

A Comparison of Classical Counterconditioning and Differential Reinforcement of  
Alternative Behavior on Aggressive Behavior in Dogs

BY

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influenced my behavior but also have greatly influenced the lives of domestic animals. Kudos to them and other pioneers.

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## Abstract

Dogs that display aggressive behavior are a threat to society, their owners, and themselves. Classical counterconditioning and differential reinforcement of alternative behavior (DRA) are commonly used in practice to reduce such behavior. While both seem to be effective treatments for aggressive behavior there has not been a direct comparison between the two in the current context. The current study compared counterconditioning and DRA with two dogs. A reversal design was used to determine the effectiveness of both procedures. Both procedures demonstrated functional control over aggressive behavior. Aggressive behavior was quickly reduced to near zero levels with either program in place. Implications for use are discussed. Despite owners being trained to criteria, follow-up data suggest that aggressive behavior returned. Future research may compare owner acquisition and preference for counterconditioning and DRA.

## A Comparison of Classical Counterconditioning and Differential Reinforcement of Alternative Behavior on Aggressive Behavior in Dogs

Aggressive behavior in dogs is problematic to society, owners, and to the dogs themselves. In recent years, incidents of aggressive behavior in dogs have increased in frequency and severity (Michelazzi, Riva, Palestini, & Verga, 2004). Increased incidents of aggressive behavior have been followed by increased concern from the public (O'Sullivan, Jones, O'Sullivan, & Hanlan, 2008). One concern for society includes public health. Previous research has cited dog bites as a source of injury for people and a potential danger to the public. It is estimated that hospital emergency rooms treat over 300,000 dog bite injuries per year in the United States, some of which require hospitalization (Weiss, Friedman, & Coben, 1998). Annually, the cost of caring for these victims is \$164.9 million (Quinlan & Sacks, 1999). Many times these dogs are relinquished to local animal shelters (Salman, Hutchison, & Ruch-Gallie., 2000; Wells & Hepper, 2000). Society incurs costs associated with the care of housing such dogs, including food, housing, medical treatment, and staff. Professionals have estimated that in the San Francisco area the care for each dog in a shelter is between \$4000-\$20,000 per year.

Aggressive behavior is a problem for owners. It has been frequently cited as one of largest concerns reported to veterinary behaviorists (Beaver, 1994; Landsberg, G.M., 1991, & Voith, 1981). Reisner (2003) suggests that high rate of referrals may reflect the amount of emotional and physical stress that owners experience. Daily stress includes the risk of an occurrence of an aggressive act, strict management, and an interruption in typical activities (e.g., not having guests over, avoiding strangers on walks). Owners may also face fines and other legal consequences

(Blackshaw, 1991). Additionally, numerous studies have cited that aggressive behavior is a common reason for owner relinquishment and euthanasia (Salman et al., 2000; Overall & Love, 2001; Wells & Hepper, 2000).

Perhaps the greatest victims of dog aggression are dogs themselves. Displays of aggressive behavior are obvious signs that the animal is under distress (Wright, Reid, & Rozier, 2005). Not only is the behavior a problem, dogs are at risk because of the severe consequences for their behavior. In an attempt to punish aggressive behavior, owners and trainers may use harsh aversive stimuli (e.g., shock collars, choke chains, or prong collars) that often result in more severe aggressive behavior or the occurrence of yelping, displaying distress signals, and even experience the loss of bodily functions. In response to dog aggression, owners are sometimes advised to use “dominant” techniques including pinning their dog to the floor or flipping him over. These techniques can evoke additional fear and anxiety in an already distressed dog. As previously stated, dogs displaying aggressive behavior are at risk for relinquishment and euthanasia (Salman et al., 2000; Overall & Love 2001; Wells & Hepper, 2000). In fact, “dogs’ survival depends on their symbiotic relationship with people” (Wright et al., 2005, p. 145). Simply put, if a dog is not friendly towards people they risk losing their house or life.

In an attempt to properly assess and treat aggressive behavior, many animal behaviorists or trainers analyze the behavioral components of aggression (Wright et al., 2005 ). In doing so, the topography is considered. Dogs are often labeled as either “offensive” or “defensive.” The difference between the two is thought to be seen with the body postures and behaviors each dog exhibits. An “offensively aggressive” dog is generally considered more likely to bite. “The offensive component consists of behaviors that engage or that are designed to increase proximity

to a stimulus or circumstance” (Wright et al., p. 147). Offensively aggressive dogs tend to display the following characteristics: body weight forward, tail carriage high, corners of the mouth pulled forward, and ears erect (McConnell, 2005). A “defensively aggressive” dog is thought to be less likely to bite and more likely first attempt to avoid the stimulus. “The defensive component consists of those behaviors that disengage, including escape, freezing, defensive threat, avoidance, or other behaviors designed to decrease proximity to a stimulus or circumstance” (Wright et al., p. 147). Defensively aggressive dogs tend to display the following characteristics: body weight back, tail tucked, corners of the mouth pulled backward, and ears pinned towards the head (McConnell, 2005). Often different treatment methods are used based on the label the dog is given.

Additionally, it may be important to study why aggressive behavior is evoked. Aggressive behavior can be viewed as a reflex. “Reflexes are intimately concerned with the well-being of the organism” and can be explained in an “evolutionary sense” (Skinner, 1953, p. 54). Such reflexes have survival value. In such a context, aggressive behavior in dogs can be viewed as respondent behavior. Antecedent stimuli elicit behavior from the organism. Many studies have shown the ability for a pain-induced stimulus to elicit aggressive behavior from an individual towards themselves and others (Azrin, Hake, & Hutchinson, 1965; Gluck, Otto, & Beauchamp, 1985; Polsky, 2000).

Respondent procedures are used to reduce fear, phobic, and aggressive behavior. Jones (1924) is one of the most heavily cited research article using respondent conditioning to eliminate phobic behavior in children. Counterconditioning, sometimes referred to classical counterconditioning, Pavlovian conditioning, or cross-motivational transfer, is the most common

treatment to reduce aggressive behavior in dogs. “Classical counterconditioning is an extremely powerful agent for behavior change” (Wright et al., 2005, p. 151). In counterconditioning, the eliciting “stimulus (the conditioned stimulus (CS)) is linked with a pleasant” unconditioned stimulus (UCS) “in an attempt to replace distress responses with appetitive conditioned responses” (Wright, et al., 2005, p. 150). In this context, counterconditioning is expected to change behavior, but through a change in the individual’s emotional state. Research has shown counterconditioning to be effective in altering such a “state.” Dearing and Dickinson (1979) found that after counterconditioning an aversive stimulus (shock) to signal an appetitive one (jaw movements), the aversive stimulus was less effective in functioning as a punishing stimulus for lever pressing in rabbits. This may support the interpretation that classical counterconditioning actually produces a change in the motivational properties of a UCS. Veterinary and animal behaviorists suggest that “conditioning procedures that elicit changes in a dog’s emotional state should be more effective in reducing negative emotional behaviors than are procedures that attempt to treat the behavior directly”(Wright et al., 2005, p.150). However, some may argue that “as long as we conceive of the problem of emotions as one of inner states, we are not likely to advance a practical technology” (Skinner, 1953, p. 167).

Aggressive behavior is not simply viewed as a respondent, it is also viewed as an operant. Consider the previous view of Skinner’s (1953) role of evolution. It would be unlikely for evolution to occur ontogenetically, but phylogenetic contingencies placed on a breed or species may make aggressive behavior more reinforcing to the organism. The contingencies for survival may depend on such behavior. From this view, evolution of aggressive behavior could fit an operant paradigm. Despite whether evolution is viewed as an operant or a respondent, the

results can be seen with dogs. Certain breeds may be more susceptible to aggressive behavior and more apt to display offensively or defensively aggressive behavior.

Additionally, operant contingencies may maintain the aggressive behavior (e.g., dog barks at the mailman and he continues delivering mail and therefore is removed; child's face is in close proximity to dog, dog growls, child walks away crying; dog pulls on the leash, breaks free from the owner, and gains access to attack the stimulus). However, it may be impractical or unethical to extinguish such responding (i.e., impractical for mailman to stop walking, unethical to not remove the child's face upon hearing a growl or place an individual in harms way for an attack).

When trainers or owners consider reducing such aggressive behavior based on consequent events, often the use of positive punishment procedures are introduced. Common punishment procedures include the application of an aversive stimulus (e.g., shock, jerk on choke or prong collar, hanging the dog off of the ground with a choke or prong collar). Such procedures may result in a suppression of barking or growling, but increased severity (i.e., no longer growling or barking, but biting).

The use of differential reinforcement of alternative behavior (DRA), commonly referred to as operant counterconditioning or operant countercommanding, is often recommended by practitioners. Research has shown that such procedures are effective at decreasing aggressive behavior. For example, Orihel and Fraser (2008) successfully reduced aggressive behavior in 6 out of 9 dogs by prompting dogs to sit when encountering a stimulus that previously elicited aggressive behavior. Baisinger and Roberts (1972) successfully reduced shock induced aggressive behavior in rats by differentially reinforcing incompatible responses. The use of such

procedures do not result in the unwanted effects of treatment (i.e., increased severity of aggressive behavior) seen in some pain induced punishment procedures.

Regardless of its the origination, aggression can be conditioned by both operantly and respondently (Ulrich, 1966). In practice, counterconditioning and differential reinforcement of alternative behavior procedures are often combined. At the 81st Western Veterinary Conference, Yin suggested, “operant counter-conditioning...can be used as a second step after classical counter-conditioning has been used.” Slifer, Babbitt, and Cataldo (1995) successfully counterconditioned children’s distress during invasive procedures with preferred activities. Preferred activities were paired with invasive procedures. Later, reinforcement was provided contingent on engagement with preferred activities and compliance (e.g., DRA/DRI). Research has shown both reinforcement procedures and classical counterconditioning can reduce problem behaviors. While both of these treatment procedures are commonly used and combined in practice, there has not been a direct comparison of the two interventions with respect to the treatment of aggressive behavior in dogs. The purpose of the present study is to compare differential reinforcement of alternative behavior with classical conditioning in the treatment of aggressive behavior in dogs.

## Method

### *Subjects*

The subjects were two dogs that had a history of aggressive behavior at the front door. Both dogs were nominated by their owners to participate in the study. A current vaccine history was gathered for both dogs. Each dog was current on all vaccines including rabies.

Sadie was a 1-year-old toy poodle. She displayed aggressive behavior (e.g., charging, barking, growling, and running away) at the front door. Sadie displayed behavior that is commonly associated with defensive aggression. She ran and attempted to hide from the stranger. Her tail was tucked, corners of her mouth pulled backward, and ears were pinned. The behavior continued if guests remained standing or walked throughout the house. If guests sat and remained seated she would stop barking after several minutes. If guests stood or began moving she would begin displaying the aggressive behavior. Sadie did not have a history of biting strangers nor did she have a history of being obedience trained. A functional analysis was run prior to the study to determine that her barking was not maintained by attention.

Sadie lived with another dog, Zoe, who was present during the sessions. Prior to the start of the study sessions were run with and without Zoe. Owners reported seeing more typical behavior when both dogs were present. When Zoe was not present, Sadie would often attempt to gain access to Zoe when hearing the doorbell. When both dogs were present Sadie displayed aggressive behavior. Zoe ran to the door, but would greet the stranger in a friendly manner (i.e., if the stranger attempted to give Zoe attention she remained there and engaged with the stranger). Zoe rarely vocalized when guests were present at the door. Zoe was exposed to baseline and treatment sessions.



Durga was a 3-year-old Giant Schnauzer. She displayed aggressive behavior (e.g., charging, lunging, barking, and biting) at the front door. Durga displayed behavior that is commonly associated with offensive aggression. She charged toward the door with her body weight forward. Her ears were pointed toward the stranger and her tail was erect. However, if guests were seated in the house she would stop displaying aggressive behavior after several minutes. She would become aggressive again when guests moved from room to room. Durga had a history of biting strangers. She was reportedly more aggressive towards men and children. Durga had previously attended a basic obedience group class. The owners previously hired a trainer to come to the house. The trainer would ask Durga to sit and stay while attempting to answer the door. When doing so he did not give Durga edibles, but occasionally delivered verbal praise. The owner attempted to follow the instructions given by the trainer, but stopped the procedures laid out after several weeks.

### *Setting*

The study was conducted in each dog's house. Aggressive behavior was displayed at the front door. The front door at Durga's house was wood. The door contained three small windows at the top which gave Durga access to directly view the stranger's head. The door at Sadie's house was bevelled glass. The glass door allowed for a distorted but direct view of the stranger. Each house had large bay windows in the living area. A dog bed was placed in a nearby room with a direct view of the front door. Durga had two adults and two children in the house with her. Sadie lived with two adults and one other dog. Owners were present for some, but not all of the sessions.

### *Materials*

The current study used edibles for both dogs to serve as reinforcers. In both cases, hotdogs and dog treats (e.g., Benny Bully Liver treats, Meaty Bonz) were used. Sampling was done prior to the experiment in order to determine the edible to be used. Edibles were used that resulted in the largest increase in responding to a “sit” cue. All edibles were palatable and able to be consumed quickly. A clicker was used as a secondary reinforcer and to mark (i.e., communicate at the precise moment) the behavior of the dog. There was a direct (i.e. 1:1) pairing of the clicker and edible. Each dog dragged a 6ft leash throughout all of the sessions. The leash was to be put on several hours in advance prior to scheduled session times. The leash was used to tether Durga during the counterconditioning sessions. Each dog had a dog bed that was large enough for each dog to stand and turn around on. A video recorder and stopwatch was used for data collection.

### *Experimental Design, Behavior, Data Collection, and Reliability*

A reversal design was used in the study (Cooper, Heron, & Heward, 1997). An ABAC design was used for Sadie and an ACAB design was used for Durga. The conditions were reversed with each dog in order to increase interval validity. Both design sequences were tested in a “stranger inside” and a “stranger outside” condition. Training sessions were 30 seconds in length. Prior to the start of the experiment, sessions were run to determine the length of time between sessions in order to avoid habituation. Sadie’s sessions were run a minimum of 2 hours apart. Durga’s sessions were run a minimum of 2 minutes apart.

Owners reported that the most common behavior associated with aggression in their dog was barking. Sadie’s family was primarily concerned with the amount and duration of barking.

Durga's family was primarily interested in reducing and eliminating number of bites. It was unethical to provide opportunities for Durga to bite. Their secondary concern was barking. Because each dog vocalized while behaving aggressively, vocalization was measured. The behavior was defined as any vocalization made by a dog that could be heard while viewing the video recorded sessions. Since Sadie was present with another dog a cumulative amount (either or both Sadie and Zoe) of barking was measured. However, Zoe only barked in one of the intervals throughout all of the treatment sessions.

Attempts at implementation were measured. Attempted implementation of DRA procedures included continued attempts at prompting the dog to go to place (i.e., the dog bed), the use of a marker (e.g., clicker, "yes", clicking with tongue) and an edible, and an attempt at maintaining the dog on place position (i.e., staying on the dog bed). An attempt at counterconditioning procedures included tethering Durga because of her bite history, using a marker (e.g., clicker, "yes", clicking with tongue), and delivering edibles when the stranger was at the front door and in the house (see Tables 1 and 2).

Table 1. Checklist for Attempting Counterconditioning

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<b>Attempt at counterconditioning</b>
_____ Owners tethered Durga
_____ Owners clicked or used another marker (e.g., “yes”, sound of click with tongue)
_____ Owners fed edibles with stranger in house

Table 2. Checklist for Attempting Differential Reinforcement of Alternative Behavior

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<b>Attempt at differential reinforcement of alternative behavior</b>
_____ Owners verbally prompted Sadie to go to place
_____ Owners clicked or used another marker (e.g., “yes”, sound of click with tongue) when Sadie was on place
_____ Owners fed edibles to Sadie while she was on place with the stranger in the house

Sessions were video recorded by the experimenter and were measured by the stranger with a stopwatch. Partial interval recording method was used to determine whether vocalization occurred. Each 30 second session was divided into six 5-second blocks. If vocalization occurred the interval was checked as an occurrence.

Attempts at implementation were assessed using whole interval recording. If an attempt to implement treatment was made for the entire duration of the interval it was scored. If an attempt was not made throughout the entire interval, the interval was scored as no attempt.

Reliability was assessed by having two trained observers view the video tapes. The experimenter served as one of the observers. The other observer was trained using behavioral definitions, examples, and non-examples of the target behavior. Examples included low growling, barking, or whining. Non-examples included vocalizations made prior to the sound of the doorbell and after the session. A checklist was used to assess attempts at implementation. Spot checks were done to ensure there was no observer drift. Reliability was calculated using point-by-point method. The number of agreements was divided by the total number of comparisons and then multiplied by 100%. Reliability of the dependent variable was calculated in 59% of the sessions. Reliability of attempts at implementation was calculated in 100% of the follow-up sessions.

### *Procedures*

There were four conditions: pre-training, stranger outside, stranger inside, and follow-up.

*Pre-training.* Prior to the study, the experimenter trained each dog to go to place (i.e., her dog bed) as shown in Appendix A. The experimenter said the dog's name and "place." She was

given an edible upon going there and maintaining the position on the bed. Each dog was trained to maintain place position while the experimenter opened the front door in the absence of the stranger or any guests. Each dog was released and no more edibles were delivered when the experimenter said, “okay.” Durga completed five pre-training sessions and Sadie completed 10 pre-training sessions. Each dog was on an FR1 schedule for going to place and a schedule no richer than VI 30s schedule for maintaining position on the bed. Both dogs met a 90% criteria for going to place and maintaining the position for 5 minutes. While on place each dog was reinforced on average every 30 seconds for maintaining the position.

*Stranger Outside.* During these sessions the stranger remained outside. The experimenter did not open the door.

*Baseline (A).* Baseline data was collected. The stranger rang the doorbell, waited for 30 seconds outside the door, and then walked away. Throughout all baseline sessions the experimenter looked at the front door and did not attend to the dog. The only time the experimenter intervened was when Durga gained access to the front door and was repeatedly scratching the door. Owners had previously requested that she not scratch the door. The experimenter took Durga’s leash and pulled her behind the barrier and readjusted the barrier. This happened in two of Durga’s baseline sessions.

*Differential Reinforcement of Alternative Behavior (B).* During the differential reinforcement of alternative behavior (DRA) sessions both dogs were reinforced for going to place. The stranger rang the bell, waited outside for 30 seconds, and then left the house. Upon hearing the doorbell the experimenter verbally cued the dog to go to place. If she did not go to place the experimenter gave a hand signal cueing her to go to place. If she still did not go to

place the experimenter physically placed the dog onto the dog bed. If the dog came off of place the experimenter said “uh oh” and physically blocked or brought the dog back onto the bed. This happened two times with Sadie and did not happen with Durga (during treatment). While on the dog was on the bed the experimenter clicked and delivered an edible. Although the behavior of the dog determined the schedule of reinforcement both dogs were reinforced on a VI 10s while in place. The dog was released (i.e., the experimenter said “okay”) and no longer fed edibles when the stranger walked away.

*Baseline (A).* A reversal was done by removing treatment and returning back to baseline. Again, the stranger came to the door, rang the bell, waited for 30 seconds at the door, and then left the house. The experimenter did not attend to the dog.

*Counterconditioning (C).* During the counterconditioning (represented by CC on graphs) sessions the stranger would again ring the bell, wait 30 seconds, and then walk away. When the doorbell was rung the experimenter immediately clicked and delivered an edible to the dog. The experimenter continued to click and deliver an edible each time the dog made eye contact with the stranger or oriented her body towards the stranger. The experimenter did not click and deliver edibles unless the dog oriented towards the stranger. The experimenter did not attend to the dog unless she oriented towards the stranger. Each dog’s behavior determined the rate of delivering edibles (i.e., shaping and fading were used). Durga was fed on average every 5 seconds. Sadie was fed on average every 10 seconds. Once the stranger walked away edibles were no longer given.

*Stranger Inside.* During these sessions the experimenter opened the door and the stranger entered the foyer of the house. The stranger stood within five feet of the front door and stared at the floor in the direction of the dog.

*Baseline(A).* During baseline sessions the stranger rang the bell, waited for the experimenter to answer the door, entered the house, and stood 5 feet from the door. The sessions began with the doorbell and were timed to 30 seconds. During sessions with Durga, upon hearing the doorbell, the experimenter tethered Durga approximately 10 feet from the door, and then answered the door. A leash was tied to the banister of the steps and the experimenter attached Durga's leash to the already tethered leash. During sessions with Sadie, the experimenter answered the door without tethering Sadie. Sadie was not physically restrained, but the bedroom doors were all closed to prevent Sadie from hiding when owners were in a different room. Differences in procedures were accounted for because of the bite history of each dog. The experimenter and the stranger ignored Sadie and Durga during baseline sessions.

*Differential reinforcement of alternative behavior (B).* During DRA sessions the doorbell was rung, the stranger began the stopwatch, and waited for the experimenter to open the door. Upon hearing the doorbell, the experimenter cued the dog to go to place, reinforced (clicked and delivered an edible) the dog for going to place, and then answered the door. Zoe was instructed to go to place during Sadie's sessions. The dog(s) continued to get reinforced for maintaining the place position while the stranger entered the house. Both Sadie and Durga were reinforced on a VI 15s schedule in DRA sessions. Durga was not tethered while on place. The dog was released (i.e., experimenter said, "okay") and no longer fed edibles when the stranger walked away.



*Counterconditioning (C).* During counterconditioning sessions the doorbell was rung, the stranger began the stopwatch, and waited for the experimenter to open the door. Upon hearing the doorbell, the experimenter immediately clicked and delivered an edible. Durga was tethered as in baseline conditions for safety. Sadie was not physically restrained. The experimenter answered the door and continued to click and deliver edibles only when the dog oriented herself towards the stranger. Durga was given edibles on an average of every 7.5 seconds. Sadie was given edibles on an average of every 6 seconds. When the stranger left the house edibles were no longer given.

#### *Follow-up*

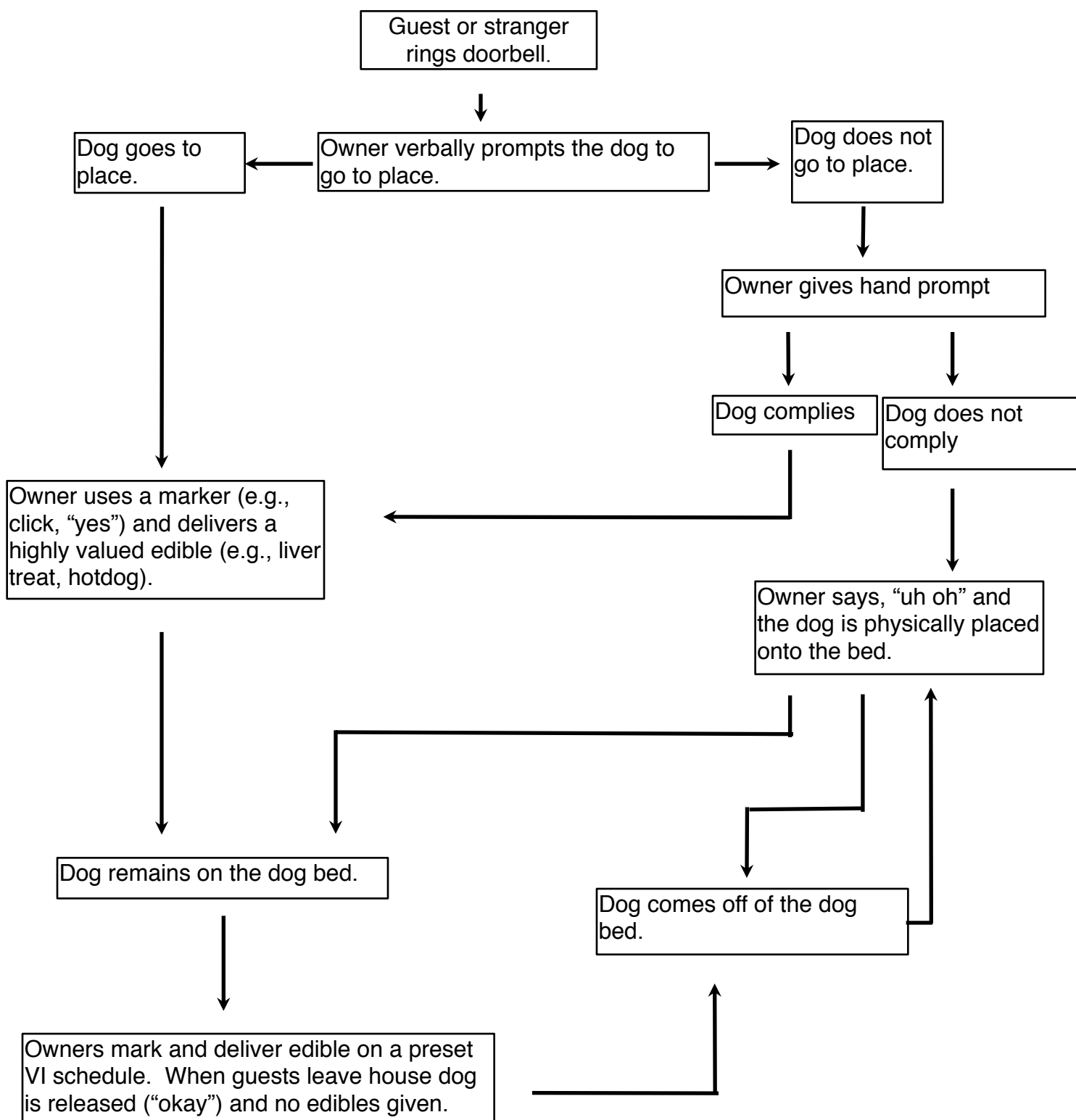
Owners were shown the data from both treatments. Each family was instructed to choose which treatment they wanted to use. Durga's family chose counterconditioning because "it seemed to make the most sense" and "it was the safest way to change her behavior." Sadie's family chose DRA because they preferred both dogs to be away from the door when guests came in the house. This made for more "obedient" dogs from their perspective. Both owners were trained in three 1-2 hour sessions. For counterconditioning, the experimenter modeled appropriate implementation with a stranger at the front door. The owner then rehearsed with the experimenter and the stranger. The experimenter prompted, gave performance feedback, and delivered verbal praise contingent on correct implementation. The experimenter faded prompts, feedback, and praise. For DRA, the experimenter modeled appropriate implementation without a stranger at the door. Owners took part in rehearsals with no strangers at the house. Once owners were implementing without prompts from the experimenter, rehearsals were done with the experimenter acting as the stranger. Verbal praise from the experimenter was delivered upon

correct implementation. Verbal praise and prompting were faded. Each owner was given step by step instructions for implementation and met a 90% criteria on implementation.

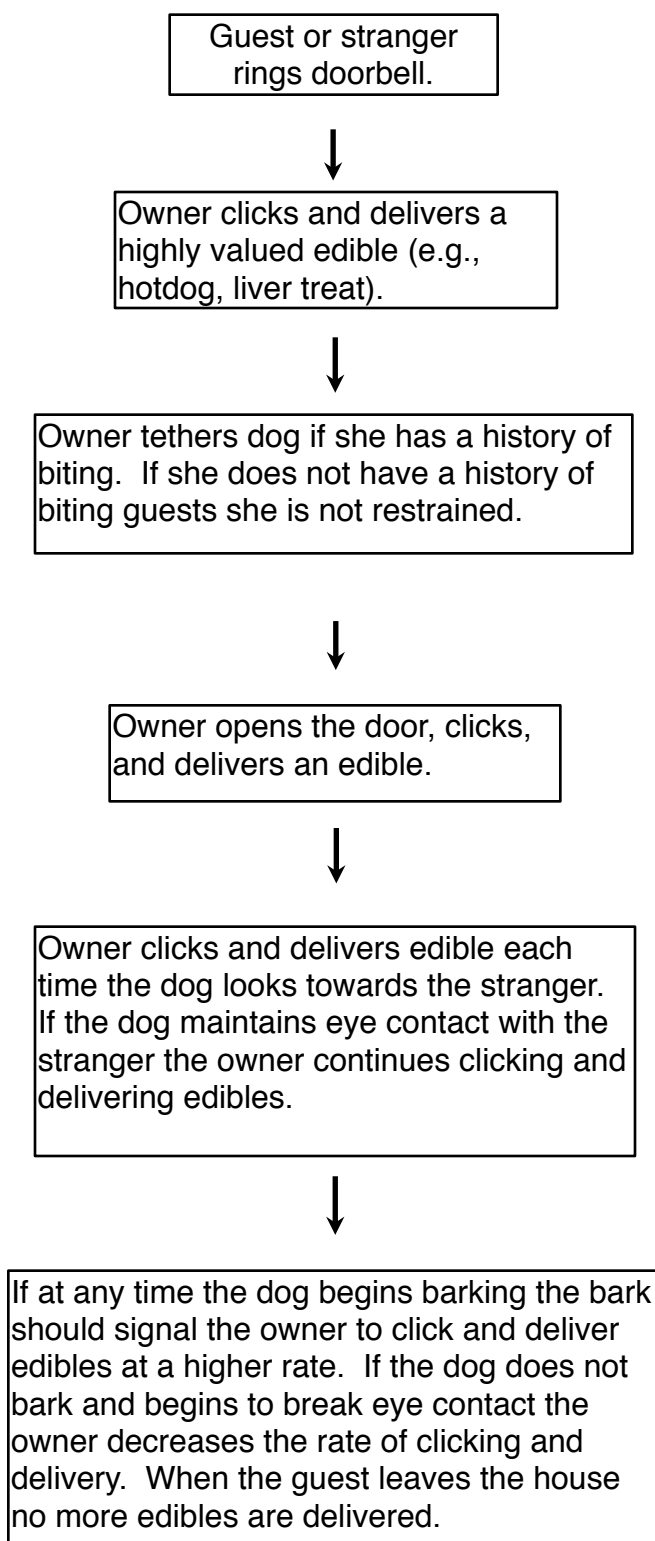
A total of six follow-up probes were taken for each dog after the study in order to measure aggressive behavior, attempts at implementation, integrity, and sustainability of each treatment. Both the experimenter and the stranger served as the stimulus during follow-up probes. Each stranger (i.e., the experimenter and the treatment stranger) visited each house equally, three times per dog. The owners were contacted and agreed to the follow-up probes, but were not told when they would occur. Sessions were 30 seconds in length and were video recorded by the stranger. Sessions began with the stranger entering the house and were conducted for 30 seconds. Sessions were not started with the sound of the doorbell because it was not feasible to measure owner or dog behavior until the stranger entered the house. Additionally, it generally took Sadie's owner longer to answer the door compared to Durga's owner.

For Sadie, two probes were taken in week 4, two probes were taken in week 6, one probe was taken in week 7, and one probe was taken in week 9. For Durga, two probes were taken in week 4, two were taken in week 6, and two were taken in week 9. The differences between the subjects were a result of owners traveling or not being home when the experimenter or stranger attempted to conduct the probe. Flow Chart 1 displayed DRA procedures owners should follow in follow-up. Flow Chart 2 displayed counterconditioning procedures owners should follow in follow-up.

Flow Chart 1. Differential Reinforcement of Alternative Behavior



## Flow Chart 2. Counterconditioning



## Results

Both dogs showed a pronounced decrease in aggressive behavior during treatment conditions. The results shown in Figures 1 and 2 suggest that both DRA and counterconditioning procedures decrease aggressive behavior at a similar rate. Durga's aggressive behavior averaged 84.75% of intervals during the first baseline conditions, was reduced to 3.2% of intervals during the first counterconditioning session, was reversed to 88.83%, and reduced to 0% during DRA conditions. When the stranger entered the house percent intervals behaving aggressively averaged 100% in baseline, was lowered to 3.2% of intervals during counterconditioning, was reversed to 81.2% of intervals, and was once again lowered to an average of 2% in DRA. For Sadie, aggressive behavior averaged 94.3% of intervals during baseline conditions, was reduced to 12.8% by DRA procedures, was reversed to 26.4%, and later lowered to 0% in counterconditioning sessions. When the stranger entered the house in baseline sessions percent intervals behaving aggressively averaged 83%, was reduced to 0% during DRA sessions, increased to 83% in the reversal, and later reduced to 0% of intervals during counterconditioning. Much of the aggressive behavior in the counterconditioning and DRA conditions was one occurrence of vocalization within the first interval upon hearing the doorbell.

### *Follow-up*

Follow-up data was collected between four and nine weeks after the experimenter trained owners. As shown in Figures 1 and 2, aggressive behavior was reversed. Durga averaged 77.8% intervals behaving aggressively. The overall average for Sadie behaving aggressively was 44.4%.

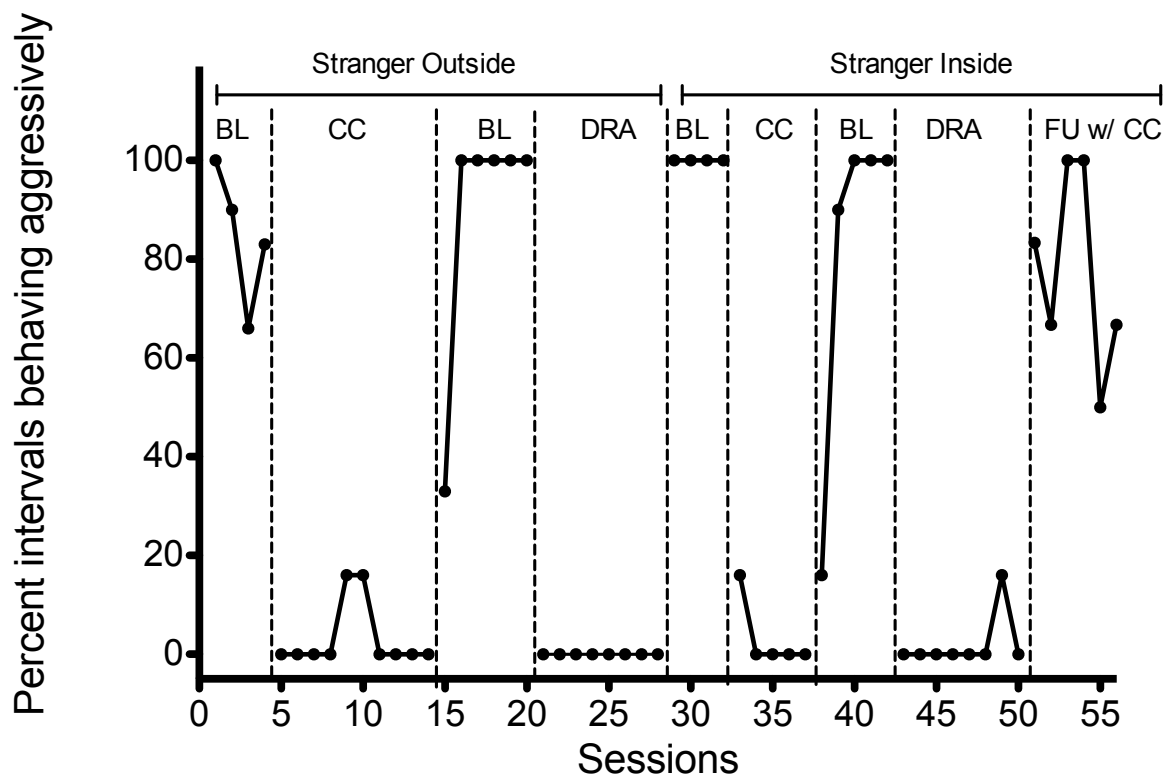


Figure 1. Percent intervals behaving aggressively with Durga. A comparison of classical counterconditioning and differential reinforcement of alternative behavior was tested between baseline sessions. Follow-up data with the owner implementing counterconditioning is presented.

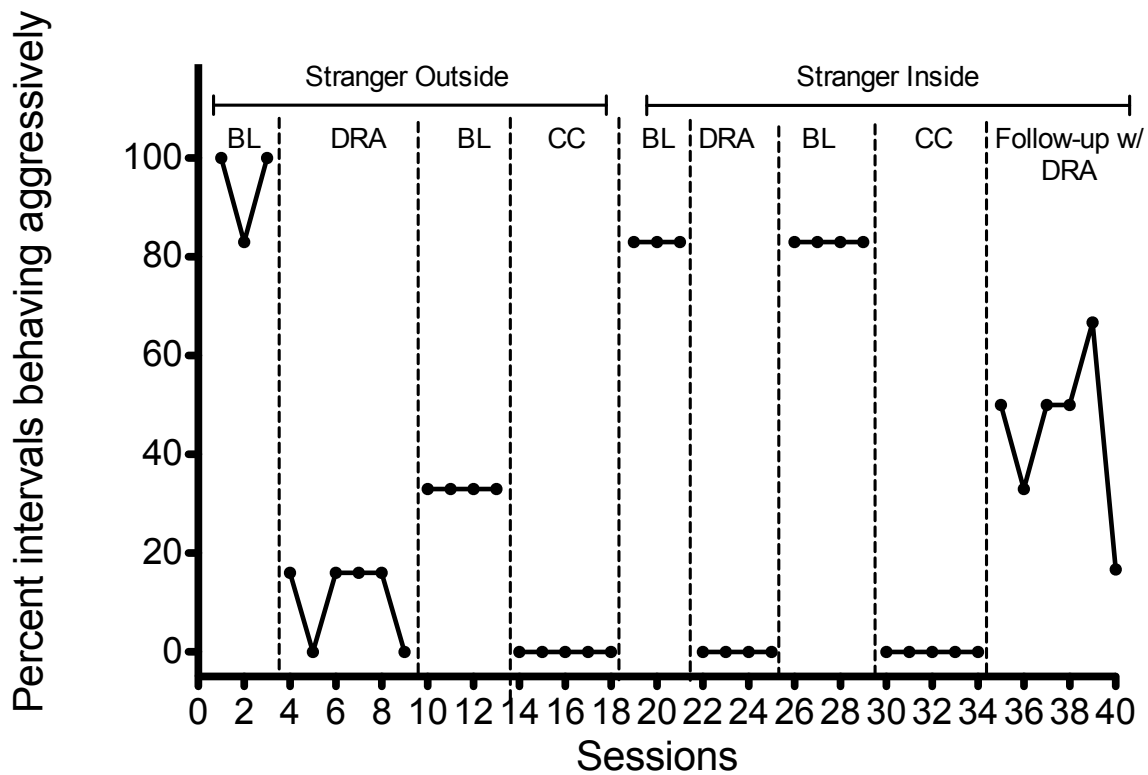


Figure 2. Percent intervals behaving aggressively with Sadie. A comparison of differential reinforcement of alternative behavior and classical counterconditioning was tested between baseline sessions. Follow-up data with the owner implementing differential reinforcement of alternative behavior is presented.

### *Preference for Treatment*

After the data were collected, it was shown to each owner. Durga's family chose counterconditioning. According to the owner, the procedures seemed like the "safest" way to teach Durga that "strangers were good." Sadie's family chose DRA procedures. This particular treatment appealed to them because it removed the dogs from the door when guests entered the house.

### *Attempts at Implementation*

Durga's family made an attempt to implement treatment in 97% of the follow-up probes. Sadie's family made an attempt to implement treatment in 100% of the follow-up probes.

### *Treatment Integrity*

Treatment was run differently in experimental conditions than in follow-up. However, it was difficult to specify from the video tapes the differences.

### *Reliability*

Reliability for the dependent variable was 98.5% with a range of 83-100%. Reliability for attempts of implementation was 100%.



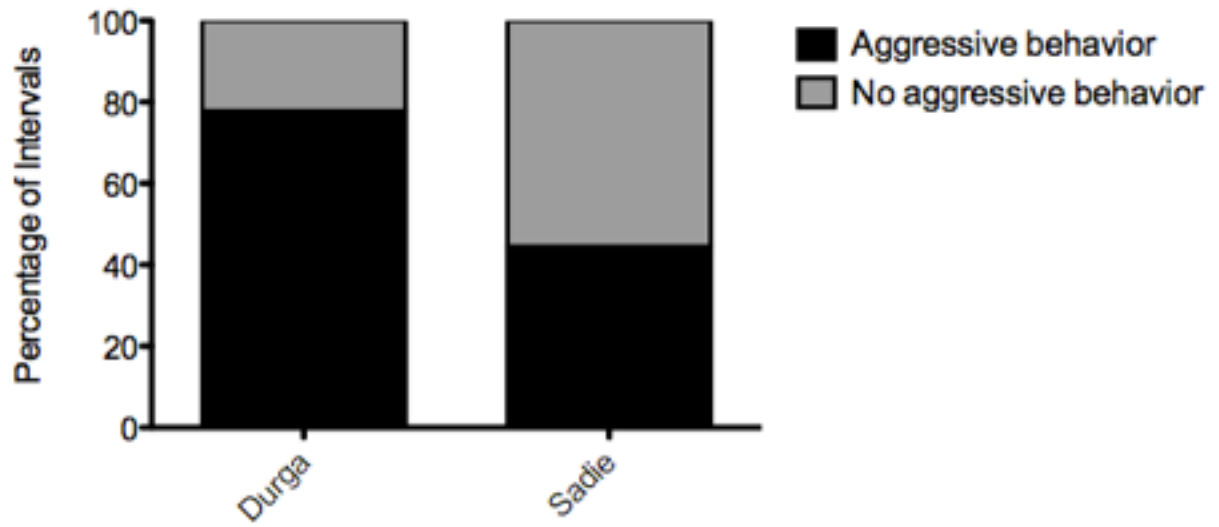


Figure 3. Percent of aggressive behavior in follow-up with Durga and Sadie.

## Discussion

Aggressive behavior was reduced by both treatments in each subject. The results confirm that both treatments are effective in reducing aggressive behavior. Contrary to what critics may suggest, the aggressive behavior was reduced significantly in a few short sessions. Despite the behavior's origination or its maintaining consequences, either procedure is effective. However, aspects of each treatment should be considered before implementation. Depending on the context in which aggressive behavior is displayed, one treatment may be more suitable.

Researchers, practitioners, and owners may consider cost with respect to effort, time, and money.

Wright et al., (1991) suggest that DRA procedures are more difficult because delivery of an edible is contingent on behavior. The effort in requiring behavior before delivering reinforcement may be greater than delivering edibles simply in the presence of the stranger. This problem could be solved by having the doorbell serve as a discriminative stimulus for place. Such stimulus control could significantly reduce effort. Alternatively, Snider (2007) suggests that classical counterconditioning requires extensive knowledge about dog behavior in order to effectively implement. For example, in the first follow-up probe with Durga she barked nearly all of the intervals. The owner reported that she was barking from a "friendly" perspective. Since it is common for dogs to bark in order to gain access to attention it may be difficult for owners to distinguish between the two. In some cases it may be unethical to run a functional analysis in order to determine if barking is being elicited or maintained by attention. Any vocalization could serve as a reminder that the rate of delivery of edibles is too slow. In the

current study, barking seemed to serve as a prompt for Durga's owner to deliver edibles in follow-up probes.

The effort in practicing procedures should be considered. In order to run counterconditioning guests or strangers must be present. It is recommended that owners have 3-5 guests over per week in order to see continued reduction in aggressive behavior. The large number of guests serving as stimuli may make the procedures effortful. Counterconditioning would be less effortful if dogs behaved aggressively on walks (i.e., access to strangers is easier at local parks or on walks). DRA procedures can be introduced and maintained without large numbers of guests serving as stimuli. For example, Sadie's owners maintained high levels of place by sending the dogs during dinner time and in the evening while watching television.

Amount of time and money spent should be considered when reviewing treatment options for clients (e.g., owners). Prior to the start of the experiment pre-training sessions were needed in order to teach place. It may be important to note the general cost of pre-training. In the current study, Durga received five pre-training sessions and Sadie received 10. It is likely to cost between \$500-\$1000 and 5-10 hours or more to run the pre-training for the DRA procedures. Counterconditioning procedures required no pre-training sessions. Therefore, counterconditioning conditions may require lower monetary costs than DRA procedures. For example, if owners are only able to afford one private consultations counterconditioning is recommended. Cost of training owners should be considered, but in the current study amount of owner training remained consistent across owners.

The use of reinforcers in the environment is an important component of maintenance of behavior change and sustained use of treatment. Social reinforcement from guests could serve

as a natural reinforcer for owner implementation. DRA procedures may be viewed more favorably by guests entering the house. Guests are likely to comment favorably on the behavior of the dog laying in his or her bed. Alternatively, social disapproval of using counterconditioning (e.g., delivering edibles non-contingently or while the dog is behaving aggressively) may punish owners for implementation. In both procedures, the removal of barking may negatively reinforce owners for implementation.

Safety is a consideration in research and practice. It is strongly recommended to either use a tether when using counterconditioning procedures or to use DRA if a dog has a bite history. Often times dogs will bite the owner or the nearest stimulus. Therefore, it is not recommended that dogs with a bite history be in close proximity to the door. If the dog's bite history includes bites resulting in puncturing of skin and requirement of medical attention complete management or euthanasia may be recommended. In some cases it may be too dangerous to use either procedure.

The current study used a reversal design (Cooper, Heron, & Heward, 2007) with two dogs to assess the effectiveness of both treatments. It sought to determine a clear representation of functional control or lack thereof. This particular design is beneficial in this context. One concern when comparing treatments may include effects from multiple treatment interference. This particular design controls for such effects. The design also controls for threats to internal validity including history, maturation, testing, instrumentation, regression, selection, and mortality (Campbell & Stanely, 1963).

While the design controls for threats to internal validity there are threats to external validity. One was the use of the experimenter serving as the implementer. This threat was made

more obvious when follow-up data revealed aggressive behavior returning despite owners implementation. Additionally, not all clients will have access to professional trainers. In order to determine the generality of the current study, treatment should be compared across more dogs, settings, and behaviors. By using one dog that displayed defensively aggressive behavior and one that displayed offensively aggressive behavior it was shown that both DRA and counterconditioning significantly reduce aggressive behavior whether the dog is displaying offensive or defensive behavior. This was done in order to determine differences in treatment outcomes across differently labeled dogs. Using such dogs improved the likelihood of generalization across dogs. The behavior in the current environment (front door) is likely to be generalizable across other environments (outside on a walk). A general repertoire of behavior could be taught to serve alternative behavior. Another limitation was the use of only one stranger. This was done in order to control for the variability in behavior that may have resulted from different stimuli (e.g., more aggressive behavior displayed with a large male with facial hair compared to a small female). Generalization across stimuli was not obvious in the current study. However, the stranger used in the study was reported by both owners to elicit the most aggressive behavior from each dog.

There were additional limitations. Sessions were kept short to avoid habituation with the stranger. Longer sessions may have shown continued improvement and maintenance of behavior change. Rates of delivering edibles could have been lowered with continued reduction in aggressive behavior. The current rate may not be feasible for owners when guests enter their house. A limitation of DRA procedures is that a novel behavior was shaped rather than using a behavior that was already in the dog's repertoire. This is done in practice and in the current

study for practical purposes and safety. A limitation to counterconditioning procedures used with Durga was the use of a tether when the stranger entered the house. Restraint is normally not recommended and can increase the likelihood of aggressive acts, however it was used as a safety measure.

A major limitation with the use of each procedure was the lack of knowledge of the functioning aspect of aggressive behavior. It can be speculated that the functioning aspect of aggressive behavior is the removal of the stimulus. In fact, Snider (2007) assumed just that and displayed the use of negative reinforcement procedures to reduce aggressive behavior. I may agree that the functioning aspect of defensively aggressive behavior is the removal of the stimulus. However, dogs that are offensively aggressive may be attempting not to avoid the stimulus, but instead gain access to the stimulus. Unfortunately, such an analysis is currently unavailable due to safety concerns. Therefore, the current study did not take into account the functioning aspect of aggressive behavior. Future research could devise a way of looking at the functioning aspects of aggressive behavior (both offensive and defensive) using a functional analysis rather than relying on speculation.

Measuring preference, acquisition rates for owners, long term maintenance of dog behavior, and sustainability would could help inform choice of treatments for owners when being consulted. Unfortunately, only a direct comparison with respect to preference of treatment was done. Reduced effort could be made by having the doorbell function as a discriminative stimulus for going to place. More obvious discriminative stimuli may be necessary in improving treatment integrity (e.g., correct implementation procedures posted, timers set at interval lengths when reinforcement should be given, more thorough training on “body language” and

appropriate time to click). Additionally, verbal praise could be delivered by family members and guests to improve integrity. Graphic analysis could be used to help owners keep in close contact with data (Bushell & Baer, 1994). Additional research should look at increasing treatment integrity with implementers and maintenance of behavior change. While owners continued to make attempts at implementing treatment, it is likely that the interventions would not survive if a continued reduction in aggressive behavior is not evident. In order for the treatments to survive and for aggressive behavior to lessen treatment integrity should be further analyzed.

The current study contributes to current research on aggressive behavior in dogs. Both procedures significantly reduced aggressive behavior in only a few sessions. Clear functional control was shown with either program in place. One treatment does not appear to be superior to the other. Researchers and practitioners are encouraged to consider the context in which aggressive behavior occurs before procedures are implemented.

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## Appendix A

The trainer began teaching place by luring the dog to place with a treat. When all four of the dogs paws were on the dog bed the trainer clicked, gave an edible, and said “okay”, signaling the dog off of the dog bed. This was repeated quickly, developing a pattern. After several repetitions the lure was faded to a hand signal by repeating the same motion without a treat in the trainers hand. This was done is less than twenty repetitions. It is important that the lure be faded within twenty repetitions. The dog continued to get reinforced with the click and an edible each time all four paws were on the bed. Again, this was repeated quickly in order to develop a pattern. After several repetitions a verbal cue was introduced. A verbal cue (i.e., “place”) was introduced, a pause was given, and then a hand signal was given. Upon the dog going to place she was rewarded. This was again repeated several times. If she went to place upon hearing the verbal cue no hand signal was given and she was heavily reinforced. If at any time a verbal cue was given and she did not go to place she was given up to 3 hand signals and then physically put on place. Throughout training the proximity of the trainer with respect to the dog bed decreased to 7ft from the bed. During treatment, the experimenter came within 7ft of the bed and gave the dog a verbal cue.

## Appendix B: Owner Questionnaire

Owner's name: *Heidi Whitehill*

Dog's name: *Durga*

Breed: *Giant Schnauzer*

Dog's age: 2 sex: *F*

spayed/neutered: *S*

What does your dog like to eat? *anything, treats, cheese, hotdog* Are you comfortable feeding her this? *yes*

Is your dog on any medication? If so, what? *yes, Proin, 25mg/day*

Has your dog ever bitten anyone? If so, who and what was the severity of the bite? *yes, surface scratch, no medical attention required*

When does your dog behave aggressively? *at the front door, on walks, in the car*

What does your dog do when the doorbell rings? *charges door, barking, jumps on the door*

What does it look like? *see above*

Is there ever a time when she does not behave this way at the front door? *when we come house, cleaning ladies*

What does your dog do when she sees a stranger or strange dog while on leash? *generally lunges and barks if person doesn't have dog or doesn't know them; generally worse with men*

What does it look like?

*See above*

Is there ever a time when she does not behave this way at the front door? Does your dog behave this way in any other context? *if they have a dog or she knows them*

Does this interfere with your life?

*Yes, we do not have many kids or friends over to visit.*

Have you previously sought treatment for this behavior?

*Yes, we hired a trainer and have done basic obedience classes.*

Owner's name: Heidi Whitehill                      Dog's name: Durga

Please rate the following: (1=not at all, 7=very)

My dog's intensity of aggressive behavior at the front door is:

1      2      3      4      5      6      7

My dog's intensity of aggressive behavior on leash/outside is:

1      2      3      4      5      6      7

My concerns about my dog's behavior is:

1      2      3      4      5      6      7

My dog's behavior affects the number of guests that come to my house:

1      2      3      4      5      6      7

My dog's behavior affects the number of outings I take with my dog:

1      2      3      4      5      6      7

I have considered medical treatment for my dog because of this behavior:

1      2      3      4      5      6      7

I have considered re-homing or euthanasia because of the behavior of my dog:

1      2      3      4      5      6      7

Owner's name: *David and Carolyn Hurt*

Dog's name: *Sadie*

Breed: *Toy Poodle*

Dog's age: *2* sex: *F*

spayed/neutered: *S*

What does your dog like to eat? *meat, cheese, treats, hotdogs* Are you comfortable feeding her this? *yes*

Is your dog on any medication? If so, what? *no*

Has your dog ever bitten anyone? If so, who and what was the severity of the bite? *no*

When does your dog behave aggressively? *at the front door, in the front yard*

What does your dog do when the doorbell rings? *barking, runs around, running towards door*  
What does it look like? *lot of unrest*

Is there ever a time when she does not behave this way at the front door? *no*

What does your dog do when she sees a stranger or strange dog while on leash/outside? *barks*

What does it look like?

*See above*

Does this interfere with your life?

*Yes, we cannot talk to guests or our neighbors if Sadie is there.*

Have you previously sought treatment for this behavior?

*Sought help with this study.*

Owner's name: Dave and Carolyn Hurt

Dog's name: Sadie

Please rate the following: (1=not at all, 7=very)

My dog's intensity of aggressive behavior at the front door is:

1    2    3    4    5    6    7

My dog's intensity of aggressive behavior on leash/outside is:

1    2    3    4    5    6    7

My concerns about my dog's behavior is:

1    2    3    4    5    6    7

My dog's behavior affects the number of guests that come to my house:

1    2    3    4    5    6    7

My dog's behavior affects the number of outings I take with my dog:

1    2    3    4    5    6    7

I have considered medical treatment for my dog because of this behavior:

1    2    3    4    5    6    7

I have considered re-homing or euthanasia because of the behavior of my dog:

1    2    3    4    5    6    7