City, New York: Doubleday.

Klopfer, P.H.(1961). Observational learning in birds: The establishment of behavioural modes. *Behaviour* 17, 71-80.

Ledger, R.A., Baxter, M.R. (1997). The development of a validated test to assess the temperament of dogs in a rescue shelter. In: Seksel, K., Mazurski, E.J.,

Taylor, A. (1999). Puppy socialization programs: short and long term behavioural effects. *Applied Animal Behaviour Science*, 62, 335-349.

Lindsay, S.R. (2000). *Handbook of applied dog behavior and training*: Vol. 1. Iowa State University Press.

Lorenz, K. (1964). *Man meets dog.*, London: Penguin Books.

Lund, J.D., Agger, J.F., Vestergaard, K.S. (1996). Reported behaviour problems in pet dogs in Denmark: age distribution and influence of breed and gender. *Preventative Veterinary Medicine*, 28, 33-48.

Marston, L.C., Bennett, P.C. (2003). Reforging the bond – towards successful canine adoption. *Applied Animal Behavior Science*, 83, 227-245.

McBride, A. (1995). The human-dog relationship. In: *The Waltham book of human animal interaction* (Ed. By I. Robinson), pp. 99-112. London: Pergamon.

McKinley, S., Young, R.J. (2003). The efficacy of the model-rival method when compared with operant conditioning for training domestic dogs to perform a retrieval-selection task. *Applied Animal Behaviour Science*, 81, 357-365.

McNicholas, J., Collis, G.M. (2000). Dogs as catalysts for social interactions: Robustness of the effect. *British Journal of Psychology*, 91, 61-70.

Miklosi, A., Polgardi, R., Topal, J. and Csanyi, V. (1998) Use of experimenter-given cues in dogs. *Animal Cognition*, 1, 113-121.

Miklosi, A., Polgardi, R., Topal, J., and Csanyi, V. (2000). Intentional behavior in dog human communication: an experimental analysis of ‘showing’ behavior in the dog. *Animal Cognition*, 3, 159-166.

Miklosi, A., Topal, J., Csanyi, V. (2004). Comparative social cognition: What can dogs teach us? *Animal Behaviour*, 67, 995-1004.

Mitchell, R.W., Thompson, N.S. (1986). Deception in play between dogs and people. In: Call, J., Brauer, J. Kaminski, J., Tomasello, M. (2003). Domestic dogs (*canis familiaris*) are sensitive to the attentional states of humans. *Journal of Comparative Psychology*, 117 (3), 257-263.

Mondelli, F., Previde, E.P., Verga, M.(2004). The bond that never developed: adoption and relinquishment of dogs in a rescue shelter. *Journal of Applied Animal Welfare Science*, 7 (4), . pp. 253-266.

Morgan, C.L. (1900). *Animal behavior*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Moulton, C., Wright, P., Rindy, K. (1991). The role of animal shelters in controlling pet overpopulation. *Journal of the American Veterinary Medical Association*, 198, 1172-1176.

Mower, O.H. (1960). *Learning theory and symbolic processes*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Patterson, J., Overmier, J.B. (1981). A transfer of control test for contextual associations. *Animal Learning & Behavior* 9(3), 316-321.

- Pennisi, E. (2002). A shaggy dog history. *Science*, 298 (5598), 1540-1543.
- Pet Food Institute (1999). *PFI Fact Sheet*. Washington, DC: Pet Food Institute.
- Pongracz, P., Miklsi, A., Kubinyi, E., Gurobi, K., Topal, J., Csyani, V. (2001). Social learning in dogs: the effect of a human demonstrator on the performance of dogs in a detour task. *Animal Behaviour*, 62, 1109-1117.
- Pongracz, P, Miklosi, A., Kubinyi, E, Topal, J., Csyani, V. (2003). Interaction between individual experience and social learning in dogs. *Animal Behaviour*, 65, 595-603.
- Ptronek, G.L., Glickman, L.T., Beck, A.M., McCabe, G.P., Ecker, C. (1996). Risk factors for relinquishment of dogs to an animal shelter. *Journal of the American Veterinary Medical Association*, 209, 572-581.
- Romanes, G.J. (1884). *Mental evolution in animals*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.
- Salman, M.D., New, J.G., Scarlett, J.M., Kass, P.H., Ruch-Gaillie, R., Hetts, S. (1998). Human and animal factors related to the relinquishment of dogs and cats in 12 selected animal shelters in the United States. *Journal of Applied Animal Welfare Science*, 1, 207-226.
- Salmon, P.W., Salmon, I.M. (1983). Who owns who? Psychological research into the human-pet bond in Australia. In: Marston, L.C., Bennett, P.C. (2003).

Reforging the bond – towards successful canine adoption. *Applied Animal Behavior Science*, 83, 227-245.

Schwartz, M. (1997). *A history of dogs in the early Americas*. New Haven and London: Yale University Press.

Scott, J.P. (1958). *Animal behavior*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Seksel, K., Mazurski, E.J., Taylor, A. (1999). Puppy socialization programs: short and long term behavioural effects. *Applied Animal Behaviour Science*, 62, 335-349.

Serpell, J.A. (1987). The influence of inheritance and environment on canine behavior: Myth and fact. *Journal of Small Animal Practice*, 28, 949-956.

Slabbert, J.M. and Rasa, O.A.E. (1997). Observational learning of an acquired maternal behaviour pattern by working dog pups: An alternative training method? *Applied Animal Behaviour Science*, 53, 309-316.

Soproni, K., Miklsoi, A., Topal, J., and Csanyi, V. (2001). Comprehension of human communicative signs in pet dogs. *Journal of Comparative Psychology*, 115, 122-126.

Spence, K.W. (1937). Experimental studies of learning and higher mental processes in infra-human primates. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In

T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Thorndike, E.L. (1898). *Animal intelligence*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Thorpe, W.H. (1956). *Learning and instinct in animals*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Thorpe, W.H. (1963). *Learning and instinct in animals* (2nd edition). In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Topal, J., Miklosi, A., Csanyi, V. and Doka, A. (1998). Attachment behavior in dogs (*Canis familiaris*): A new application of Ainsworth's (1969) strange situation test. *Journal of Comparative Psychology*, 112, 219-229.

Tuan, Yi-Fu (1984). *Dominance and Affection: The Making of Pets*. New Haven: Yale University Press.

Tuber, D.S., Sanders, S., Hennessy, M.B., Miller, J.A. (1996). Behavioral and glucocorticoid responses of adult domestic dogs (*Canis familiaris*) to companionship and social separation. *Journal of Comparative Psychology*, 110, 103-108.

- Tuber, D.S., Miller, D.D., Caris, R.H., Halter, R., Linden, F., Hennessy, M.B. (1999). Dogs in animal shelters: problems, suggestions and needed expertise. *Psychiatry Science*, 10, 379-386.
- Turner, E.R.A. (1964). Social feeding in birds. *Behavior*, 24, 1-46.
- Van der Borg, J.A.M., Netto, W.J., Planta, D.J.U. (1991). Behavioural testing of dogs in animal shelters to predict problem behavior. *Applied Animal Behaviour Science*, 32, 237-251.
- Verplank, W.S. (1957). A glossary of some terms used in the objective sciences of behaviour. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.
- Vila, C., Savolainen, P., Maldonado, J.E., Amorim, I.R., Rice, J.E., Homecutt, R.L., Crandall, K.A., Lundeberg, J. and Wayne, R.K. (1997). Multiple and ancient origins of the domestic dog. *Science*, 276, 1687-1689.
- Wallace, A.R. (1870). *Contribution to the theory of natural selection*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological laboratory*. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.
- Washburn, M.F. (1908). *The animal mind*. In: Galef, B.G. Jr (1988). *Imitation in animals: History, definition, and interpretation of data from the psychological*

laboratory. In T.R. Zentall & B.G. Galef (Eds.), *Social learning: Psychological and biological perspectives*. (pp. 3- 28). Hillsdale, NJ: Erlbaum.

Weiss, E., Greenberg, G. (1997). Service dog selection: effectiveness for dogs from animal shelters. *Applied Animal Behaviour Science*, 53, 297-308.

Wells, D.L., Hepper, P.G. (2000). The influence of environmental change on the behaviour of sheltered dogs. *Applied Animal Behaviour Science*, 68, 151-162.

Whiten, A. and Ham, R. (1992). On the nature and evolution of imitation in the animal kingdom: reappraisal of a century of research. In: *Advances in the study of behavior* (Ed. By P.J.B. Slater, J.S. Rosenblatt, C. Beer and M. Milinski), pp. 239- 283. New York: Academic Press.

Valsecchi, P., Choleris, E., Moles, A., Guo, C., & Maindardi, M. (1996). Kinship and familiarity as factors affecting social transfer of food preferences in adult Mongolian gerbils (*Meriones unguiculatus*). *Journal of Comparative Psychology*, 110 (3), 243-251.

Valsecchi, P., & Galef, B.G. (1989). Social influences on the food preferences of house mice (*Mus musculus*). *International Journal of Comparative Psychology*, 2 (4), 245-256.

Vila, C., Savolainen, P., Maldonado, J.E., Amorim, I.R., Rice, J.E., Homecutt, R.L.,Crandall, K.A., Lundeberg, J. and Wayne, R.K. (1997). Multiple and ancient origins of the domestic dog. Science, 276, 1687-1689.

Zapf, S. (1998) Service Animal Adaptive Intervention Assessment. In: Zapf, S.A., and Rough, R.B. (2002). The development of an instrument to match individuals with disabilities and service animals. *Disability and Rehabilitation* 24 (1/2/3), 47-58

Zentall, T.R., Sutton, J.E. and Sherburne, L.M. (1996). True imitative learning in pigeons. *Psychological Science*, 7, 343-346.

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