

The Effects of a Multicomponent Intervention on Treatment Integrity of Counterconditioning for  
Aggression in Dogs

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## Abstract

The purpose of this study was to examine the effects of consumer management procedures on dog owner treatment integrity. A within subjects comparison was made. The primary dependent variable was treatment integrity. Errors were analyzed as either omission or commission. Secondly, dog aggression and precursors to aggression were measured. Lastly, owners and experts rated goals, procedures, and effects to assess acceptability. Owners were trained with consumer management procedures to use classical counterconditioning (CC) which reduces aggression in dogs. Consumer management procedures included verbal instruction, modeling, and performance feedback. Performance feedback was delivered in the form of praise for correct implementation, corrective feedback, and sharing process and outcome data. The intervention was divided into two main phases: instruction and generalization programming. Instruction targeted a relatively simple context for owners. During instruction treatment integrity was targeted with verbal instruction, modeling, and performance feedback. During generalization programming the integrity with which owners implement CC in more complex contexts was targeted with performance feedback. The intervention was effective during both phases with the result of increased treatment integrity. Secondly, there was a dramatic decrease in aggression and a minor decrease in precursor behavior. Lastly, goals, procedures and effects were rated as highly acceptable by owners and experts. Implications for use are discussed.

The effects of a multicomponent intervention on treatment integrity and sustained use of classical counterconditioning for aggression in dogs

### INTRODUCTION

In behavior analytic research and practice, efforts are made to document that behavior change is attributed to the introduction of the independent variable and unrelated to other variables. To establish experimental control in this manner, both dependent and independent variables should be clearly defined (Peterson, Homer, & Wonderlich, 1982). Clearly defining the independent variable helps researchers eliminate errors and encourage replication (Johnston & Pennypacker, 1993). Not only should the independent variable (i.e., treatment) be defined, but it should be measured and its adherence reported. The degree to which treatment is implemented as intended is referred to as treatment integrity (Gresham, 1989). Treatment integrity is particularly important in applied settings because the end user of the intervention is often not the experimenter and is typically an individual (e.g., caregiver, educator, paraprofessional) with limited training. If left unmeasured it is difficult to determine if behavior change, or lack thereof, is due to the intervention or to unknown variables (Gresham, 1989; Peterson, Homer, & Wonderlich, 1982). That is, the internal validity of the study is compromised.

Results of several published reviews indicate that researchers adequately measure and report reliability of dependent variables, but that the same standards are not applied to measuring and reporting reliability of the independent variables. For example, Peterson, Homer, and Wonderlich (1982) determined that the majority of studies in the *Journal of Applied Behavior Analysis* provided definitions of the independent variable; however, few studies reported the integrity or reliability of the independent variable (Peterson, Homer, & Wonderlich, 1982; Gresham & Kendell, 1987). Moncher and Prinz (1990) reported similar findings in their review

of articles published between 1988 and 1990 in major journals within four domains: clinical psychology, behavior therapy, psychiatry, and marital and family counseling. They found that nearly 55% of studies did not report or comment on treatment integrity. Recent reviews provide further support of these findings in the current literature. McIntyre, Gresham, DiGennaro, and Reed (2007) reviewed school-based studies published between 1991 and 2005 in the *Journal of Applied Behavior Analysis* and determined that nearly 30% of the studies reported reliability of the independent variable. Sass, Twohig, and Davies (2004) reviewed research in three journals including *Behavior Therapy*, the *Journal of Consulting and Clinical Psychology*, and the *Journal of Applied Behavior Analysis* and documented low reporting of treatment integrity (29.7%, 50.3%, and 11.3% respectively). Similarly, Wheeler, Baggett, Fox, and Blevins (2006) reviewed articles published in 2004 from *The Behavior Therapist* relating to interventions for children with autism and found that only about 18% (11 of 60) assessed treatment integrity. A similar level of reporting (18.5 %) was found when three major learning disabilities journals were reviewed from 1995 to 1999 (Gresham, MacMillan, Beebe-Frankenberger, & Bocian, 2000). A review specifically targeting peer mediated interventions for children with autism reported treatment integrity as rarely reported (Chan, Lang, Rispoli, O'Reilly, Sigafos, & Cole, 2009). Taken together, these reviews suggest a glaring lack of treatment integrity reporting in the published literature across disciplines. Although less than ideal, a positive finding is that more recent reviews report somewhat increased quantification and reporting of treatment integrity (see Gresham, Gansle, & Noell, 1993; Sheridan, Welch, & Orme, 1996). Although these numbers are likely to improve (Noell & Witt, 1999) a gap between current standards and ideal conditions remains.



## Does Treatment Integrity Really Matter?

One of the purposes of reporting treatment integrity is to help encourage long lasting and sustained interventions. Clearly, treatment integrity influences treatment outcomes (Gresham, 1989). This influence has been shown in a variety of settings (see Otterloo, Leij, & Veldkamp, 2006; Henggeler, Melton, Brondino, Scherer, & Hanley, 1997). In an attempt to determine the degree to which treatment integrity affects treatment outcomes, researchers are now examining treatment integrity as an independent variable. Based on the current review of the literature, treatment integrity has been examined as an independent variable with prompting procedures, time-out, differential reinforcement of alternative behavior, and discrete trial training procedures.

Noell, Gresham, and Gansle (2002) altered levels of treatment integrity of an antecedent prompt when teaching mathematics to second-grade students via a computerized instructional program. Treatment involved instructional prompting, feedback, and praise delivered via computer. On a proportion of the trials, the antecedent instructional prompt was omitted. Specifically, instructional prompts were given on all of the math problems (PI-100), two-thirds of the math problems (PI-67), and one-third of the math problems (PI-33). Feedback on accuracy for each problem, as well as praise delivered on a variable ratio 3 (VR3) schedule remained consistent throughout each condition. Overall, students performed at higher levels in the PI-100 condition when compared to the other conditions. These findings provide evidence that higher treatment integrity is associated with better outcomes.

Wilder, Atwell, and Wine (2006) examined the effects of varying levels of treatment integrity on compliance in a three-step prompting procedure. Each level of treatment integrity (i.e., 100%, 50%, and 0%) was associated with a specific request. During baseline, experimenters

requested a task and either (a) praised compliance or (b) ignored noncompliance. During the parametric analysis of treatment integrity, the experimenter manipulated the extent to which a three-step prompting procedure was implemented given noncompliance after a request. During the 100% condition, the three-step prompting procedure followed each time noncompliance occurred. During the 50% condition, the three-step prompting procedure followed approximately 50% of the time noncompliance occurred. During the 0% condition, the three-step prompting procedure never followed noncompliance. Results indicated that compliance was highest under the 100% condition. The 50% condition resulted in moderate levels of compliance. The low integrity condition resulted in low levels of compliance.

Finally, Grow et al. (2009) examined the effects of two prompting procedures: a full integrity procedure (i.e., least-to-most prompting) and an error procedure (i.e., multiple prompts made). The error procedure included multiple verbal prompts, a model prompt, and the omission of a physical prompt. Four children were taught four arbitrary response chains of building geometric shapes. Both procedures were effective at teaching the response chain. However, children acquired the response in fewer trials with the full integrity prompting procedure. Further, maintenance of that skill was higher with exposure to full integrity prompting. Collectively these studies show the effects of treatment integrity of prompting procedures on outcomes. However, these effects on behavior are not limited to failures delivering prompting procedures; similar findings have been reported with other behavior analytic techniques including time-out (Northup, Fisher, Kahang, Harrell, & Kurtz , 1997; Rhymer, Evans-Hampton, McCurdy, & Watson, 2002), differential reinforcement of alternative behavior (DRA) (Vollmer,

1999; St. Peter Pipkin, Vollmer, & Sloman, 2010), and discrete trial training (DiGennaro Reed, Reed, Baez, & Maguire, 2011).

Northup, Fisher, Kahang, Harrell, and Kurtz (1997) examined the effects of varying levels of treatment integrity on behavior when using time-out with differential reinforcement of alternative behavior (DRA). Levels of treatment integrity included: 100% (i.e., full integrity), 50% (i.e., partial integrity), and 25% (i.e., low integrity). Target behaviors included aggression, disruption, or pica (i.e., inappropriate behavior) and communication (i.e., appropriate behavior). The most robust change in behavior was evident during the 100% integrity condition. However, the effects of treatment were maintained with 50% integrity. For some participants, effects were maintained with 25% integrity.

Rhymer, Evans-Hampton, McCurdy, and Watson (2002) found slightly more diminished maintenance of behavior with treatment integrity failures. The experimenters examined the effects of varied levels of treatment integrity on a time-out procedure alone. Target behavior included aggression in an 18-month old child. Conditions included 100%, 75%, 50%, and 25% integrity. Results suggest that time-out administered at levels of 100% and 75% integrity resulted in similar low rates of aggression. Similarly, 50% and 25% treatment integrity resulted in comparable high rates of aggression.

Vollmer, Roane, Ringdahl, and Marcus (1999) analyzed the effects of varying levels of treatment integrity on problem behavior with DRA alone. Participants included three individuals with special needs who engaged in self-injurious behavior or aggression. Target behaviors included compliance or mands (requests). Levels of treatment integrity included 100%, 75%, 50%, 25%, and 0%. Individuals engaged in more target behavior following the 100% conditions.

Levels of target behavior (appropriate behavior) were reduced during conditions with lesser integrity. However, the behavior was reversible and returned to high levels when levels of treatment integrity increased. The results of these studies are consistent with other research that suggests that behavior can be acquired with some level of treatment integrity errors. However, the effects of treatment are diminished as the number of errors increase (Worsdell, Iwata, Hanley, Thompson, & Kahng, 2000).

Possibly the most robust study using treatment integrity as an independent variable was conducted by St. Peter Pipkin, Vollmer, and Sloman (2010). The study used a translational approach to examine the effects of varying levels of treatment integrity on DRA. In a simple computer task, college students were kept unaware of the contingencies involved with each task. Students were presented with two colored circles: one black and one red, represented problem behavior and appropriate behavior, respectively. Students earned points for clicking on a specific colored circle. In baseline conditions, clicking on the black circle resulted in points earned on a fixed ratio 1 (FR1) schedule. Clicking the red circle resulted in no points earned, which is an extinction procedure. In the full integrity condition (DRA), the contingencies for clicking on each circle were reversed. Clicking the red circle (i.e., appropriate behavior) resulted in reinforcement on an FR1 schedule and clicking on the black circle (i.e., problem behavior) resulted in no reinforcement. Additional conditions included 80, 60, 40, and 20, during which responding was placed on a random ratio (RR) schedule. Each condition corresponded with a different probability for gaining reinforcement. For example, in the 80% condition the probability that clicking on the red circle resulted in reinforcement was 80%. The probability that clicking on the black circle resulted in reinforcement was 20%. Errors of omission (missed

reinforcer deliveries) and errors of commission (accidental reinforcement for problem behavior) were further analyzed by dividing the participants into groups. Three of the four subsets were exposed to decreasing levels of treatment integrity (i.e., BL, DRA, 80, 60, 40, 20). Subsequent conditions included increasing levels of treatment integrity (i.e., BL, DRA, 20, 40, 60, 80). Participants in Subset 1 were exposed to omission errors only. Participants in Subset 2 were exposed to commission errors only. Participants in Subset 3 were exposed to combined omission and commission errors. Participants in Subset 4 experienced 50% integrity in the following sequence: BL, DRA, BL, DRA, 50, BL, 50, DRA, 50, BL, 50, DRA. The sequence was selected to control for sequential effects. Results indicated that participants in Subsets 1, 2, and 3 displayed low levels of appropriate behavior during BL and high levels of appropriate behavior during DRA. In addition, omission errors in Subset 1 did not produce high levels of problem behavior. Results from Subset 2 suggest that higher levels of treatment integrity (i.e., 80%, 60%) did not result in high levels of problem behavior. However, when treatment integrity was low (i.e., 40%, 20%) individuals engaged in higher levels of problem behavior. Results from Subset 3 were similar to that of Subset 2. Individuals engaged in high levels of problem behavior when errors were high (i.e., 40%, 20%) and engaged in low levels of problem behavior when errors were low (i.e., 80%, 60%). Results from Subset 4 suggest that participants either (a) carried over responding from the previous phase or (b) allocated responding to the most previously reinforced response. St. Peter et al. (2010) extended these procedures to an applied setting in which children with autism were participants. Experiment 2 replicated the errors made with Subset 3 when using DRA procedures. Experiment 3 replicated the sequence and errors made with Subset 4. Results from Experiments 2 and 3 were consistent with those found in Experiment 1.

Most recently, DiGennaro Reed, Reed, Baez, and Maguire (2011) conducted a parametric analysis of commission errors during discrete-trial training. Experimenters manipulated levels of treatment integrity, specifically commission errors, when teaching nonsense shapes to 8-year-old children. Three varying levels of error were analyzed: 100% (full error), 50% (half errors), and 0% (no errors). When children responded incorrectly, they were given praise each time during the 100% condition, half of the time during the 50% condition, and never during the 0% condition. All children more accurately identified the nonsense shape when no errors were present. The results varied for the 100% and 50% errors condition. One of the participants had a clear differential responding according to the level of integrity (i.e., significantly higher levels of correct responses with the 50% compared to the 100% condition). The other two participants had similar levels of responding during the 50% and 100% conditions. Collectively, these findings and others have shown that varying levels of treatment integrity influences treatment outcomes when administering prompting procedures, time-out, DRA, and discrete-trial training. These data provide evidence of the effects of treatment integrity failures and a rationale for examining treatment integrity as a dependent measure.

#### Treatment Integrity as a Dependent Measure

The previously mentioned reviews concerning reports on treatment integrity suggest that treatment integrity has not typically been measured as a dependent measure. At best, when it has been measured, it was measured as a secondary or tertiary dependent measure. However, in more recent years, treatment integrity has gained attention as a dependent measure in its own right. Researchers have assessed various instructional methods for improving treatment integrity. Instructional methods can be generally divided into two categories: indirect training and direct

training. Indirect training involves didactic instruction (e.g., lecture, verbal instruction) which may be a natural method of introducing a treatment plan to the implementer, but it has limitations as a comprehensive and effective training program (Beidas & Kendall, 2010). Direct training (sometimes referred to as “active training”; see Beidas and Kendall, 2010) involves the caregiver physically practicing implementation (Perepletchikova and Kazdin, 2005; Perepletchikova, Treat, & Kazdin, 2005). While the latter is generally recommended, often consumers are initially introduced to indirect training prior to direct training. Numerous studies have reported the effects of a variety of both indirect and direct training programs on consumer behavior (Auld, Belfiore, & Scheeler, 2010; Coddling, Feinberg, Dunn, & Pace, 2005; DiGennaro, Martens, & McIntyre, 2005; DiGennaro, Martens, & Kleinmann, 2007; Noell, Witt, Gilbertson, Ranier, & Freeland, 1997; Witt, Noell, LaFleur, & Mortonson, 1997; DiGennaro Reed, Coddling, Catania, & Maguire, 2010).

Common forms of training include verbal instruction (indirect), modeling (direct), and rehearsal (direct). A growing body of research has examined the effects of verbal instruction, modeling, and rehearsal on treatment integrity. For example, Mueller et al. (2003) studied the effects of a parent-level intervention on parent implementation of a feeding protocol. In baseline, parents were given a written protocol regarding feeding procedures. During intervention, parents were exposed to verbal instructions, modeling, and rehearsal. Findings indicated that parents delivered a higher percentage of correct prompts and consequences of the feeding protocol during intervention. A parent’s performance was further improved when they received additional post-session corrective feedback. A 1-month follow-up probe suggested that one parent continued to implement the feeding protocol with integrity. In a subsequent study, Mueller et al.

(2003) conducted an extended analysis to determine which intervention components were responsible for behavior change. Baseline conditions were the same as in Study 1 (i.e., parents were given written instructions). Six parents were then exposed to verbal instruction. Two parents were only exposed to written and verbal instructions, two parents received additional modeling, and two parents received additional rehearsal. Those parents exposed to rehearsal performed at the highest level of treatment integrity and those parents exposed to modeling performed at moderate to high levels. Parents initially exposed to verbal instruction performed at low levels of treatment integrity and required an additional exposure before performing at high levels. These results indicate that rehearsal, when compared to verbal instruction and modeling, is a more effective antecedent intervention.

Verbal instruction, modeling, and rehearsal have been used as sole training programs. However, they are most commonly used in conjunction with other training components, such as performance feedback. Performance feedback (PFB) involves instructing the caregiver about his or her performance and has been shown to increase consumer treatment integrity (e.g., Duhon, Mesmer, Gregerson, & Witt, 2009; Eames et al., 2010). PFB is administered in various forms including, but not limited to, verbal praise, corrective feedback, and sharing process and outcome data (Alvero, Bucklin, & Austin, 2001).

Witt, Noell, LaFleur, and Mortenson (1997) examined the effects of performance feedback on teacher implementation of a program to increase academic performance. After consultants helped teachers introduce a program in their classroom and found low levels of treatment integrity, consultants provided performance feedback in the form of daily meetings during which process and outcome data were shared. The consultants successfully faded



feedback to once per week while maintaining high levels of treatment integrity for 3 of the 4 participants.

In an attempt to replicate and extend previous findings, Noell, Witt, Gilbertson, Ranier, and Freeland (1997) compared the effects of didactic training and performance feedback on teacher implementation of a reinforcement based treatment to increase academic performance of elementary students. Didactic training involved identification of the treatment, confirmation of the treatment from teachers, and verbal instructions. Performance feedback included process feedback, outcome feedback, and graphic displays of process and outcome data. Experimenters reviewed missed steps and praised correct steps with teachers during 3-5 min meetings each morning before class. Performance feedback produced dramatic increases in treatment integrity which were maintained over time. In addition, student performance was also improved.

In another study targeting teacher treatment integrity, Mortenson and Witt (1998) examined the effects of a performance feedback package on implementation of a reinforcement-based classroom intervention. Participants were four teachers and their corresponding students. The package consisted of sharing outcome data, process data, giving corrective feedback, delivering praise for correct implementation, responding to relevant questions, prompting continued faxing of summaries, and reminding teachers that the consultant would return the following week. Treatment integrity of 3 of the 4 teachers improved. Overall student behavior improved, but remained variable throughout the training.

Noell et al. (2000) compared two follow-up programs designed to increase teacher treatment integrity. Teachers were trained to implement a peer tutoring intervention for reading comprehension. When treatment integrity was low, experimenters met with teachers to discuss

the intervention. Treatment integrity improved for less than half of the participants after the first follow-up program. Teachers were then exposed to performance feedback in which experimenters shared outcome and process data with teachers. Performance feedback resulted in four of the five teachers implementing the plan with high integrity. Student reading comprehension increased significantly with the introduction of the peer tutoring intervention. Effects were maintained at the four-week follow-up. Similar results were found when procedures were extended to teacher implementation of a program designed to reduce disruptive behavior in a classroom (Noell, Duhon, Gatti, and Connell, 2002).

Using a more translational approach, Sterling-Turner, Watson, Wildmon, Watkins, and Little (2001) compared the effects of training type on undergraduate psychology students' implementation of a procedure to reduce facial ticks in a simulated treatment environment. Results indicate training involving verbal instruction produced the lowest degree of treatment integrity. Individuals who received modeling or rehearsal with performance feedback performed with the highest degree of treatment integrity. These findings supplement previous research and suggest that performance feedback, combined with other effective procedures such as modeling and rehearsal, can produce high levels of performance even in simulated environments.

Noell et al. (2005) compared three different follow-up strategies after consultation: interviews, interviews with an emphasis on commitment, and performance feedback. Participants were elementary school teachers who were trained to implement an intervention to address students' academic behavior, challenging behavior, or a combination of both. Weekly interviews were adopted to examine current practice used. Teachers were asked about child performance, if the treatment was being used, and if so, how it was going. A commitment component was added

to the weekly interviews. The commitment component was a social influence procedure whereby the experimenter discussed five areas which served to enhance the correspondence between teachers' commitment and actual implementation. The performance feedback component included the experimenter meeting with the teacher, reviewing permanent products, and showing process and outcome data in graphic displays. Performance feedback resulted in the highest levels of treatment integrity. As performance feedback was faded, treatment integrity remained high, but variable.

In another study, Coddling, Feinberg, Dunn, and Pace (2005) examined the effects of performance feedback on teacher implementation of positive support plans in a special education setting. Daily feedback for antecedent and consequent interventions was given at the end of each observation period. Feedback consisted of praise for correct implementation and constructive verbal feedback. The authors found that delivering feedback increased treatment integrity. The effects were maintained in subsequent follow-up observations (i.e., during 5 and 10-week follow-up probes for two participants; and during 5, 10, and 15-week follow-up period for one participant).

Rodriguez, Loman, and Horner (2009) examined the effects of performance feedback on the integrity with which teachers implemented an intervention designed to reduce problem behavior. After being introduced to the program, teachers exhibited low integrity. The experimenters reviewed outcome data, discussed perceived strengths and weaknesses, praised teachers for correct implementation, gave teachers corrective feedback, and reviewed follow-up information. Performance feedback resulted in high levels of treatment integrity with the secondary effect of reduced student problem behavior.

Feedback in the form of sharing process and outcome data was shown effective in another study that addressed treatment integrity. Auld, Belfiore, and Scheeler (2010) trained teachers on the use of DRA in their classroom by providing a 1-hour workshop and performance feedback after weekly observation sessions. Performance feedback included sharing process and outcome data, reviewing problem areas, discussing specific areas of DRA, and responding to relevant teacher questions. The results indicate increased treatment integrity and increased hand-raising by students.

Relatedly, DiGennaro Reed, Coddington, Catania, and Maguire (2010) examined the effects of written and verbal instruction, video modeling, and performance feedback on teacher treatment integrity. During baseline, teachers received written and verbal instructions on how to implement a behavioral intervention and were asked to implement the procedure with a student in their classroom. Because treatment integrity was low under this condition, the authors introduced a video model depicting correct implementation of the procedure. Although treatment integrity improved above baseline, desirable levels were not consistently maintained. Performance feedback (i.e., viewing video recorded model and reviewing errors) was introduced, further increasing treatment integrity to 100% of steps implemented correctly. The effects were maintained at a 1-week follow-up.

Collectively, the results of the above described studies document the effects of consumer management procedures (e.g., verbal instruction, modeling, and performance feedback) on treatment integrity. In the past two decades, consumer management procedures have targeted the integrity of parents, caregivers, public and private school teachers, and direct care professionals and other staff. Surprisingly, consumer management procedures have not targeted dog owners

who are often asked to implement training protocols and address problem behavior of their dogs. Furthermore, research has focused on the integrity of which operant treatments are delivered to the exclusion of measuring the degree to which respondent treatments are delivered accurately and consistently. Finally, the extent to which treatment integrity generalizes to more challenging contexts has not been analyzed.

### Aggressive Behavior is Problematic

Owners, like other caregivers, often serve as interventionists when problem behavior is displayed by those for whom they are responsible. Like children, dogs may exhibit aggression which requires intervention. Aggressive behavior in dogs is problematic to society, owners, and to 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 aggression have been followed by increased concern from the public (O'Sullivan, Jones, O'Sullivan, & Hanlan, 2008), particularly in the area of public health. Previous research has cited dog aggression as a source of injury for people and a potential danger to the public. It is estimated that hospital emergency rooms in the United States treat over 300,000 dog bite injuries per year, some of which require hospitalization (Weiss, Friedman, & Coben, 1998). Annually, the cost of caring for victims of dog aggression is \$164.9 million (Quinlan & Sacks, 1999). Dogs not only display aggression towards humans, but also towards other dogs (dog-dog aggression). Dog-dog aggression may result in human injury when owners or others are bitten while breaking up a dog fight. Commonly, aggressive dogs are relinquished to local animal shelters (Salman, Hutchison, & Ruch-Gallie., 2000; Wells & Hepper, 2000). Society incurs costs associated with caring for relinquished dogs, including food, housing, medical treatment, and staff wages.

Aggressive behavior is a problem for dog owners. Problem behavior of this type have been frequently cited as one of largest concerns reported to veterinary behaviorists (Beaver, 1994; Landsberg, 1991, & Voith, 1981). Reisner (2003) suggests that high rates of referrals may reflect the amount of emotional and physical stress that owners experience. Daily stressors may include the risk of aggression, constant supervision, and an interruption in typical activities (e.g., avoiding other dogs on a walk). Owners may also face fines and other legal consequences (Blackshaw, 1991). Additionally, numerous studies have cited aggressive behavior as a common reason for owner relinquishment and euthanasia (Salman et al., 2000; Overall & Love, 2001; Wells & Hepper, 2000).

Perhaps the greatest victims are the dogs displaying aggression. Displays of aggressive behavior are obvious signs that the animal is distressed (Wright, Reid, & Rozier, 2005). In addition, dogs are at risk because of the severe consequences for their behavior. In an attempt to punish aggressive behavior, owners and trainers may use aversive stimuli (e.g., shock collars, choke chains, or prong collars) that often result in more severe aggression or yelping, displaying distress signals, and even the loss of bodily functions (Herron, Shofera, & Reisner, 2009). In response to dog aggression, owners are sometimes advised to use “dominant” techniques including pinning their dog to the floor or flipping them over. These techniques can evoke additional fear and anxiety in an already distressed dog (Bradshaw, Blackwell, & Casey, 2009). If aggressive behavior continues, dogs risk losing their home or life.

#### Classical Counterconditioning as a Treatment for Aggression

Classical counterconditioning (CC), sometimes referred to as respondent conditioning, Pavlovian conditioning, or cross-motivational transfer, is used to reduce anxious, fearful, or

aggressive behavior. Numerous studies have demonstrated the inhibitory effect CC has on behavior elicited by aversive stimuli (Dickinson & Pearce, 1977). Although the literature on CC with respect to applied animal behavior is not robust, CC is a common treatment used in practice to reduce aggressive behavior in dogs. Wright et al. (2005) suggests classical counterconditioning is extremely effective at reducing aggression. In CC, the eliciting stimulus is paired with a pleasant, usually edible (i.e., appetitive), unconditioned stimulus (Dickinson & Pearce, 1977). The result of this pairing may be that the aversive stimulus becomes a neutral or even positive stimulus thereby losing its power to elicit aggressive behavior. In the current context, the eliciting stimulus or presence of another dog (referred to as a stimulus dog) may be an aversive stimulus which elicits an aggressive response such as lunging and barking from the participant dog. If the stimulus dog is paired with edibles (unconditioned appetitive stimulus) the presence of the stimulus dog may no longer elicit aggression. The end goal is that the target dog no longer displays aggression towards the stimulus dog, the sight of which previously elicited aggression.

Clinical practice and research suggests CC is effective in decreasing aggressive behavior. Echterling Savage (2010) used a reversal design to examine the effects of CC on aggressive behavior in dogs. In this study, dogs displayed aggression when guests rang the doorbell and entered the home. In baseline, the experimenter ignored the dogs and provided no programmed consequence. During CC, the experimenter clicked a clicker (a secondary conditioned reinforcer) and delivered an edible immediately after the sound of the doorbell. Each time dogs looked towards the door or a guest, the experimenter clicked and delivered another edible. CC significantly reduced aggression to near zero levels in both participants across all treatment

phases. Throughout all phases the experimenter implemented treatment; however owners were trained to a competency criterion before follow-up. A training package consisting of prompting, modeling praise for correct implementation, and corrective feedback during three instructional meetings was provided. During follow-up, owners implemented CC with less than desired treatment integrity. Additionally, dog aggression returned to undesirable levels. These results are consistent with previous literature indicating the negative effects on treatment outcomes when caregivers show decrements in treatment integrity (Vollmer, Roane, Ringdahl, & Marcus, 1999; Rhymer, Evans-Hampton, McCurdy, & Watson, 2002; DiGennaro Reed, Reed, Baez, & Maguire, 2011).

#### Modifications of CC

Several modifications to CC may increase its effectiveness and, subsequently, the degree to which owners implement the procedure with integrity. For example, a modification might include training owners to implement CC when they observe behaviors that are precursors to more severe aggression. Additionally, the effectiveness of the food reinforcer may be increased by putting dogs in a state of deprivation (i.e., creating an establishing operation for food as a reinforcer). Another modification includes reducing owner effort when implementing CC procedures. Finally, the rate at which dogs are fed could be faded to increase resistance to extinction.

#### *Train Owners on Precursor Behaviors*

Training owners to implement CC immediately before their dog displays aggression is a modification that could improve the effectiveness of the treatment. Dogs display a variety of behaviors (i.e., “body language”) immediately before exhibiting aggression. For the purposes of



this manuscript, behaviors that precede aggression will be termed “precursor behaviors.”

Precursor behaviors could be broadly categorized as “offensive” or “defensive.” An offensively aggressive dog is generally considered more likely to bite. Offensively aggressive behavior is designed to lessen the distance between the aggressor and the victim (Wright et al., 2005).

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 to avoid the stimulus. Defensively aggressive behavior is designed to increase the distance between the dog and the eliciting stimulus (Wright et al., 2005). 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). Since these behaviors are exhibited prior to aggression, implementation should occur when these precursor behaviors are displayed.

Research suggests that the general public, owners, veterinarians, and even many dog trainers are unable to identify these precursor behaviors (Tami & Gallagher, 2009). However, those with extensive experience training dogs are able to identify body postures (Bahlig-Pieren & Turner, 1999; Diesel, Brodbelt, & Pfeiffer, 2008). One criticism of CC is the amount of “guesswork” involved when delivering the intervention (Snider, 2007). Such “guesswork” arises when there is a lack of obvious discriminative stimuli to set the occasion for implementation of the procedure. A discriminative stimulus ( $S^D$ ) sets the occasion for a behavior by signaling the availability of a reinforcer. In the current context the  $S^D$  for owners is precursor behavior emitted by dogs, the behavior is implementation of CC, and the reinforcer is the avoidance of dog aggression. However, if owners are unable to identify the dog postures that precede aggression,

they are unlikely to identify when treatment should be implemented. Complicating matters further, the point at which owners should implement may change throughout treatment as aggression is reduced. For example, initially all precursor behavior should occasion owner implementation of CC. As treatment progresses, less severe precursor behavior may no longer occasion implementation. Instead, only more severe precursor behavior should signal implementation of CC. Finally, the context in which dogs display the range of precursor behavior may continually change. For example, Dog A exhibits significantly more precursors the closer stimulus dogs become. However, Dog A exhibits precursors more often when Dog B is within 20 ft as compared to when Dog C is within 10 ft. Training owners on their respective dog's precursor behaviors may help establish stimulus control.

Although the literature on body postures serving as S<sup>D</sup>s is nonexistent, research suggests that behavior can come under stimulus control. For example, Reeve, Reeve, Townsend, and Poulson (2007) examined the effects of training S<sup>D</sup>s on children's helping behaviors. In baseline, S<sup>D</sup>s were presented (e.g., "This table is dirty."), but prompting, video modeling, and reinforcement were not provided for helping behavior. During treatment, discriminative stimuli, prompting, video modeling, and reinforcement were provided for helping behaviors. Concurrent probe sessions were conducted in which prompting, video modeling, and reinforcement were not provided. Additional generalization measures were taken as well as maintenance probes. Helping behavior significantly increased from baseline sessions during treatment, probe, and maintenance sessions. Helping behavior came under the control of statements (S<sup>D</sup>s), demonstrating stimulus control. Further, helping behavior generalized in the presence of novel stimuli, settings, and instructors.

Discrimination procedures are commonly used to indicate varying consequent conditions to students. Cammilleri, Tiger, and Hanley (2008) evaluated the effectiveness of stimulus control procedures to differentiate two schedules of reinforcement (extinction and reinforcement) in a multi-element design. Varying colored leis served as stimuli. While wearing green leis ( $S^D$ ) teachers responded to student requests (i.e., delivered reinforcement). While wearing red leis ( $S^\Delta$ ) teachers did not respond to student requests (i.e., extinction). Students requested teacher assistance during the green lei condition at a higher rate than during the red lei condition. These results suggest the student behavior of seeking attention from the teacher came under stimulus control.

Conners et al. (2000) used discrimination procedures to signal varying levels of delivered consequences during functional analysis. Attention, demand, alone, and play conditions were evaluated in a functional analysis. During the “ $S^D$  present” phase each assessment condition was conducted in a different colored room by a different therapist. During the “ $S^D$  absent phase” each assessment conditions were conducted in the same room by the same therapist. The presence of  $S^D$ s influenced all participants’ behavior. For one of the four participants, the presence of the  $S^D$  was necessary for differential responding. For the remaining participants,  $S^D$ s facilitated differential responding. Taken together, these previous studies suggest that owners could be taught to differentiate responding based on  $S^D$ s in the form of their dog’s precursor behavior.

In summary, CC may be more effective if owners are trained to implement procedures in the presence of dog precursor behaviors. However, unless individuals have extensive experience observing dog behavior, they lack the skills to identify those precursor behaviors in practice. Training owners on their respective dog’s precursor behaviors may help to identify a clear  $S^D$  for

implementation. If owners are able to implement CC when their dog presents precursor behavior, they may avoid their dog engaging in more dangerous behaviors such as aggression.

*Increase the Effectiveness of a Food Reinforcer*

The second modification to CC is to increase the deprivation of the edible that is paired with the eliciting stimulus. As previously mentioned, the eliciting stimulus is commonly paired with an appetitive (i.e., edible) stimulus. The reinforcer used in the paradigm must be more powerful than the eliciting stimulus is aversive (Wright et al., 2005). However, verbal reports from owners and clinicians suggest that many dogs refuse edibles in the presence of the eliciting stimulus. One way to increase appetitive behavior is to increase the animal's drive or motivation.

In behavior analysis, the concept of drive or motivation could be conceptualized as a motivating operation (MO). MOs alter the effectiveness of a reinforcer by either increasing its effectiveness (establishing effect) or decreasing its effectiveness (abolishing effect) (Michael, 1982; Catania, 2007; Laraway, Snyckerski, Michael, & Poling, 2003). An MO that increases the effectiveness of a reinforcer is more specifically referred to as an establishing operation (EO). If consumption is considered the behavior of interest, putting the animal in a state of food deprivation could serve as an EO by increasing the effectiveness of edibles. Although research on deprivation and CC is limited, there are numerous studies that show effects of deprivation in the basic lab and applied settings. The majority of research conducted in applied settings has been on altering deprivation. Research has focused on offering non-contingent reinforcement to eliminate deprivation with the end result of reduced problem behaviors (McGill, 1999).

Wacker et al. (1996) manipulated meals to reduce problem behavior in children. The experiments conducted a brief functional analysis during which social attention was manipulated

as a maintaining consequence for self-injurious behavior (SIB). The authors further manipulated meal schedules for one participant and meal frequency for another participant. For the first participant, SIB was not only maintained by attention, but was also correlated with the meal schedules. When the participant was sated he engaged in less SIB. Further, crying was associated with meal schedule almost exclusively regardless of the amount of social attention. For the second participant, functional analysis results suggest SIB was not maintained by attention. However, SIB was influenced by frequency of meals. SIB occurred more frequently when no meals were offered as compared to six meals. SIB and crying appeared to be maintained by gastric discomfort. By increasing the frequency of meals (i.e., altering the MO), experimenters were able to reduce both crying and SIB.

Vollmer and Iwata (1991) examined the effects of altering the EO on the number of responses (i.e., moving blocks, switch closure). The authors deprived five adult males of three classes of reinforcers including primary (e.g., small edibles), conditioned (e.g., social praise), and sensory (e.g., music). All participants had higher levels of responding during deprived as compared to the sated conditions across all stimuli tested. By altering the EO for a variety of reinforcers, experimenters increased a variety of target responses.

Another study manipulated levels of deprivation to increase engagement in preferred activities (Klatt, Sherman, & Sheldon, 2000) which competed with problem behavior. Following a preference assessment to identify the highly preferred activities, varying levels of access to items were provided in order to create states of deprivation. The findings revealed that engagement was higher after longer periods of deprivation. Data suggest depriving access to those activities increased engagement with the items. Next, the experimenters extended these

findings to target transition periods (i.e., time between activities) for the participants. Transition periods were problematic because of the difficulty in engaging the participant. Engagement with the item served to compete with other behaviors (e.g., going to bed early). Teachers were able to vary levels of deprivation to increase engagement with preferred items during these transition times.

Collectively, these studies suggest that altering the EO influences emission of target behavior. The results could be extended to consumption of edibles by dogs such that creating deprivation could increase the likelihood that CC will be effective. To further enhance effectiveness, a closed economy (Hursh, 1980; 1984) wherein the dogs have access to the reinforcer during treatment sessions only could be created. This may be preferred over an open economy where dogs could have access to the edible reinforcers outside of experimental conditions. Findings from basic laboratory research (Collier, Hirsch, & Hamlin 1972; Hall & Lattal, 1990; Collier, Johnson, & Morgan, 1992) and applied settings (e.g., Roane, Call & Falcomata, 2005) support use of this application.

For example, Roane et al., (2005) compared responding under open and closed economies in adult individuals with disabilities. Prior to the start of the investigation, a preference assessment was conducted and experimenters determined how much of the reinforcer was consumed when free access was given. Participants were given a 5-hr period of free access to the preferred item (e.g., cartoon videos or video games) to determine typical amounts of consumption (i.e., duration of watching cartoon videos, duration of playing video games) in a naturalistic setting. These durations were used as the quantities of access to the reinforcers during experimental conditions. During baseline conditions, target behaviors (envelope sorting or

completing worksheets) did not result in any programmed consequences. During the open economy, access to the preferred item was given contingent on the target behavior. If the participant did not earn all of the available access, they were given the preferred item outside of the session. During the closed economy, access to the preferred item was given contingent on the target behavior, but access was restricted to the session only (i.e., supplemental access was not given). Increased number of responding was evident in both participants during the closed economy when compared to the open economy and baseline conditions. Further, the closed economy resulted in a larger number of responses and a larger number of reinforcers obtained across response requirements. Although some studies report conflicting findings (Sy & Borreo, 2009; Vollmer & Iwata, 1991), these results suggest that findings from the basic lab can be extended to applied settings. These findings could be further extended to dog behavior. The availability of reinforcers could fall on a continuum with each economy on opposing ends. Dogs' access to edibles could be restricted to times in which the eliciting stimulus is presented. The more closed the economy, the more behavior (i.e., eating in the presence of the eliciting stimulus) is likely to be emitted per reinforcer.

In summary, in order for CC to be effective target dogs must consume edibles in the presence of stimulus dogs. Owners often report that their dog will not eat in these contexts. Research suggests deprivation and the use of a closed economy increase the effectiveness of reinforcers with operant behavior in humans. These results could be extended to respondent (i.e., Pavlovian) behavior in dogs and are not uncommon when using classical counterconditioning (see Johnson, Gilmore, & Shenoy, 1982; Kroll, 1975). Therefore, putting dogs in a state of

deprivation and using a closed economy may increase the effectiveness of edibles as reinforcers in CC.

### *Reduce Effort*

A third modification to CC that could improve its effectiveness is to reduce the effort required for implementing the procedure. Increased effort has similar effects on behavior as punishment (Friman & Poling, 1995). Research has shown that reducing effort improves maintenance of caregiver behavior (see Friman, Finney, Rapoff, & Christophersen, 1985; Friman, Glasscock, Finney, & Christophersen, 1987). Casella et al. (2010) examined the effects of varying levels of effort on safe care behaviors by therapists. Behaviors including glove wearing, hand sanitizing, and replacement of electric outlets were examined across low, medium, and high levels of effort. Individuals engaged in higher rates of safe care behaviors when effort was low compared to when effort was high. Although reduced effort has not been used to influence owner behavior, these findings could be extended to current practice.

In clinical practice, owners often report effort allocated to two areas including physical handling and feeding the dog edibles. Dogs that display aggression often lunge or pull towards the stimulus dog or another target. This can make physical handling difficult for owners. Further, when implementing, owners are instructed to observe their dog's facial expressions, as well as, the rest of their dog's body. This is problematic unless the dog's head is near the owners side (i.e., heel position). Fitting dogs for a head collar (e.g., Gentle Leader™) reduces the effort of keeping the dog in a favorable physical position.

Secondly, the amount of edibles needed during implementation can make handling the dog cumbersome and difficult. Finally, dogs often take edibles from their owners hand with extreme



force when in the presence of the eliciting stimulus or stimulus dog. This can often result in pain or even wounds on the owners hand. Using a treat dispenser (e.g., bottle of squeeze cheese) may reduce the effort and pain associated with implementing. Edibles can be delivered at a high rate without the dog's teeth coming into contact with owners' hands. As aggression is reduced, the amount of food required is reduced and dogs begin taking treats with less force. Therefore, a food dispenser could be used temporarily and gradually faded to reduce reinforcer satiation (Lee & Belfiore, 1997).

In summary, owners are instructed to keep their dog near them and feed edibles at a high rate when encountering a stimulus dog. The force at which dogs pull, the force at which they take food, and the high rate of food delivery required makes CC difficult to implement. Introducing target dogs to head collars as well as using a food dispenser may decrease unnecessary effort and increase the integrity with which CC is implemented. That is, reducing effort for implementing CC may increase sustained use over time of this effective treatment over time.

#### *Thin or Fade Food Delivery*

The fourth modification to CC is to thin or fade the schedule of food delivery. In practice, CC pairings are often delivered continuously (i.e., paired 1:1 ratio with eliciting stimulus). Under these conditions behavior comes under the control of the conditioned stimulus rapidly. However, this dense schedule can become problematic. A common complaint about CC is that owners have to remain "constantly vigilant" regarding their dog's behavior (Snider, 2007). This constant vigilance is present because the association in respondent conditioning is extinguished when the conditioned stimulus is not followed by the unconditioned stimulus (Pavlov, 1924; Bouton, 2004). Owners are constantly monitoring to avoid extinguished pairings (i.e., aggression).

However, like operant conditioning, CC schedules can be thinned to avoid extinction. When using continuous reinforcement (CRF) schedules are thinned to intermittent schedules behavior becomes more resistant to extinction (Ferster & Skinner, 1957). Under intermittent schedules, the animal is more likely to be successful when dealing with contingencies found in the natural environment. Therefore, it may be important to pair the eliciting stimulus intermittently.

Numerous studies have shown that behavior can be maintained when reinforcement is faded from a CRF schedule to intermittent schedules. For example, Neef, Shafer, Egel, Cataldo, and Parrish (1983) successfully faded delivery of reinforcement to a VR 3 schedule (i.e., behavior was reinforced on average every third time). Children's compliance of "do" and "don't" requests were initially acquired using a CRF schedule. During follow-up conditions, reinforcement was faded to a VR 3 schedule and behavior was maintained at a high rate. More recently, Slater and Dymond (2011) shaped trailer loading in horses. Once target behavior was acquired, loading was put on a CRF schedule. In follow-up loading was maintained by a VR 2 schedule (i.e., delivering a reinforcer every second time the horse loaded the trailer). In animal training, schedules of reinforcement are often thinned while behavior is maintained at high rates.

Research further suggests that intermittent schedules are more resistant to extinction. Kazdin and Polster (1973) compared resistance to extinction with two adult males using a reversal design to show the effects of extinction. During the first reinforcement phase, token economy was used to reinforce social interactions. When the contingency was removed, social interactions dramatically decreased. During the second reinforcement phase, the behavior of an individual was reinforced continuously while the other individual's behavior was reinforced on a variable schedule. In the following reversal phase, social interaction that was previously

maintained on a variable schedule was maintained at higher frequencies compared to that which was reinforced continuously.

Another way in which reinforcement can be faded is by delaying the delivery of the reinforcer. Research suggests that behavior may not tolerate large delays, however it may tolerate short delays. Numerous basic and translational research studies have shown the effects of delayed reinforcers with respect to reinforcer magnitude and choice (Rachlin & Green, 1972; Ainslie, 1974; Solnick, Kannenberg, Eckerman, & Waller, 1980). Many of which examine increasing self-control in decision making (Schweitzer & Sulzer-Azaroff, 1988; Dixon et al., 1998; Dixon & Holcomb, 2000; Fisher, Thompson, Hagopian, Bowman, & Krug, 2000). However, research has been conducted to examine the effects of delay when using equal magnitude reinforcers. Applied studies suggest behavior cannot be maintained under long delays (e.g. 30 s). However, those same studies suggest short delays (e.g., 5 s) are able to maintain behavior (Hagopian, Fisher, Sullivan, Acquistio, & LeBlanc, 1998; Hanley, Iwata, & Thompson, 2001). Training dogs to tolerate delays during CC may improve overall treatment by allowing owners more time to deliver the edible.

In summary, reinforcers are often paired continuously with no delay during training. However, when owners implement in the natural setting, it is difficult to maintain such dense pairings. Although these studies examine operant behavior under schedules of reinforcement, these findings could be extended to CC pairings. Therefore, thinning the schedule of food delivery and introducing a delay may help dogs tolerate contingencies in the natural setting thereby reducing aggression.

The current review of the literature suggests four ways in which CC could be modified to increase its effectiveness. First, by establishing the dog's precursor behavior as an S<sup>D</sup> for owner implementation, CC may more effectively reduce the dog's aggressive behavior. Second, the dog is more likely to eat edibles if their deprivation level is increased. This should create more pairings of the edible and the sight of the stimulus dog so that CC becomes more effective at reducing the dog's aggression. Third, reducing the effort required for the owner to implement may lead to CC being more consistently implemented. This may result in CC more effectively reducing the dog's aggressive behavior. Fourth, by fading the frequency of pairing the edible with sight of the stimulus dog the effect of CC may be more consistent even when not delivered on every occasion.

#### Research Problem

When implemented with integrity, CC significantly reduces aggressive behavior. However, owner implementation often lacks integrity. Directly targeting owner treatment integrity may lead to a greater socially significant treatment for reducing aggressive behavior in dogs. Continuing to target owner treatment integrity in a group setting may increase owner treatment integrity in more challenging contexts (i.e., generalization). Finally, modifying CC may help to increase treatment integrity and make treatment effects more clinically significant. Therefore, the current research addresses the societal problem that owners fail to implement treatment with integrity after training. The proposed research focused on three areas: (a) modifying CC in order to increase the effectiveness of treatment (b) directly targeting owner treatment integrity with instruction and (c) providing generalization programming to offer opportunities to respond in more challenging contexts.

## METHODS

### Assuring Collaboration

Owners were involved in planning key aspects of the research. They were naturally involved in identifying one of the target behaviors (i.e., aggression) because they nominated themselves and their dog to participate in the study. Owners consulted with the researcher on the severity and generality of the problem behavior. Owners assisted in the documentation of the secondary effects (i.e., aggression) of the intervention by completing questionnaires after the intervention. Owners had regular access to the data depicted in graph format. Throughout the intervention, the experimenter held weekly phone meetings with owners to review process and outcome data (i.e., owner treatment integrity and dog aggression).

### Participants and Setting

Five owners and their respective dogs were recruited via the experimenter's dog training company. Each dyad was constructed of an owner and their respective dog. New and previous clients (whose dog continued to display aggression) were asked if they would like to participate in the study. Only owners with 1 hour or less instruction participated. Two dogs lived with one adult owner and three dogs lived with two adult owners. For those homes in which two adult owners were present, only one owner implemented treatment throughout the study, but both owners were present during trials. The experimenter encouraged that the same owner be the only individual leash walking the dog outside of the experimental arrangement. Only dogs who displayed aggression with a minimum mean of 39% across baseline conditions were allowed to participate. If aggression was less than a mean of 50% across all baseline conditions, an additional criteria of precursor behavior with a mean of 89% was required.

*Dyad A*

Owner A, a 25-year-old Caucasian man, participated as an implementer. He had a college education and was a head baker at a local grocery store. Owner A participated with Captain, a 3-year-old male Dalmatian. Captain was recently adopted from a local animal shelter 3 months prior to involvement in the study. Upon adoption Captain was neutered. Captain's owners reported that he was aggressive on leash with other dogs and strangers. Captain had a history of biting (defined in this manuscript as teeth making contact with the skin of another individual with the result of broken skin) a neighbor while on leash. Owner A's partner, a 27-year-old Caucasian man was also present during most of the trials. Another dog lived with Captain, but was not present during the trials.

Owner B, a 46-year-old Caucasian woman, participated as an implementer. She was college educated and was employed as a teacher at a local school. Owner B participated with Maddie, a 1.5 year old female German Shepherd. Maddie was adopted at a local animal shelter when she was 8-weeks-old. Upon adoption Maddie was spayed. Maddie's owner reported that she was aggressive on leash towards other dogs and towards strangers as they approached or entered the home. Maddie did not have a history of biting. Owner B had two children who were not present during any of the trials. Maddie lived with two adult dogs and two cats, who were not present during the trials.

Owner C, a 47-year-old Caucasian man, participated as an implementer. He held a high school diploma and worked at a local convenient store. Owner C participated with Lego, a 2-year-old male American Bulldog. Lego was adopted at a local animal shelter when he was approximately 1-year old. Upon adoption Lego was neutered. Lego's owners reported that he

was aggressive on leash towards other dogs and towards a cat that lived in the home. The owner reported that Lego broke away from his leash and grabbed another dog (on one occurrence) and a cat (on another occurrence), and “pinned them to the ground.” Lego did not have a bite history. Owner C’s wife was present during each trial. Lego lived with another dog and a cat, who were not present during the trials.

Owner D, a 36-year-old man, participated as an implementer. He held a college degree and worked as a website developer. Owner D participated with Charlie, a 2.5-year-old female Boxer. Charlie was adopted from a Craigslist, one year prior to participating in the study, when her previous owners could no longer care for her. She was spayed upon adoption. Charlie was reported to be aggressive on leash. Her owner reported that she broke away from her leash and grabbed, shook, but did not wound the neighbor dog. Charlie did not have a bite history. Owner D’s wife was present during all of the trials. There were no other animals living in the home.

Owner E, a 45-year-old woman, participated as an implementer. She held a bachelor’s degree and was currently enrolled as a graduate student in the field of family counseling. Owner E participated with Yoshi, a 4-year-old male Shiba Inu. Yoshi was adopted from his breeder, two months prior to participating in the study, after his previous owners could no longer care for him. Yoshi had been neutered by his previous owner. Yoshi was reported to be aggressive on leash with other dogs. Yoshi had a history of biting his owner while becoming aggressive on leash with another dog (i.e., “redirected aggression”).

Five homes or their surrounding area (e.g., local park, walking trails) in the Kansas City metro area served as the setting for instruction phase of the study. Exposures to stimulus dogs were conducted in each dog’s immediate physical community (e.g., local park, neighborhood).

The owner(s) and their dog were present in the setting. During generalization programming, a dog training facility (i.e., the experimenter's home) served as the setting for generalization programming. Generalization programming consisted of like peers (i.e., owners with dogs that displayed aggression towards other dogs). Generality of owner implementation was observed and programmed for in the facility's immediate physical community (e.g., neighborhood).

### Dependent Measures

The research measured four dependent variables from three different sources: treatment integrity, acceptability of treatment from owners and experts, dog aggression (e.g., vocalization towards eliciting stimulus, lunging towards the stimulus), and dog precursors to aggression (e.g., tail up, prolonged and direct eye contact).

#### *Owner Treatment Integrity*

Owner treatment integrity served as the primary dependent measure. Implementation was scored correct if an owner delivered a bridge (i.e., "yes") and an edible when precursor behavior was presented. Initially, it was required that the bridge and the edible be delivered within 1 s of the precursor being displayed. In subsequent trials, as dog behavior improved, it was required that the bridge and the edible be delivered within 1-3 s of the precursor behavior being displayed. Implementation was scored correct if the owner continued to deliver a bridge in a 1:1 ratio when precursor behavior continued (e.g., dog continuing to stare at stimulus dog). Implementation was scored correct if an owner moved their dog away from stimulus when their dog refused edibles, displayed more severe precursor behavior, or displayed aggression. Implementation was scored correct if owners refrained from delivering a bridge and edible in the absence of precursor behavior. Implementation was scored incorrect as an error of omission if the owner (a) did not



deliver a bridge or edible within the specified time of the presented precursor, (b) did not deliver a bridge, but did deliver an edible within the specified time of the presented precursor, (c) delivered a bridge, but did not deliver an edible within the specified time of the presented precursor, or (d) did not make an attempt to increase distance from stimulus dog or failed to increase the rate of feeding when their dog refused the edible, displayed more severe precursor behavior, or became aggressive. Implementation was scored incorrect as an error of commission if the owner (a) delivered a bridge in the absence of precursor behavior, (b) delivered an edible in the absence of precursor behavior, or (c) added a treatment step. Examples of added treatment steps included blocking the dog's view of the stimulus, delivering a verbal reprimand during implementation, or delivering more than one bridge word per delivery of one edible. Whole interval 5 s recording was used to score owner treatment integrity. Percent intervals of correct implementation was calculated by dividing the total number of correct intervals by the total number of intervals multiplied by 100. Errors were further analyzed by comparing errors of commission and omission.

#### *Acceptability of Goals, Procedures, and Effects*

Acceptability of goals, procedures, and effects were measured in the current study. Owners completed one questionnaire prior to the study and two questionnaires upon completion of the study. Experts (2 dog trainers, 2 animal rescue personnel, 2 veterinary care professionals, and 2 researchers) completed similar forms upon completion of the study. All forms used a 6-point Likert type scale and can be found in Appendix A. Prior to the study owners completed a Social Validity of Goals form. This form was used to determine if the goals of treatment were appropriate by having owners rate 7 statements. Upon completion of the study, owners were

asked to complete a Social Validity of Procedures form, containing 29 statements, to determine the acceptability of the procedures. Owners were asked to complete a Social Validity of Effects form, containing 7 statements, to determine the acceptability of the effects of treatment. Mean scores were calculated to determine levels of acceptability of goals, procedures, and effects for owners.

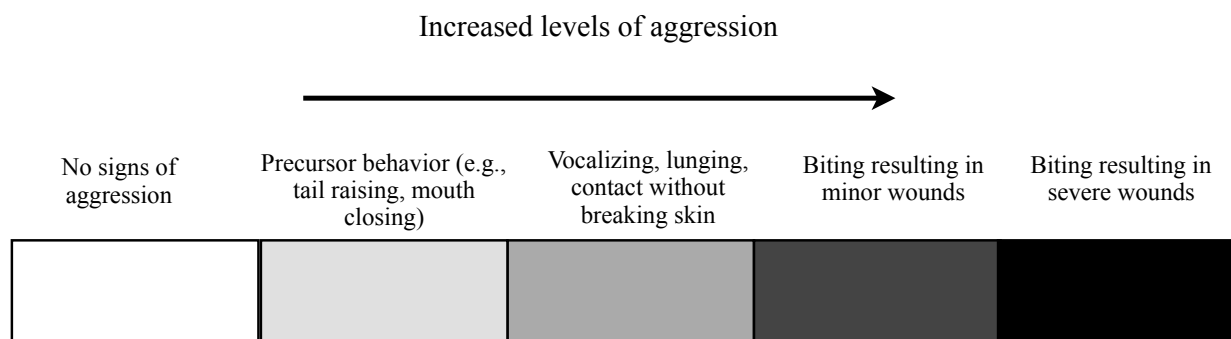
Upon completion of the study, 6 experts completed a Social Validity of Goals form. Experts included two dog trainers, 2 animal rescue personnel, 1 veterinarian, and 1 registered veterinary technician. This form was used to determine if the goals of treatment were appropriate by having experts rate 7 statements. These same experts completed a Social Validity of Procedures form, containing 12 statements, to determine the acceptability of the procedures. All experts (including 2 graduate students involved in performance management research) were asked to complete a Social Validity of Effects form, containing 7 statements, to determine the acceptability of the effects of treatment. Mean scores were calculated to determine levels of acceptability of goals, procedures, and effects from experts.

### *Dog Aggression*

The primary dog behavior measured was aggression. Aggression was defined as any vocalization, lunging, or the combination of both directed towards the stimulus dog. Lunging was further defined as forward movement towards the stimulus with both feet coming off of the ground. Vocalization and lunging were selected because they are behaviors that could be safely measured that fall near a bite on a continuum of aggression (see Figure 1). Due to ethical considerations biting was prevented and therefore did not occur. Partial-interval 5 s recording method was used to score aggression across all phases. Percent intervals of aggression was

calculated by dividing the number of intervals in which dogs were aggressive by the total number of intervals multiplied by 100.

Figure 1. A continuum of dog aggression.



#### *Dog Precursor Behavior*

The secondary dog behavior measured was precursor behavior. Precursor behavior was broadly defined as any behavior that was previously determined from baseline trials to occur immediately prior to aggression. Each dog displayed a variety of precursor behavior (e.g., prolonged stare toward stimulus dog, ears pointed towards stimulus dog). For a list of precursor behaviors see Table 1. Partial-interval 5 s recording method was used to score precursor behavior across all phases. Percent intervals of precursor behavior was calculated by dividing the number of intervals in which precursor behavior occurred by the total number of intervals multiplied by 100.

Table 1. A list of example precursor behavior.

Dog	Precursor Behavior
Captain	Ears lifted; tail raising; prolonged eye contact with the stimulus
Maddie	Ears pointed and directed towards stimulus; prolonged eye contact with the stimulus
Lego	Prolonged eye contact with stimulus; tail up and pointed towards stimulus; ears perked
Charlie	Prolonged eye contact with the stimulus
Yoshi	Prolonged eye contact with the stimulus; ears pointed and directed towards stimulus

## Measurement System

All behaviors, with the exception of treatment acceptability, were measured by human observers reviewing video recorded sessions.

### *Owner Treatment Integrity*

To measure percent intervals of treatment integrity, observers used a data sheet (Appendix B) and a vibrating time keeper while reviewing video recorded sessions. 30 s trials were broken into 5 s intervals. Whole interval recording was used. If owners implemented correctly during the entire interval it was marked as an occurrence. If owners made an error during the interval it was marked as a nonoccurrence.

### *Dog Aggression and Precursor Behavior*

To measure aggression and precursor behavior, observers used data sheets (Appendices C and D) and a vibrating time keeper while reviewing video recorded sessions. 30 s trials were broken into 5 s intervals. Partial interval recording was used. If the behavior occurred during the interval, the interval was marked as an occurrence. If the behavior did not occur during the interval, it was marked as a nonoccurrence.

### *Acceptability of Goals, Procedures, and Effects*

Owners and experts completed questionnaires (see Appendix A) to measure acceptability of goals, procedures, and effects. Mean scores for all participants and experts were calculated to determine levels of acceptability.

### Reliability, Interobserver Agreement (IOA), and Procedural Fidelity

The experimenter initially scored all video tapes. Reliability was assessed by having two trained observers view the video tapes. Observer A calculated 49.4% of the reliability trials;

Observer B calculated 50.6% of the reliability trials. Both observers were trained using behavioral definitions, examples, and non-examples of the target behavior. Spot checks were conducted to ensure there was no observer drift. For reliability of owner treatment integrity, dog aggression, and precursor behavior interval-by-interval method was used. Interobserver agreement (IOA) was calculated by taking the number of agreements over the total number of comparisons converted to a percentage. Reliability of owner treatment integrity, dog aggression, and dog precursor behavior was calculated in a minimum of 40% of all trials across all phases for each participant.

Table 2 displays reliability of treatment integrity, aggression, and precursor behavior across all conditions. Reliability was conducted during instruction in 44.4% of baseline trials, 41.9% of intervention trials, and 50% of follow-up trials. Reliability was 90.4%, 97.6%, and 95.2% for treatment integrity, aggression, and precursor behavior during baseline of instruction. Reliability was 86.6%, 96.2%, and 93.1% for treatment integrity, aggression, and precursor behavior during the intervention of instruction. Reliability was 87.1%, 98.1%, and 98.1% during follow-up of instruction. Reliability was conducted during generalization programming in 66.7% of baseline trials, 41.7% of intervention trials, and 57% of follow-up trials. Reliability was 84.8%, 98.5%, and 86.5% for treatment integrity, aggression, and precursor behavior during baseline of group training. Reliability was 80.3%, 97.8%, and 85.5% for treatment integrity, aggression, and precursor behavior during the intervention of group training. Reliability was 86.4%, 100%, and 90% for treatment integrity, aggression, and precursor behavior during follow-up of generalization programming. Reliability was conducted in 45.5% of total probe

trials. Reliability was 80.3%, 95.5%, and 93.9% for treatment integrity, aggression, and precursor behavior during probe trials.

Table 2. Reliability of treatment integrity, aggression, and precursor behavior.

<b>Phase</b>	<b>Condition</b>	<b>Dependent Variable</b>	<b>Reliability</b>	<b>Range</b>
Private Instruction	Baseline	Treatment Integrity	90.4%	33.3-100%
		Aggression	97.6%	83.3-100%
		Precursor	95.2%	66.7-100%
	Intervention	Treatment Integrity	86.6%	50-100%
		Aggression	96.2%	66.7-100%
		Precursor	93.1%	66.7-100%
	Follow-up	Treatment Integrity	87.1%	66.7-100%
		Aggression	98.1%	83.3-100%
		Precursor	98.1%	83.3-100%
Group Instruction	Baseline	Treatment Integrity	84.8%	50-100%
		Aggression	98.5%	83.3-100%
		Precursor	86.5%	50-100%
	Intervention	Treatment Integrity	80.3%	50-100%
		Aggression	97.8%	83.3-100%
		Precursor	86.7%	50-100%
	Follow-up	Treatment Integrity	86.4%	83.3-100%
		Aggression	100%	100%
		Precursor	90%	50-100%
Private and Group Instruction	Probe Trials	Treatment Integrity	80.3%	50-100%
		Aggression	95.5%	66.7-100%
		Precursor	93.9%	50-100%



Procedural fidelity was assessed by having the experimenter and the observers view video tapes. A task analyses (see Appendix E) was used to score completion of a procedural step as completed or not. Procedural fidelity was calculated in a minimum of 30% of all trials across all phases. The experimenter, Observer A, and Observer B conducted 10.9%, 60.6%, and 28.5% of the procedural fidelity checks, respectively.

Table 3 displays procedural fidelity data for the following instruction conditions: pretreatment, introducing Gentle Leader, intervention, and follow-up. The table displays the following generalization programming conditions: habituation steps, safety protocol, intervention, and follow-up. Procedural fidelity data for probe trials is also presented. During instruction, procedural fidelity checks were conducted during 100% of pretreatment training and introduction to the Gentle Leader and was 100%. Procedural fidelity checks were conducted during 50.4% of intervention and 100% of follow-up trials and was 99.5% and 100%, respectively. During generalization programming, procedural fidelity checks were conducted during 100% of all habituation steps and safety protocol and was 100% for both. Procedural fidelity checks were conducted during 32.2% of the intervention trials and 100% of follow-up trials. For both conditions procedural fidelity was 100%. Procedural fidelity was collected during 100% of all probe trials and was 100%.

Table 3. Procedural fidelity checks.

<b>Phase</b>	<b>Condition</b>	<b>Trials with Fidelity Checks</b>	<b>Reliability</b>	<b>Range</b>
Private Instruction	Pretreatment	100%	100%	-
	GL Introduction	100%	100%	-
	Intervention	50.4%	99.5%	97.5-100%
	Follow-up	100%	100%	-
Group Instruction	Habituation	100%	100%	-
	Safety Protocol	100%	100%	-
	Intervention	32.2%	100%	-
	Follow-up	100%	100%	-
Private and Group Instruction	Probe Trials	38.5%	100%	-

## Research Design

A single subject design was used for the current study. Single subject designs are appropriate when clinical significance of effects is relevant. Single subject designs focus on individual behavior rather than that of a group. Each participant serves as his or her own control. Single subject design relies on visual analysis to show the effects of the independent variable on dependent measures. In doing so, baseline logic is used. Baseline logic includes three elements: prediction, verification, and replication. If levels of behavior are stable in baseline (in a minimum of three observation periods) it is reasonable to predict that levels of behavior will remain stable in the absence of an independent variable. This prediction is verified when there is a change in level of the dependent variable when and only when the independent variable is introduced. The verification is repeated across participants, settings, behaviors, or conditions to ensure the independent variable was responsible for changes in dependent measures.

More specifically, a multiple baseline design across participants was used in the study (Cooper, Heron, & Heward, 1997). A multiple baseline design uses a staggered introduction of the intervention across participants, settings, or behaviors. A multiple baseline design is an appropriate design when maintenance is of interest. Further, it allows for flexibility in adding additional components to an intervention.

## Procedure

Throughout the study any additional owners (e.g., spouses, partners) that were present during the trials stood near the participating owner. The study consisted of several components and was divided into two phases: private and generalization programming.

### *Instruction*

During the first phase of the study, participants were exposed to instruction. Instruction consisted of baseline, intervention, and follow-up. The intervention consisted of directly targeting owner treatment integrity when implementing a modified CC treatment. The following modifications were made to CC as treatment: (a) instruct owners on discriminative stimuli, (b) alter the establishing operation for dogs, (c) decrease effort, and (d) thin the pairing of food delivery to resist extinction. Owner treatment integrity was targeted with verbal instruction, modeling, prompting, and performance feedback.

During instruction, owners were consulted with in the natural setting. Exposures were conducted in the dog's immediate physical community in an area with an increased likelihood of exposure to other dogs (i.e., nearby walking trail, local park). Although there was an attempt to have equal quality exposures, stimuli included those in the natural setting and were difficult to control. All exposures were conducted at a distance that was deemed safe by the first author (i.e., distance large enough to ensure no contact would be made with another dog or other humans). Each dyad stood near a path or sidewalk where stimulus dogs would pass. The distance from the path was determined during baseline and differed across dyads. Distances from the path were: 8 ft for Dyad's A, B, and E; 15 ft for Dyad's C and D. Each trial began once a stimulus dog approached and entered into a predetermined space. The predetermined space was 75 ft away from the target dog. This space was representative of the distance at which each dog displayed precursors and became aggressive during baseline conditions. This space was marked by something stationary and consistently present in the natural environment (e.g., park bench, fire hydrant). The trial consisted of another dog entering the space, passing the target dog, and

leaving the space in the opposite direction (50-75 ft in the opposite direction). Each trial ended after 30 s and when the stimulus dog left the space. To ensure trials that were equivalent in duration, a range of distance for each exposure (i.e., trial) was used. For all dogs a range of 125-150 ft existed. If multiple dogs entered the space, the trial started when the first dog entered the space and the last dog exited the space. If the stimulus dog remained in the space for more than 30 s, the trial ended after 30 s and immediately began, using the same stimulus dog. If the stimulus dog remained in the space for longer than two trials, the experimenter directed the dyad to move away so that the stimulus dog was out of sight. The dyad reentered the space once the stimulus had left. All trials were 30 s in length. Anyone jogging or biking with a dog was not used as stimuli. Several trials (3-10) were conducted during each 1-hour instruction session. All instruction sessions were held once per week on the same day and time.

*Baseline (BL).* During baseline, owners were instructed to “do what they normally do” when they confront another dog on leash. If owners stated that they would normally avoid another dog by walking the opposite direction, the experimenter asked them to “do what you normally do except stand in the same general area.”

*Pretreatment training.* The first portion of the instruction consisted of pretreatment training. This portion of the intervention was delivered prior to treatment (i.e., CC) and included (a) decreasing effort in physical handling (b) verbal instruction (c) identifying a discriminative stimulus for implementation and (d) altering the establishing operation. Pretreatment training consisted of a 1.5 hour meeting with the experimenter 1-week prior to intervention trials. During pretreatment training, the experimenter identified the bridge used during training. The experimenter established “yes” as a bridge (See Appendix F). The bridge served as a secondary reinforcer and

was used to help owners implement CC with more appropriate timing. The experimenter also identified the edible to be used during each trial. The edible was selected from three options (a) squeeze cheese (b) peanut butter or (c) hotdog. The experimenter selected the edible based on an interview from the owner and its ability to serve as a reinforcer for a sit command (based on latency of response). If squeeze cheese and hotdog resulted in similar levels of latency, cheese was selected. Cheese was selected for all dogs, except Charlie and Yoshi. Hotdog was initially selected for both dogs. During the first exposure, Charlie would not eat hotdogs nor cheese, therefore canned salmon (brought by the owner) was used for the first two trials. After the first two trials, Charlie ate cheese during each exposure. Therefore, hotdog was no longer used and cheese was chosen as the preferred reinforcer. Yoshi was offered and ate cheese after the second trial. Therefore, hotdog was no longer used and cheese was chosen as the preferred reinforcer. Prior to follow up probes, Owner E reported that Yoshi began avoiding the cheese container. Therefore, the owner began to use and continued to use cut up string cheese.

*Decreasing effort in physical handling.* For those dogs that did not currently walk with head collars (all dogs except Charlie), reducing physical effort for owner implementation was done by fitting each dog with a head collar Gentle Leader™. There was an attempt to fit and introduce each dog to a Gentle Leader™. A Gentle Leader™ is a head collar which assists in reducing the force when a dog pulls on leash. They are used regularly in dog training. The experimenter introduced the Gentle Leader™ according to Appendix G. For a period of one week, owners prepared their dog for the Gentle Leader™ (see Appendix H for a handout given to each owner). The experimenter checked the fitting and observed Charlie wearing the Gentle Leader™.

*Verbal Instruction.* During verbal instruction, the experimenter verbally explained CC and responded to any relevant questions. For a script of the experimenter's verbal explanation see Appendix I. Owner comprehension was tested with multiple choice questions regarding the treatment. Answers were reviewed and errors were verbally corrected by the first author. For a copy of multiple choice questions see Appendix J.

*Identifying discriminative stimuli.* Owners were instructed on common discriminative stimuli ( $S^D$ ). They included their own dog's precursor behavior, their own dog's aggression, and stimulus dog behavior that commonly elicits aggression. Dog precursor behavior (i.e., behavior that immediately precedes aggression) was identified by the first author from the video recorded baseline sessions. Examples of precursor behavior included: prolonged stares towards the stimulus, tail up and pointed towards stimulus, and ears perked towards stimulus. These behaviors should have served as signals for owners to implement. Implementing CC when precursor behaviors are exhibited reduces the probability that aggressive behavior will follow. Owners were shown video tapes of their respective dogs. Owners were verbally instructed on the precursor behaviors that should signal them to begin implementing CC and were given a rationale why implementation should occur. Comprehension was tested by having owners label precursor behaviors while watching previously unseen videos of their dog from baseline sessions. Owners were required to independently and correctly identify three consecutive instances of precursor behavior before moving on. These instances occurred within and across trials. If novel videos were available due to the number of errors, the experimenter showed already viewed videos. Owners were verbally instructed on behavior that signaled to either increase the rate of feeding or increase the distance from the stimulus dog. Their own dog

displaying more severe precursor behavior or aggression should occasion owners to increase the rate of edible delivery and/or increase the distance (attempting to decrease the intensity) from the stimulus dog. In addition, owners were instructed on behaviors from stimulus dogs that commonly elicits aggression (e.g., stimulus dog begins vocalizing, stimulus dog begins pulling towards owner's dog). Owners were instructed to become even more observant of their dog's precursor behavior when stimulus dogs engaged in these behaviors.

*Altering the establishing operation for dogs.* After selecting the edible to be used during each trial, the experimenter arranged for a feeding device (i.e., bottle of squeeze cheese) to be present during each trial. Owners were encouraged to use the selected edible only in the presence of other stimulus dogs (within or outside of the experimental condition) for research purposes. The edible was selected from three others based on its ability to serve as a reinforcer for a "sit" command. For Maddie, the edible was selected for based on its ability to reinforce approaches toward the experimenter. Owners were instructed to withhold meals corresponding to the following week's instruction session (e.g., "Next Tuesday, don't feed Lego breakfast or dinner until after we have our training session."). Further, owners were put on a "Learn to Earn" program (see Appendix K) to further alter the effectiveness of a wide variety of reinforcers (e.g., dog food, treats, attention). Owners are instructed to require their dogs to comply with obedience commands (e.g., "sit") prior to gaining access to preferred items or activities. During each weekly meeting, the experimenter verbally reviewed compliance with the "Learn to Earn" program.

*Treatment.* The intervention during treatment consisted of (a) reducing effort in delivering edibles (b) in vivo modeling (c) prompting (d) performance feedback and (e) fading feedback.



Individual instruction meetings were held once per week on the same day and time and were approximately 1 hour in duration.

*Reducing effort in delivering edibles.* A feeding device was introduced to reduce effort in delivering edibles. A feeding device was chosen based on the earlier identification of the strongest reinforcer. It was a bottle of squeeze cheese. The bottle allowed for fast delivery of edibles and reduced contact between the owner's hand and dog's teeth.

*In vivo modeling.* Before owners implemented treatment, the experimenter modeled treatment with the first stimulus dog seen. The experimenter then gave the leash to the owner so that each owner implemented on the next trial.

*Prompting.* During each trial, if dogs displayed precursor behavior and owners did not implement within the specified time period (usually 1-3 s and depended on progress with dog behavior) owners were prompted by the first author. Prompting occurred within 2-4 s of owners failing to implement. If owners did not implement after three verbal prompts, the experimenter planned to deliver edibles to the dog. Owners were never prompted more than once per error.

*Performance feedback.* The experimenter delivered performance feedback to each owner immediately following each trial. Performance feedback included praise for correct implementation, corrective feedback, and sharing data. Praise and corrective feedback occurred immediately following each trial during a 30 s to 1 min conversation. Data were analyzed and displayed visually on two graphs (time series line graph, bar graph). Each graph depicted owner and dog data. The time series line graph depicted owner and dog data from each trial throughout the experiment with the most recent data highlighted. The bar graph depicted mean levels of owner and dog data from each meeting indicated by date. Mean levels were written above each

corresponding bar. Graphs were emailed with confirmation of them being received. Each graph was reviewed with the owner during a 10-15 min phone consultation one day prior to the next scheduled trial. Owners were praised for areas performed correctly and given detailed corrective feedback on areas that needed improvement (e.g., “During trial 36 you were slow to implement CC.”).

*Fading (Fad).* During instruction, trial performance feedback was faded and delivered only after each instruction meeting. Fading only occurred after a minimum of three instruction meetings. Further, fading only occurred after a minimum of three trials in which owners implemented at 100% and dogs exhibited 0% aggression. If the dyad met the criteria for fading during the first few trials within the meeting, owners were given post trial feedback until meeting criteria. Once criteria was met, owners were given post meeting feedback. Data were not shared once fading was introduced.

*Fading delivery of edibles.* Throughout instruction a delay in delivery of edibles was shaped (i.e., duration of time between precursor behavior and treat gradually increased). The experimenter verbally instructed each owner to begin fading or shaping food delivery when their dog began looking towards the stimulus dog and immediately back to them within 1-2 s. For example, the experimenter said, “It looks like Lego is ready for us to begin fading the amount of food that we feed him. Next time, wait until Lego stares for 2 seconds before you deliver your bridge and feed him.” This occurred only towards the end of instruction.

*Follow-up (FU).* Follow-up probes were collected during a 1-week follow-up session without the use of the intervention to determine if owner behavior maintained. If treatment integrity had fallen below a mean of 67%, additional individual instruction would have been

provided prior to the dyad entering the support group. All of the dyads surpassed the performance criteria and did not receive additional instruction.

### *Generalization Programming*

During generalization programming, participants were exposed to a habituation period, verbal instruction on safety, baseline, and a secondary intervention. Generalization programming was conducted at an outdoor dog training facility (i.e., the experimenters home) in group format. All meetings (except habituation periods) were held once per week. Each meeting lasted approximately 1-hour. The experimenter and a dog trainer provided feedback to dyads. Each instructor was paired in random order with a dyad. During generalization programming, each dyad randomly served as stimuli for other dyads. Only dogs that were participating in the trial were in sight. The remaining dogs were kept in their respective owner's car and out of sight. Each session consisted of 3-6 trials per dyad. Each trial began when two dyads entered into a previously determined space. For trials in which walking was targeted dyads approached other dyads with 175 ft separating each dyad. Starting points were marked with natural and consistent identifiers (e.g., mailbox). Dyads continued walking, passing one another. The trial started when each dyad began walking and ended after 30 s. For trials in which conversation was targeted, dyads approached and stopped with 15 ft of one another. The experimenter and the dog trainer initiated conversation with each owner. The trial started when both owners stopped and ended after 30 s. For trials in which transition times were targeted, the target dyad was encouraged to get their dog out of the car or come out of the house. Another dyad was standing within 15 ft. Each trial started when the front door or the car door opened. The trial ended after 30 s.

*Habituation period.* Owners and dogs had independent exposure to the dog training facility prior to data collection to allow each dog to habituate to the environment. Habituation occurred in one session which lasted 15-30 min. The criteria for habituation included attending to the owner when off leash, performing already known obedience behaviors when on leash, and consuming preferred edibles.

*Verbal instruction on safety.* Prior to the first exposure in generalization programming, the experimenter verbally reviewed safety information. Owners were instructed to enter the training area without their respective dogs. The experimenter instructed owners to (a) keep their dogs on leash (b) enter and exit the training area independent of other dyads, and (c) keep their dogs in the car until instructed by the experimenter.

*Baseline (BL).* Verbal reports from dog trainers and owners, including the experimenter and participants, were collected during instruction to determine stimulus situations that were more challenging for owners (i.e., stimulus situations in which owners do not implement with integrity). Additional data in challenging contexts were collected from direct observation within each session, from video recorded sessions, and from previously reviewed pilot data. Targeted stimuli included walking with the target dog while implementing, engagement in a conversation with another person, and transition periods (e.g., exiting the front door, getting the dog out of car). The experimenter and a dog trainer setup contrived exposures targeting challenging contexts. Owners were instructed to “do their best” if they asked questions during the post-intervention baseline.

*Intervention (Int).* The second intervention was identical to the performance feedback portion of instruction and was used to program generalization of treatment integrity in more challenging

contexts. These contexts were targeted by artificially constructing exposures with other dyads during generalization programming. Dogs were exposed to other dogs in 1-2 challenging context per week. Each dyad participated in a minimum of 3 trials per meeting. The group did not move on to the next challenging context until they had implemented during that particular context with a minimum of 83% integrity for three consecutive trials.

*Fading (Fad).* All challenging contexts were targeted prior to fading feedback. When owners implemented with a minimum of 83% integrity and dogs exhibited 0% aggression for three consecutive trials, a new challenging context was targeted. For example, once all of the dyads met criteria for walking, transition was targeted. This continued until criteria was met for all dyads in each context. Then fading occurred during one meeting in which feedback was given after each context rather than after each individual trial.

*Follow-up (FU).* One week follow-up probes (one probe per challenging context) were conducted without the use of the intervention to determine if owner behavior maintained. These were conducted in the instruction setting.

#### *Generalization and Maintenance Probes*

Generalization and maintenance probes across time and setting were collected throughout the experiment. Each probe consisted of one exposure to another dog (i.e., trial). During instruction, probes were collected to assess levels of owner treatment integrity in more challenging contexts. Challenging contexts included (a) walking while implementing (b) engagement in conversation (c) and transition from one area to another (e.g., getting out of the car, walking out of the house). One probe per challenging context was collected during instruction. The experimenter arranged exposures with a stimulus dyad (i.e., a dog trainer and his

dog). Owners were previously blind to the encounter. The experimenter walked with each dyad. A dog trainer, walking a stimulus dog, appeared in these contexts to present a more challenging exposure. The experimenter refrained from offering any support to the owner. At the same time, probes were conducted to determine levels of owner treatment integrity across stimulus classes. Captain and Maddie were aggressive towards strangers at the front door. During these trials, a dog trainer, wearing a disguise, served as the stranger. Lego was aggressive towards the owner's cat. Charlie and Yoshi were not aggressive to other stimuli. Owners were not given direct instruction on how to address these stimuli. One probe each was conducted during instruction, baseline of generalization programming, and during group follow-up. During generalization programming and follow up, maintenance of owner treatment integrity in less challenging contexts (i.e., those targeted during instruction) was assessed. These probes were conducted in the dog's instruction setting using natural stimulus dogs. Throughout all probe trials the experimenter refrained from offering any support to the owner.

#### Plan for Assuring Generalization

Generality across participants was programmed for by using participants, both owners and dogs, with varying histories. In the current study, owners served as the implementer for their respective dog which represents a typical setting. The current program was designed for use by trainers who commonly prescribe CC as a treatment for aggression. Setting generality was enhanced by conducting instruction in the natural setting (i.e., training in the dog's immediate physical community). Generalization programming was conducted in an outdoor training facility (i.e., the experimenter's home). The training facility is not unlike each dog's natural environment. Response generalization was assessed by requiring the same responses that are

required in the natural setting. Numerous stimulus dogs were used and varied in physical appearance and behavior. Further, deficiencies were targeted to encourage response generalization across stimulus situations in which integrity was generally low. Generalization across time was programmed for during fading of the intervention and was assessed during follow-up observations. Owners contacted natural reinforcers during the intervention that encouraged sustained use of treatment.

## RESULTS

### Treatment Integrity, Aggression, and Precursor Behavior

Figure 2 depicts owner treatment integrity as percent intervals during each trial. Closed circles represent treatment integrity in a simple context (i.e., that context targeted during instruction). Percent treatment integrity while the owner walks is depicted by open diamonds. Percent treatment integrity while the owner transitions from one location to the next (e.g., coming out of the front door, getting their dog out of the car) is depicted by open triangles. Percent treatment integrity while the owner engages in conversation is depicted by open squares. Percent treatment integrity across other stimulus classes is depicted by the open circles. Aggression is represented by the histogram. Figures 3, 4, 5, 6, and 7 depict the same data displayed with individual dyads. Figure 8 depicts identical treatment integrity data with the histogram representing dog precursor behavior. Figures 9, 10, 11, 12, and 13 depict data from Figure 8 displayed with individual dyads. In general, the intervention resulted in dramatic increases in treatment integrity, dramatic reductions in aggression, and slightly diminished precursor behavior.

### *Instruction*

Figure 2 depicts treatment integrity and aggression data from Dyads B, C, D, and E. Figure 8 depicts treatment integrity and precursors from Dyad B, C, D, and E. Dyad A is not included in the 4-panel multiple baseline because they did not complete the study. In baseline of instruction, mean percentage of treatment integrity was 0%, mean percent aggression was 57.9% (range of 0 to 100%), and mean percent precursor behavior was 96% (range of 50 to 100%). During the intervention phase of instruction, mean percent treatment integrity was 84.9% (range of 17-100%), mean percent aggression was 6% (range of 0 to 50%), and mean percent precursor behavior was 91.9% (range of 17-100%). All means excluded generalization probes. During a 1-week follow-up mean percent treatment integrity was maintained at 91.7% (range of 66.7-100%), mean percent aggression was 0.94% (range of 0-17%), and mean percent precursor behavior was 97.2% (range of 66.7% to 100%).

Figures 3, 4, 5, 6, and 7 depict treatment integrity and aggression data for Dyads B, C, D, E and A respectively. Figures 9, 10, 11, 12, and 13 depict treatment integrity and precursor behavior for Dyads B, C, D, E, and A respectively. Treatment integrity was 0% for all owners during baseline of instruction. During baseline Dog A, B, C, D, and E engaged in 39%, 94.3%, 63.2%, 72.2%, and 37.4% aggression, respectively. Dog A, B, C, D, and E displayed 89%, 100%, 96.6%, 91.7%, and 100%, respectively. Owners C and D acquired high levels of treatment integrity (97.5% and 90.2% respectively) almost immediately upon the introduction of the intervention. Owner B's behavior was initially variable, but remained stable and near 100% after several trials. Mean treatment integrity for Owner B was 86.9%. Treatment integrity for Owners A and E remained variable for the majority of private training (71.5% and 75.4% respectively).



However, their behavior stabilized and met the criteria for fading. During the intervention for private training, Dog A, B, C, D, and E displayed 4.8%, 16.6%, 4.2%, 1.7%, and 0% aggression, respectively. Overall, all dogs displayed dramatically less aggression with the introduction of the intervention. Dog A, B, C, D, and E displayed 77.7%, 94%, 93.3%, 97.1%, and 95.3% precursor behavior, respectively. All dyads met the criteria of 100% treatment integrity and 0% aggression in a minimum of three consecutive trials prior to fading feedback. When feedback was faded treatment integrity remained at 100% for Owners A and B. During fading, Owner C's mean integrity was 94%, Owner D's mean integrity was 88%, and Owner E's mean integrity was 79%. For Owners C and D, integrity was maintained at 100% at a 1-week follow-up meeting. Owners B and C maintained 77.8% and 96.6% integrity, respectively. Follow-up data on Owner A was not available because the dog was euthanized. Dog aggression remained at 0% throughout fading and during follow-up for all remaining participants. Dog B displayed 91.7% precursor behavior in follow-up. Dogs C, D, and E displayed 100% precursor behavior in follow-up. Small reductions in precursor were maintained by Dog B, but were not evident or maintained for any other participant.

### *Generalization Programming*

Figure 2 depicts data from Dyads B, C, D, and E. In baseline of generalization programming, mean percentage of treatment integrity was 52.8%, mean percent aggression was 8.3% (range of 0 to 50%), and mean percent precursor behavior was 86.1% (range of 17 to 100%). During the intervention phase of generalization programming, mean percent treatment integrity was 85.2% (range of 17-100%) mean percent aggression was 0.43% (range of 0 to 33%), and mean percent precursor behavior was 70.9% (range of 0-100%). At a 1-week follow-

up mean percent treatment integrity was 65.3% (range of 0-100%), mean percent aggression was 0%, and mean percent precursor behavior was 86.1% (range of 50 to 100%).

Figures 3, 4, 5, and 6 depict treatment integrity and aggression data for Dyads B, C, D, and E respectively. Figures 9, 10, 11, and 12 depict treatment integrity and precursor behavior for Dyads B, C, D, and E respectively. During baseline of generalization programming, Owners B, C, D, and E mean treatment integrity was 22%, 55.7%, 72.3%, and 61.%. Dogs B and C engaged in 16.7% aggression. Dogs D and E engaged in 0% aggression. During baseline of group training Dogs B, C, D, and E displayed 100% , 94.3% , 94.3%, and 55.7% precursor behavior. During the group intervention, Owner B, C, D, and E displayed 77.5%, 91.1%, 84.3%, and 89.4%, respectively. The intervention resulted in increased levels of treatment integrity. Owners B, D, and E displayed variability in treatment integrity, while Owner C maintained more stable behavior. Overall, all dogs displayed significantly reduced levels of aggression with the introduction of the intervention. Aggression was 1.6%, 1.8%, 1.6%, 0% for Dogs B, C, D, and E, respectively. Precursor behavior was 62.9%, 54.2%, 86.9%, and 79.8% for Dogs B, C, D, and E . All dyads met the criteria of 83% treatment integrity and 0% aggression in a minimum of three consecutive trials prior to fading feedback. When feedback was faded implementation maintained or was slightly diminished. During follow-up, treatment integrity was maintained at 66.7%, 100%, 44.3%, and 50% for Owners B, C, D, and E, respectively. Aggression remained at 0% throughout follow-up for all participants. Precursor behavior was 83.3%, 77.7%, 83.3%, and 100% for Dogs B, C, D, and E, respectively.

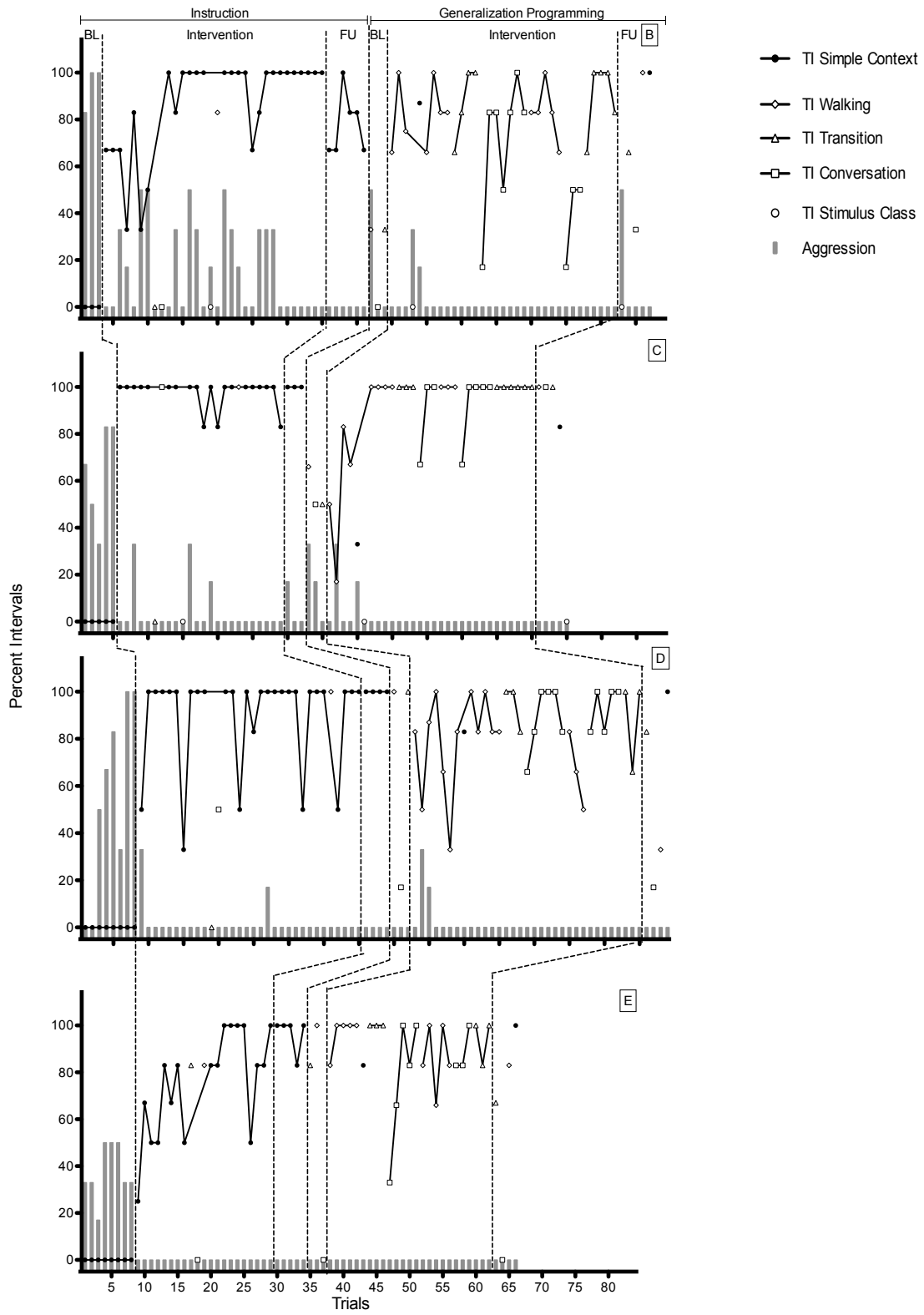


Figure 2. Treatment integrity and aggression during instruction and generalization programming.

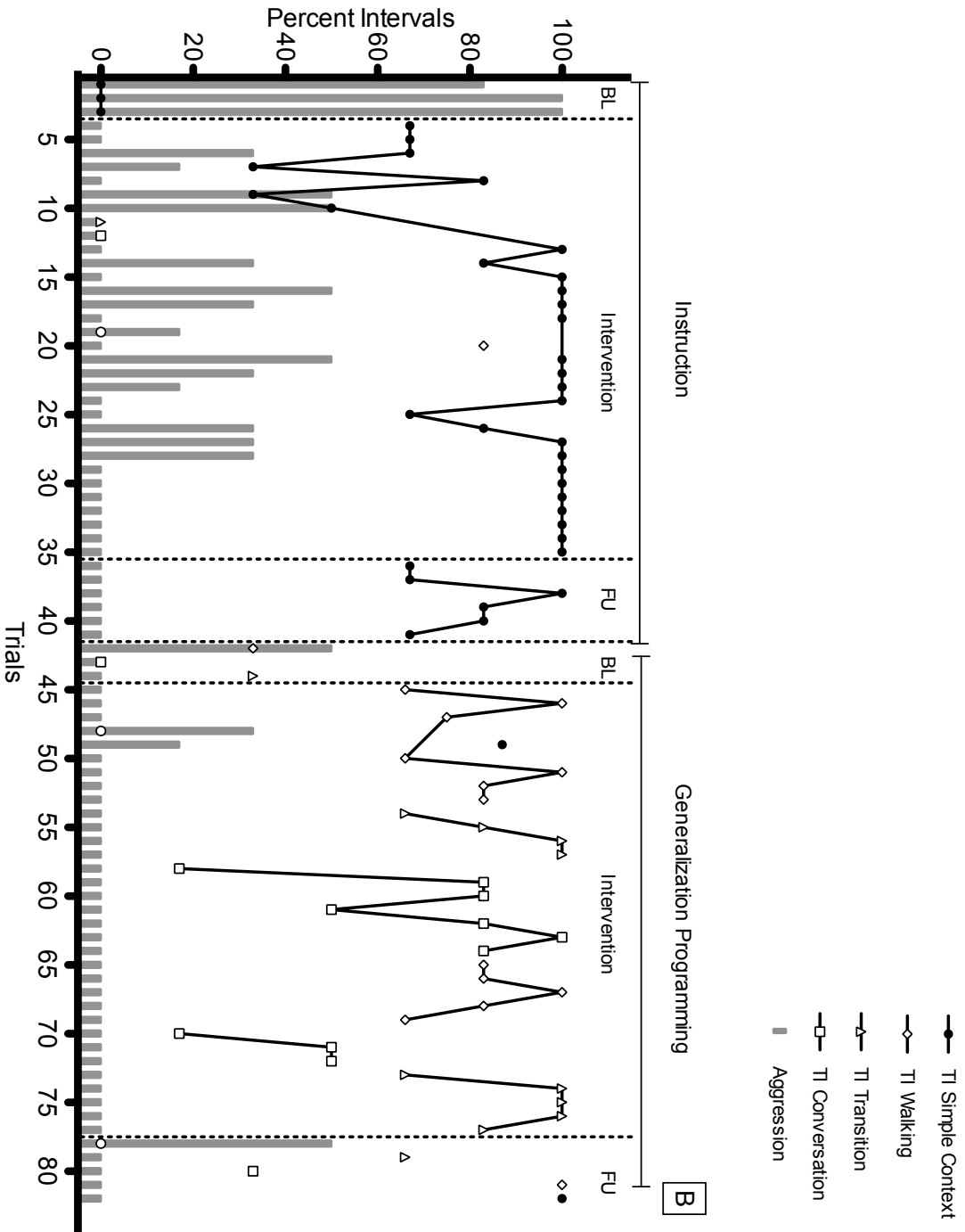


Figure 3. Treatment integrity and aggression during instruction and generalization programming for Dyad B.

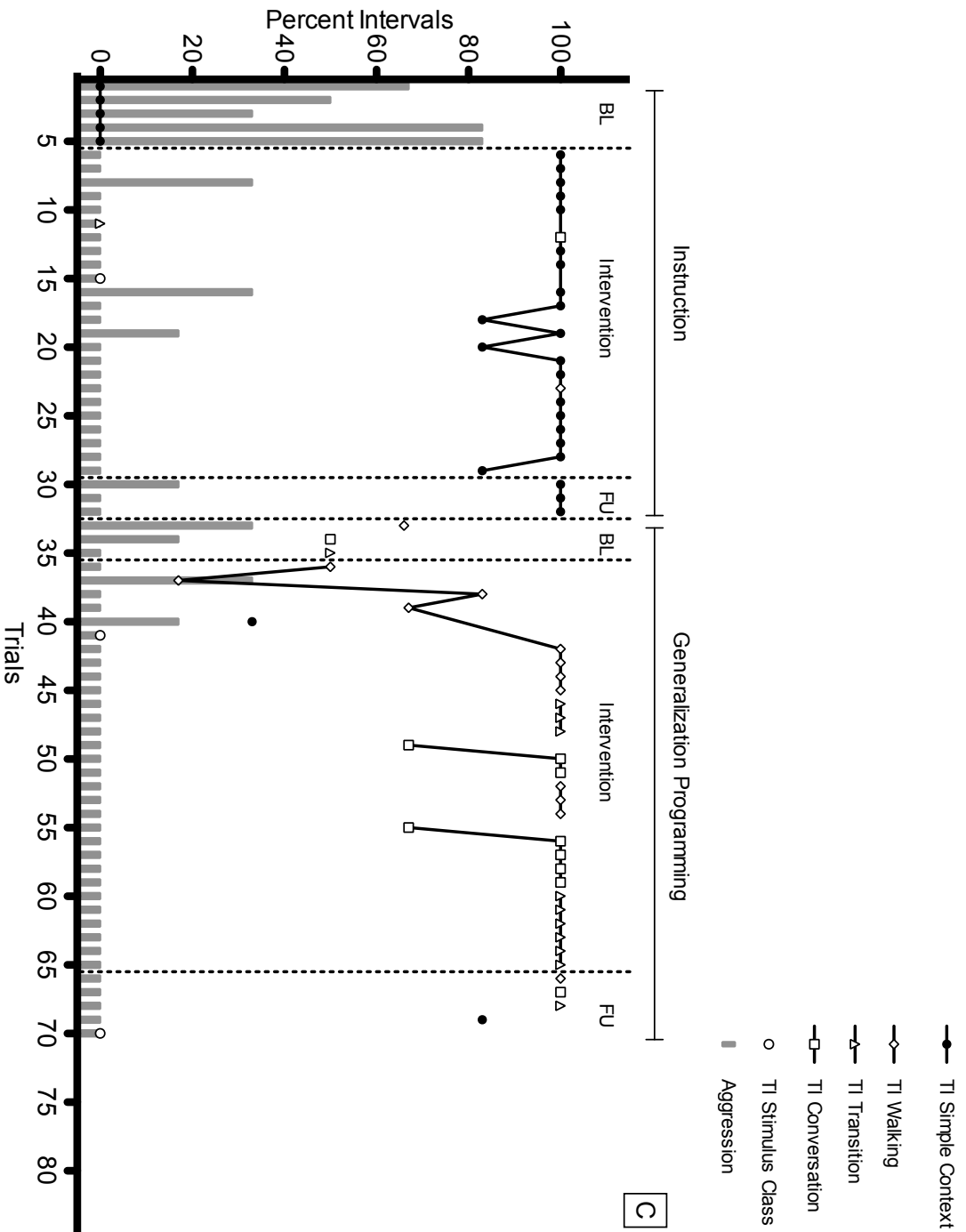


Figure 4. Treatment integrity and aggression during instruction and generalization programming for Dyad C.

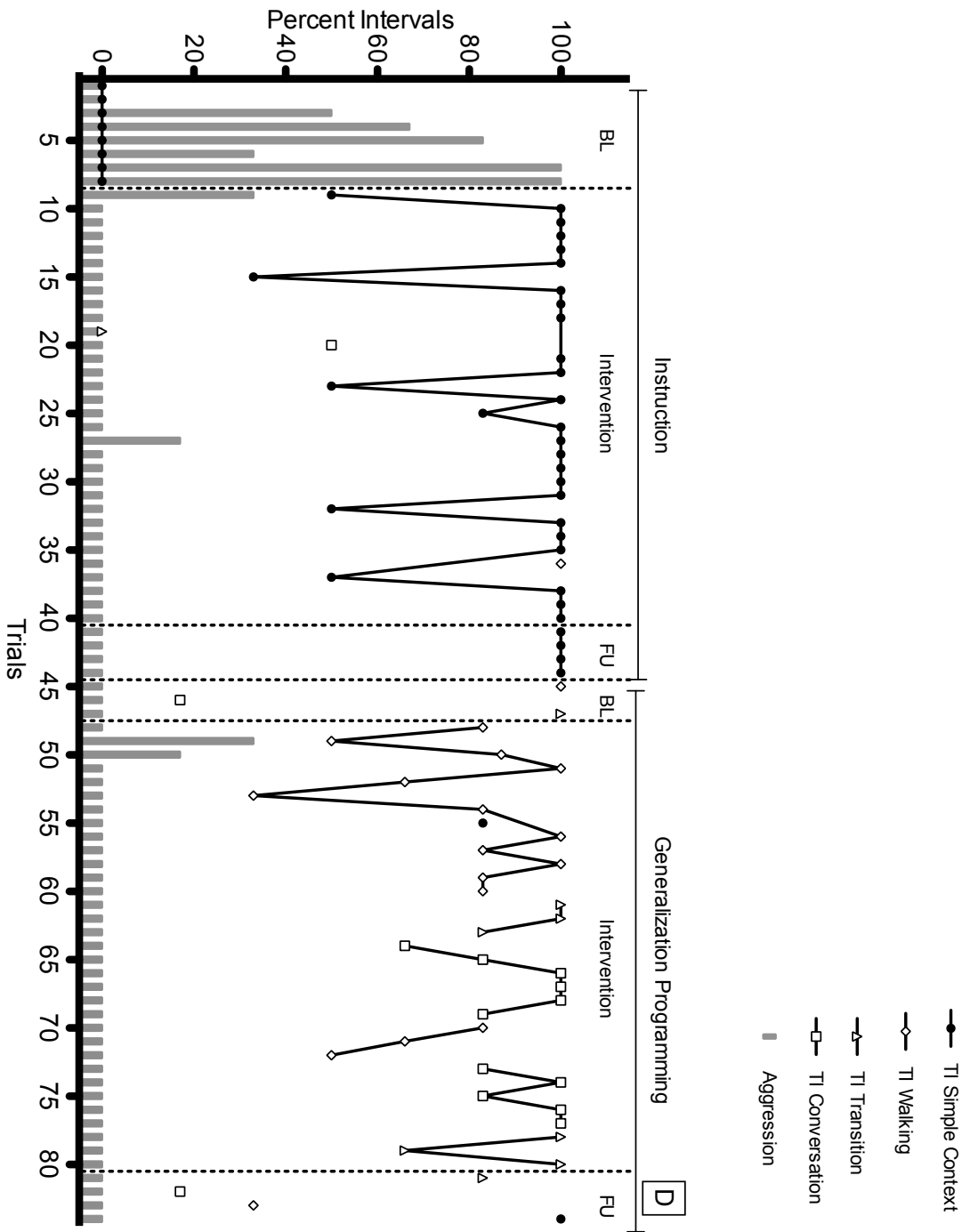


Figure 5. Treatment integrity and aggression during instruction and generalization programming for Dyad D.

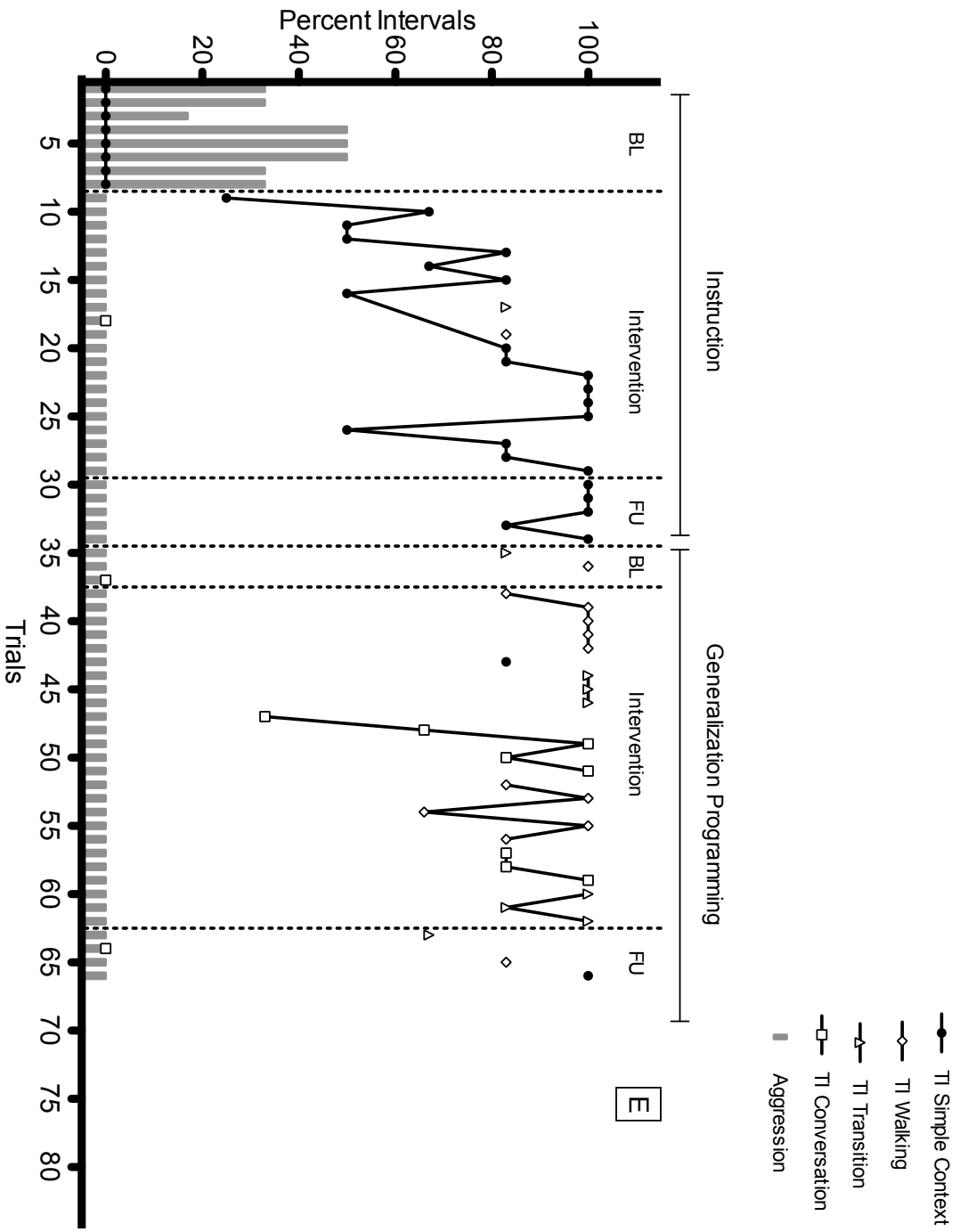


Figure 6. Treatment integrity and aggression during instruction and generalization programming for Dyad E.

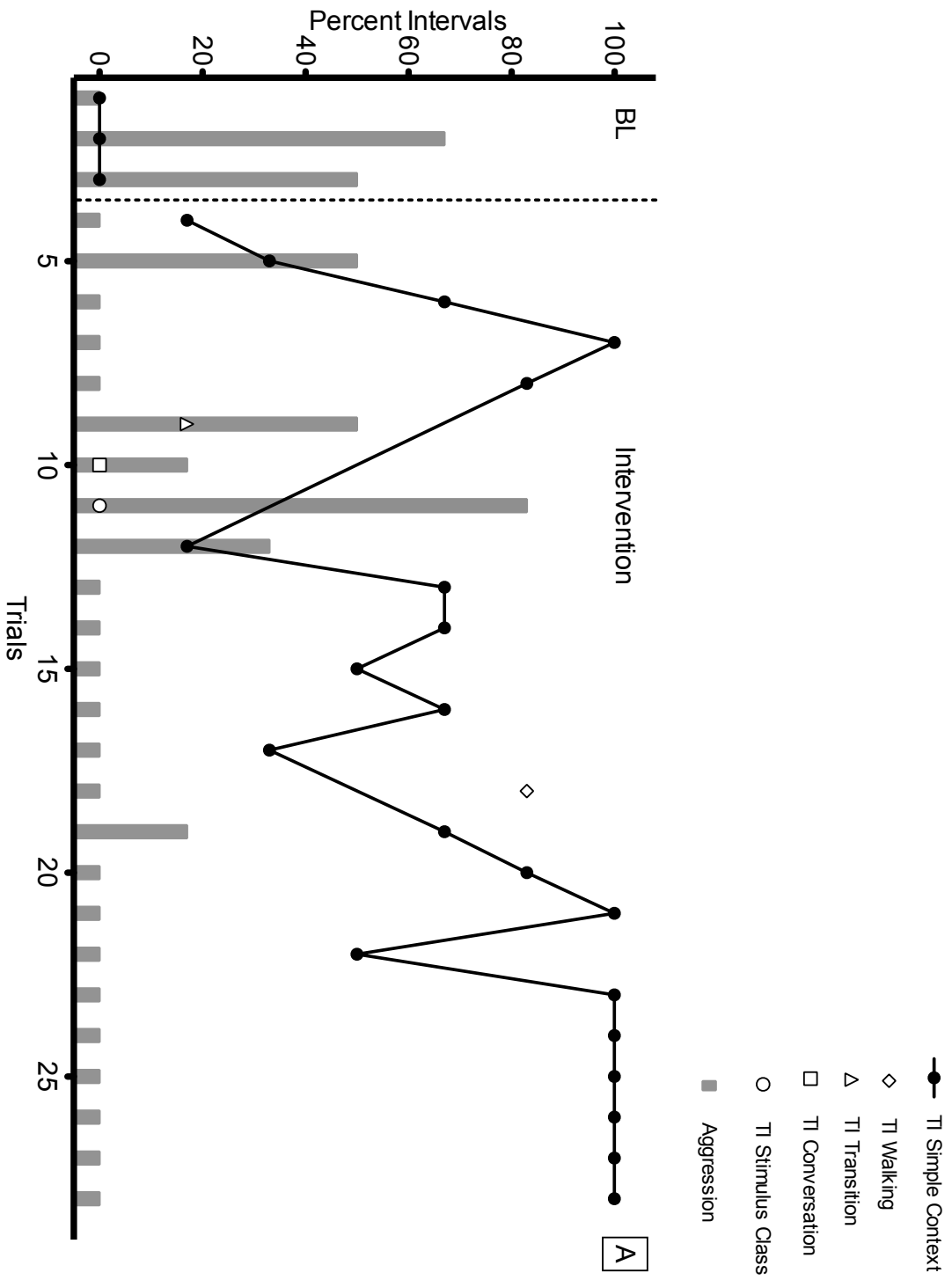


Figure 7. Treatment integrity and aggression during instruction for Dyad A.



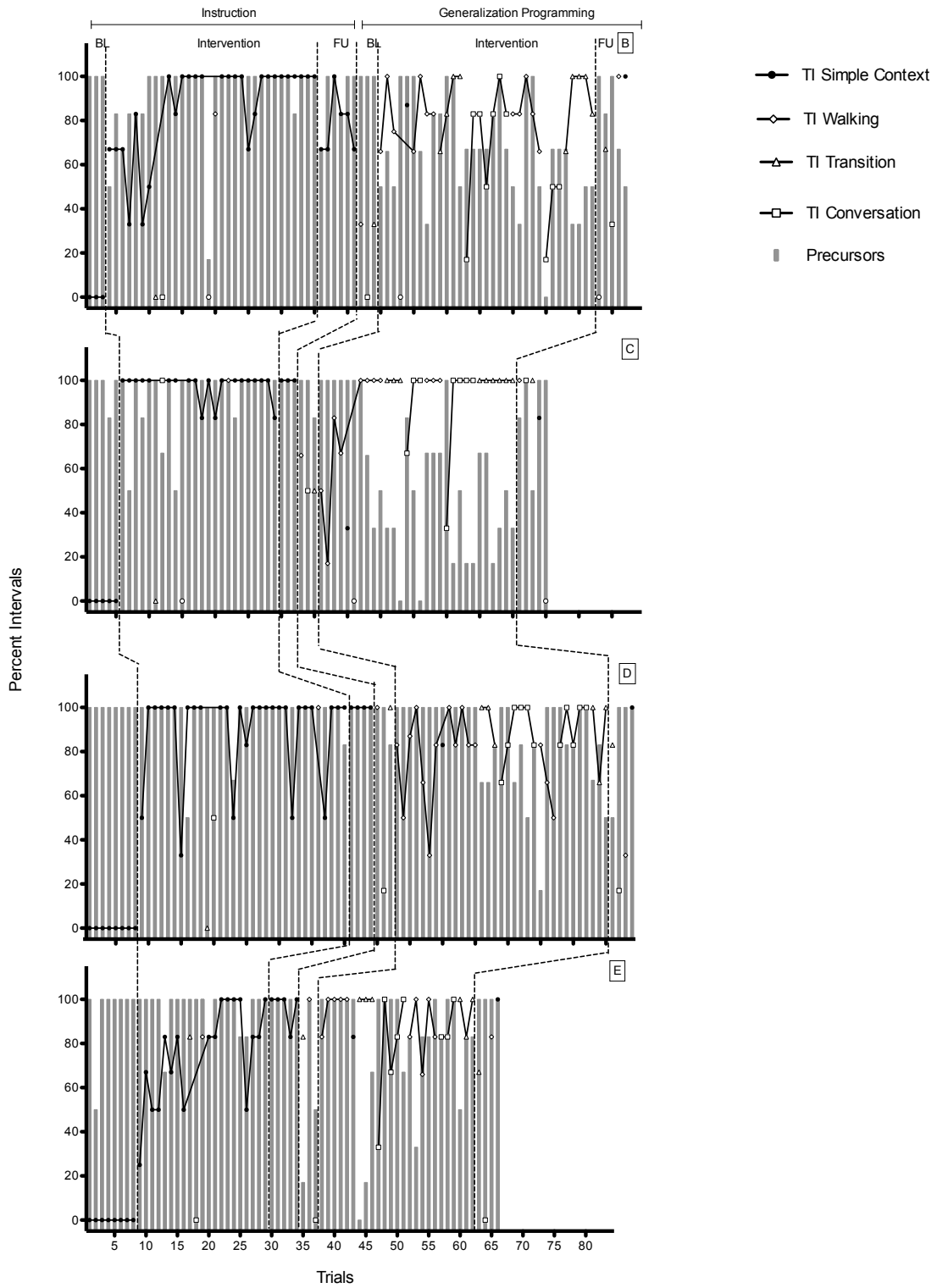


Figure 8. Treatment integrity and precursors during private and generalization programming.

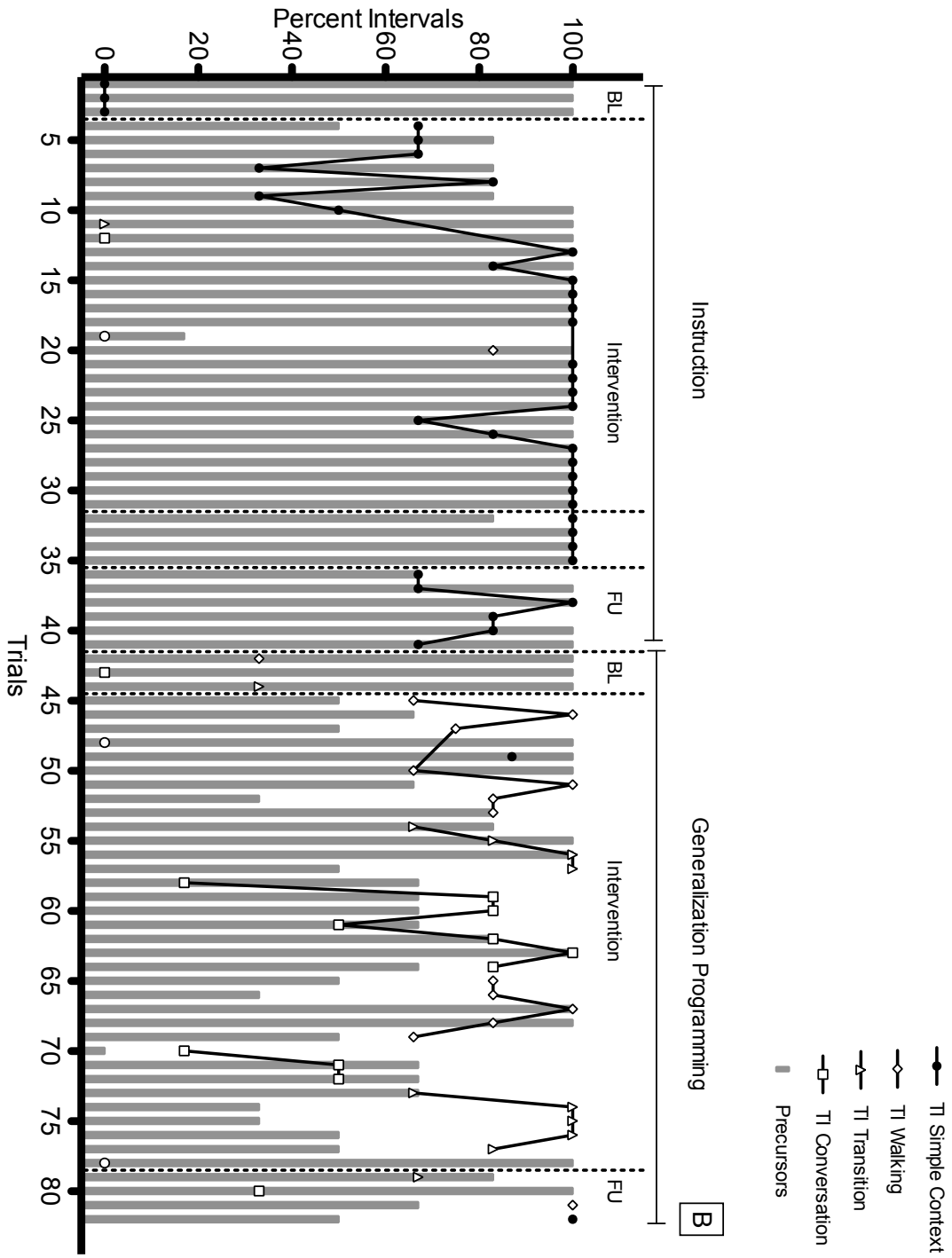


Figure 9. Treatment integrity and precursors during instruction and generalization programming for Dyad B.

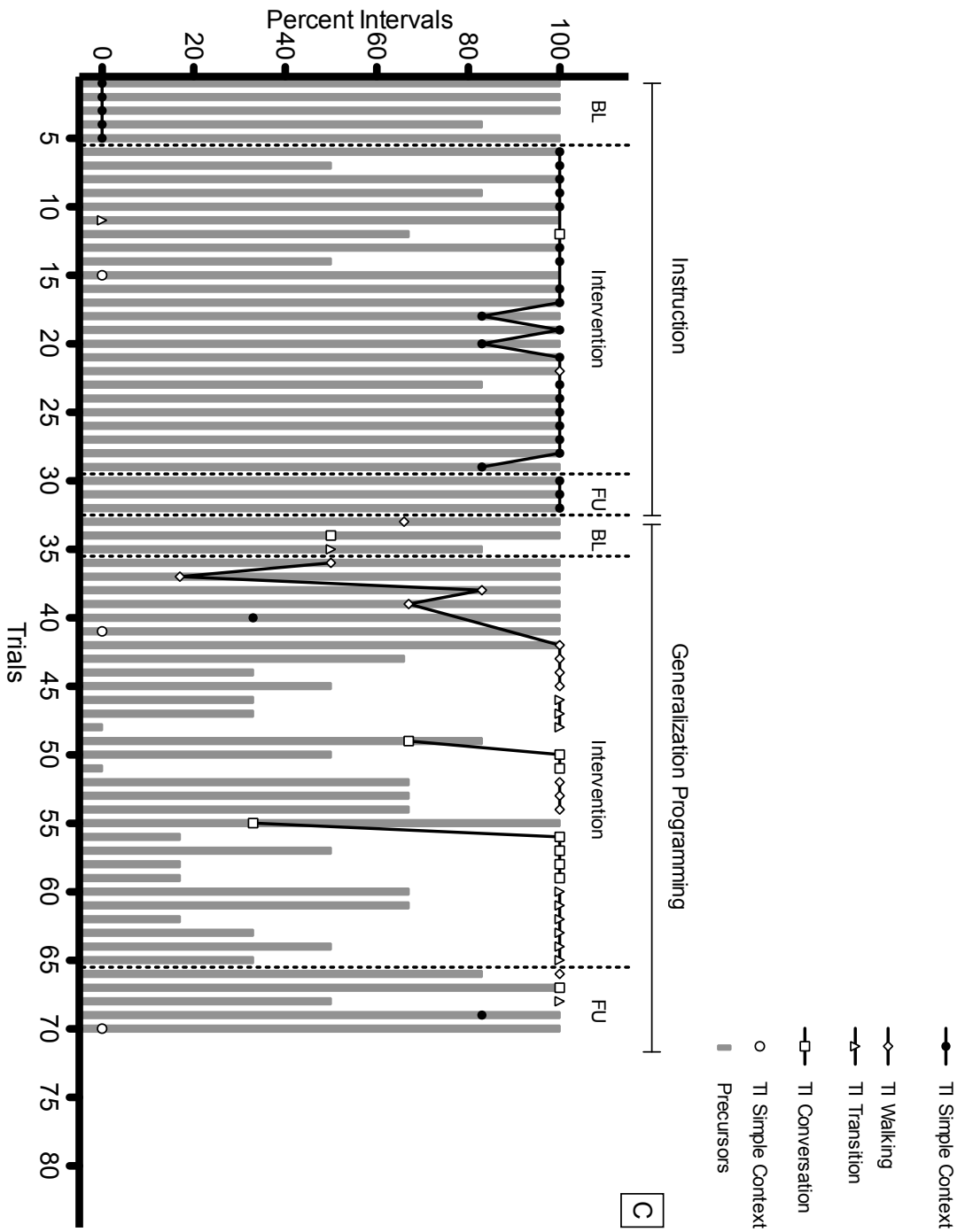


Figure 10. Treatment integrity and precursors during instruction and generalization programming for Dyad C.

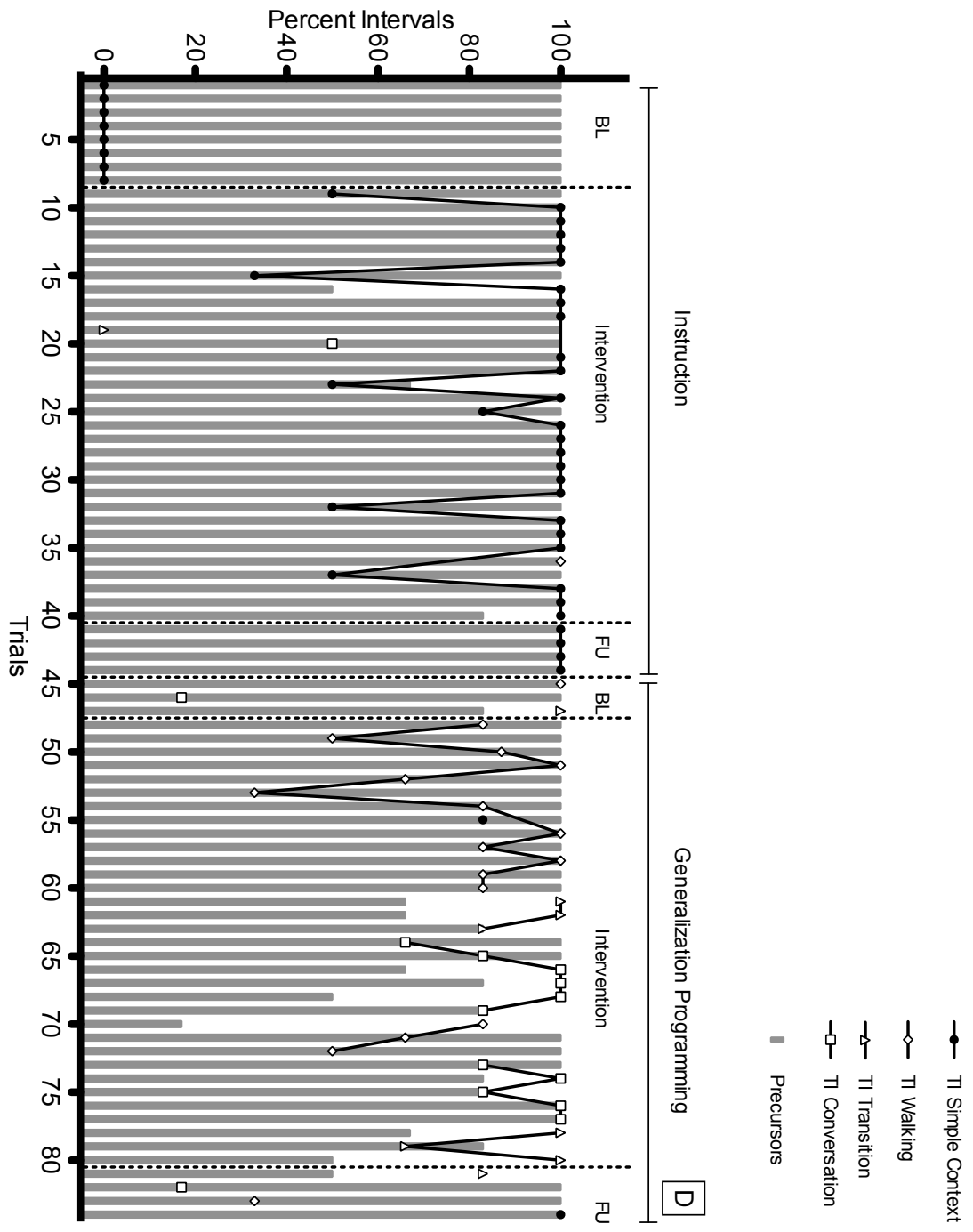


Figure 11. Treatment integrity and precursors during instruction and generalization programming for Dyad D

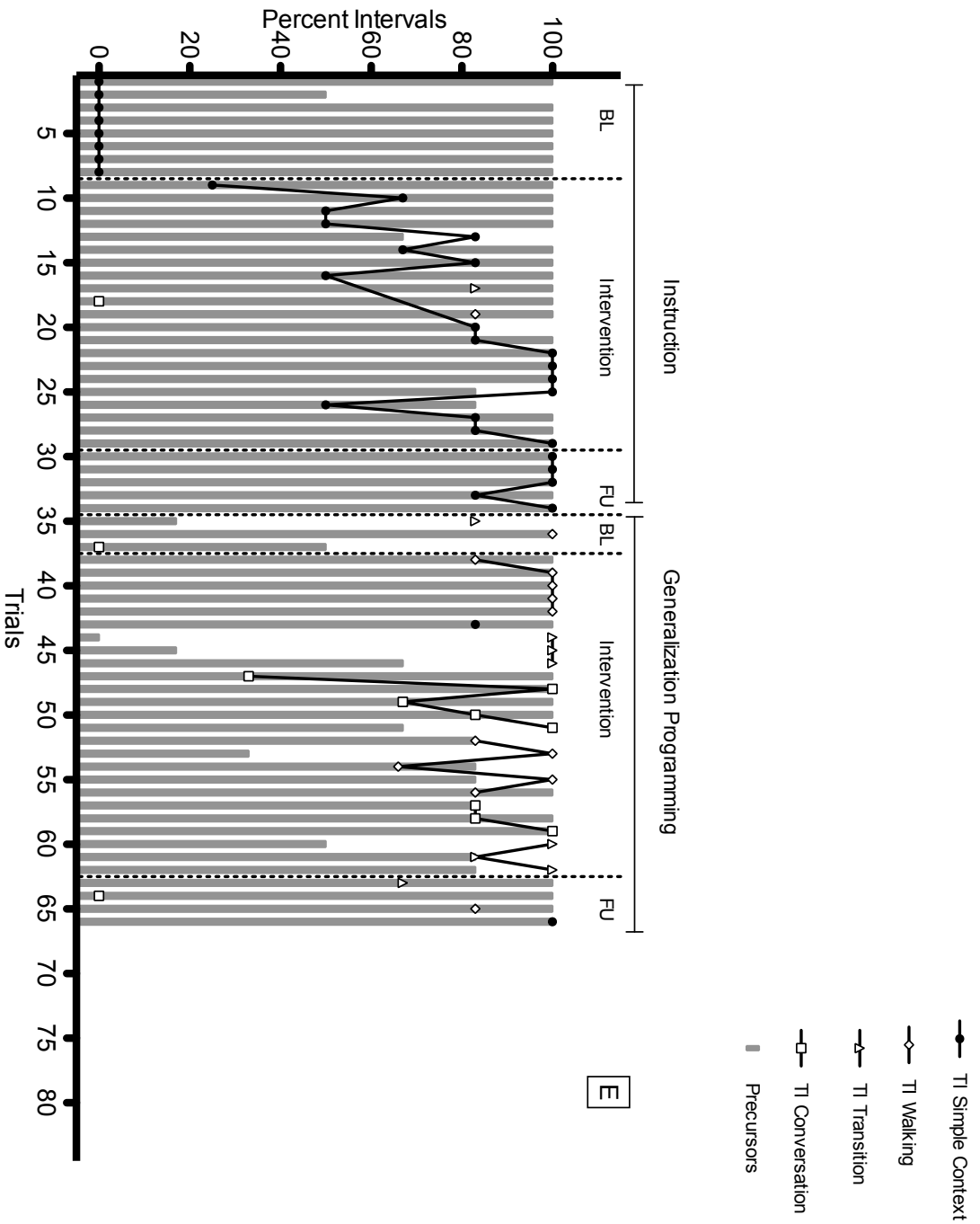


Figure 12. Treatment integrity and precursors during instruction and generalization programming for Dyad E.

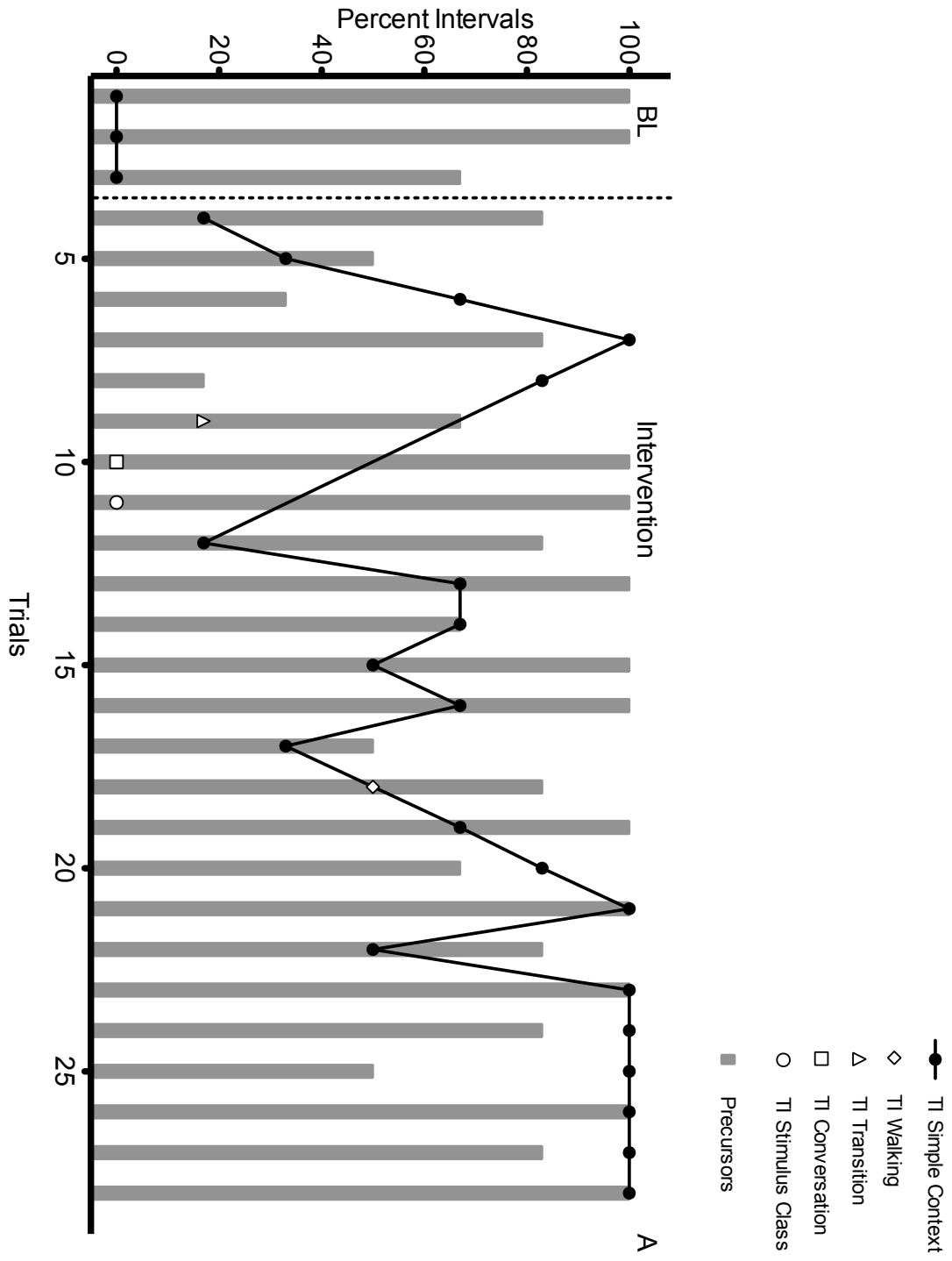


Figure 13. Treatment integrity and precursors during instruction for Dyad A.

### Errors of Omission and Commission

Figures 14, 15, 16 depict specific errors made throughout the experiment. Figure 14 depicts errors made prior to exposure to any instruction. Figure 15 depicts errors made after the introduction of instruction, but prior to specifically targeting more challenging contexts (i.e., challenging contexts probes, stimulus class probes). Only those areas not yet targeted are depicted in the graph. Figure 16 depicts errors made once individuals were instructed in specific contexts. The gray scale represents errors of omission. The blue scale represents errors of commission. More threatening errors (i.e., errors that result in increased levels of aggression) are represented by darker colors. Less threatening errors (i.e., errors that result in little to no aggression) are represented by lighter colors.

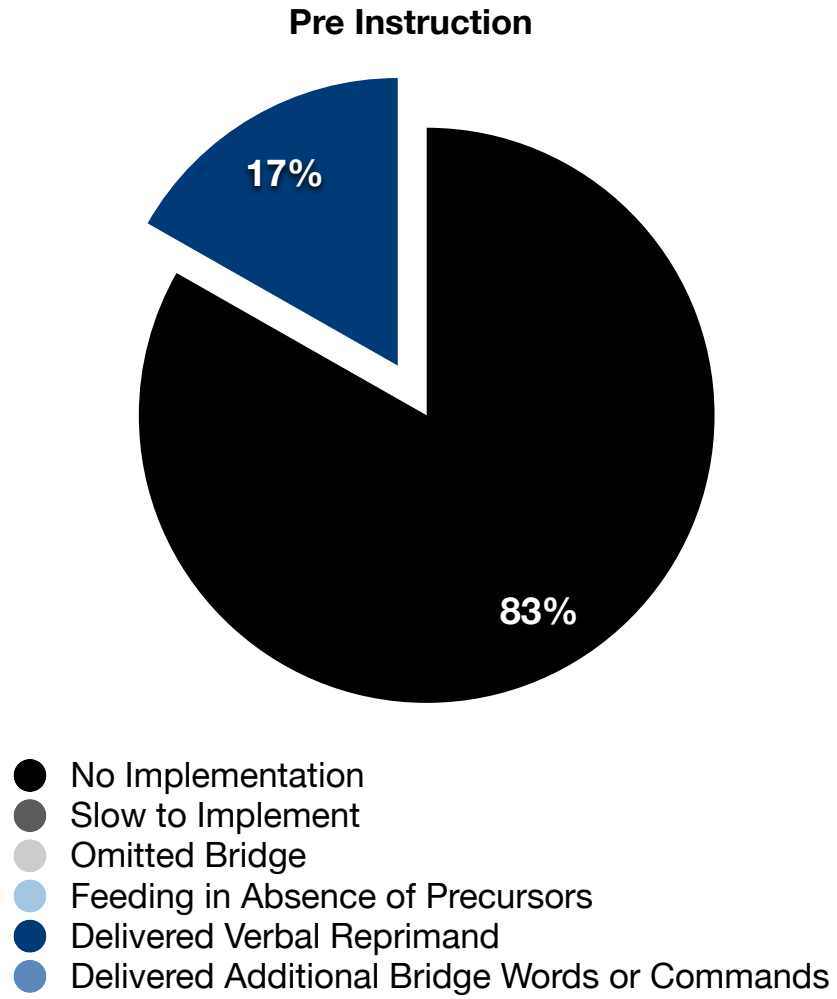


Figure 14. Types of errors made prior to instruction.



### Pre Context Exposure

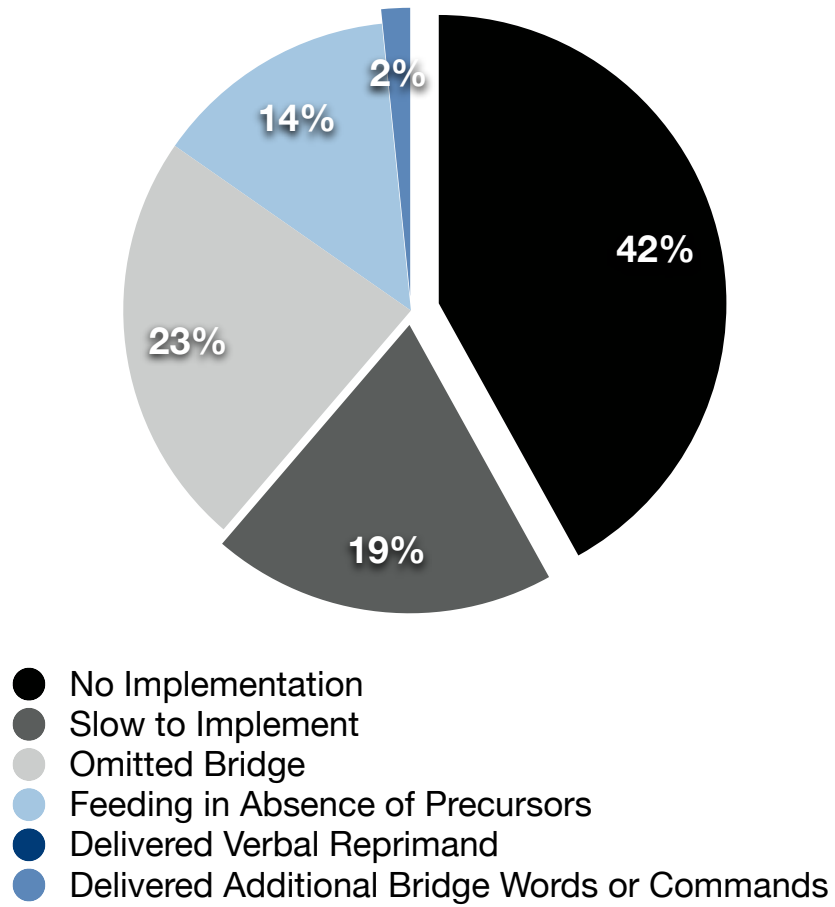


Figure 15. Types of errors made after instruction in a simple context, but without instruction on specific contexts.

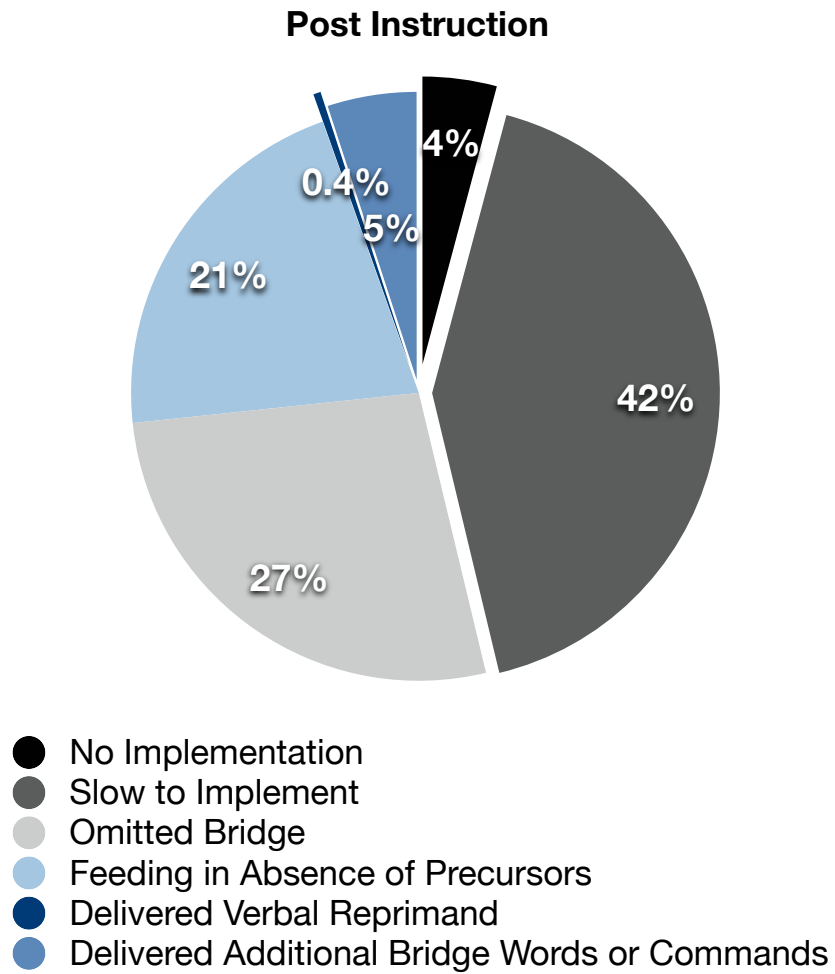


Figure 16. Types of errors made after the introduction of instruction in specific contexts.

### Social Validity

Social validity of goals, procedures, and effects were assessed from owners, dog trainers, rescue group personnel, veterinary care professionals, and researchers. Table 4 displays individual social validity scores.

Table 4. Social Validity of goals, procedures, and effects.

<b>Expert</b>	<b>Mean Goals Rating</b>	<b>Mean Procedures Rating</b>	<b>Mean Effects Rating</b>
Owner A	5.9	N/A	N/A
Owner B	5.9 (range of 5-6)	6	6
Owner C	5.1	5.9 (range of 5-6)	5.9 (range of 5-6)
Owner D	4.9 (range of 4-6)	5.1 (range of 5-6)	5 (range of 5-6)
Owner E	6	5.8 (range of 5-6)	5.3 (range 3-6)
Trainer A	5.8 (range of 5-6)	5.8 (range of 5-6)	5.3 (range of 5-6)
Trainer B	5.8 (range of 5-6)	5.8 (range of 5-6)	5.8 (range of 5-6)
Veterinary Care A	5.9 (range of 5-6)	5.9 (range of 5-6)	5.4 (range of 5-6)
Veterinary Care B	6	6	5.6 (range of 5-6)
Rescue Group A	5.4 (range of 5-6)	6	5.1 (range of 5-6)
Rescue Group B	6	6	6
Researcher A	N/A	N/A	5.14 (range of 4-6)
Researcher B	N/A	N/A	4.2 (range of 2-6)

### *Goals*

Mean goal scores were calculated from all participants. The mean goal score from all owners was 5.6. The mean goal score from two trainers was 5.8. The mean goal score from two rescue group members was 5.7. The mean goal score from two veterinary care professionals was 5.95.

### *Procedures*

Mean acceptability of procedures were calculated from all participants. Mean acceptability of procedures was 5.7 for owners. Mean acceptability of procedures from two trainers was 5.8. Mean acceptability of procedures from two rescue groups was 6. Mean acceptability of procedures from two veterinary care professionals was 5.95.

### *Effects*

Mean effect scores were calculated from all of the participants. Mean effect score was 5.6 for owners. Mean effect scores from two trainers was 5.6. Mean effect scores from two rescue groups members was 5.6. Mean effect scores from two veterinary care professionals was 5.5. Mean effect scores from two researchers was 4.7.

## DISCUSSION

### General Conclusions

The purpose of this study was to evaluate the effects of an intervention package on the extent to which owners implemented a CC protocol with integrity. The intervention was divided into two main components which were instruction and generalization programming. Both components included common consumer management procedures. Instruction included verbal instruction, modeling, and performance feedback. Subsequent generalization programming

included performance feedback. During both phases performance feedback was delivered in the form of praise for correct implementation, corrective feedback, and sharing process and outcome data. In addition to common consumer management procedures, modifications to CC were made. Owners were trained on stimuli that signaled implementation. Effort for owners was reduced by introducing head collars and a feeding device. The head collars reduced the force at which dogs pulled. The feeding device reduced effort when delivering edibles. The effectiveness of the food reinforcer was increased by using or approximating a closed economy and by putting dogs in a state of food deprivation. Finally, food pairings were thinned to resist extinction.

Instruction directly targeted owner implementation during relatively simple exposures. A significant increase in treatment integrity was evident when and only when the intervention was introduced. Each owner was exposed to the intervention after varying number of trials, therefore it is reasonable to conclude that the intervention delivered during instruction caused the increase in treatment integrity. Secondarily, dog aggression was targeted during instruction. A significant decrease in dog aggression was evident when and only when the intervention was introduced. Each dog was exposed to treatment only after their respective owner was exposed to the intervention; therefore it is reasonable to conclude that the intervention had a secondary effect of reduced dog aggression. Third, dog precursor behavior was targeted. There was not a significant reduction in precursor behavior with the introduction of the intervention during instruction. Precursor behavior remained high throughout all of instruction. Although, there was not an evident change in the quantitative amount of precursor (measured as occurrence or non-occurrence), there did seem to be a qualitative difference with all of the dogs. For example, during baseline Lego's tail and ears remained perked and he continued staring at the stimulus

dog throughout the entire trial. During the intervention, Lego's tail remained in a neutral position and he occasionally looked at the stimulus dog. The data did not clearly depict the overall reduction in intensity of the precursor behavior. Owners often reported that their respective dog appeared "more relaxed" in general upon the introduction of the intervention. Therefore, it may be reasonable to conclude that the intervention was responsible for a decrease in intensity of precursor behavior. Finally, owner treatment integrity was maintained, with the exception of Owner B, during follow-up. All dog aggression, with the exception of Lego, remained at zero levels.

Generalization programming targeted treatment integrity during seemingly more difficult contexts. Generalization programming allowed for repeated practice in situations that were deemed impractical or impossible to replicate during instruction. Treatment integrity was targeted when owners were walking, engaging in conversation, and transitioning out of the house or car. During baseline, some owners displayed high levels of treatment integrity across some contexts. More specifically, Owners C, D, and E implemented while walking with levels of 63%, 100%, and 100% respectively. Owners D and E implemented while transitioning with levels of 100% and 83% respectively. Others displayed low levels across some or all of the situations. For those that implemented with high levels of treatment integrity during baseline, they continued to implement with high rates throughout generalization programming. It may be important to note that Owner D's integrity was high during the baseline walking probe and was initially reduced during generalization programming. However, during baseline, the owner was not actually walking as the stimulus dog passed. Instead the owner stopped and waited for the other dog to pass. They were not instructed to continue walking during the trial and were scored correct as

defined by the behavioral definition of treatment integrity. Those owners implementing with low levels of integrity during baseline had increased levels once exposed to the intervention. Each dyad was exposed to the intervention during generalization programming after one probe in baseline, therefore it may be reasonable to conclude that the intervention during generalization programming was responsible for increased levels of treatment integrity across more challenging exposures. Secondly, dog aggression was targeted during generalization programming. Although aggression was low during baseline, there was a decrease in dog aggression when the intervention was introduced. Therefore, it is reasonable to conclude that the intervention had a secondary effect of reduced dog aggression. Third, dog precursor behavior was targeted. There was not a dramatic reduction in the quantitative amount of precursor behavior with the introduction of the intervention. However, as with instruction, an overall decrease in intensity was evident with the exposure to the intervention in the group setting.

Treatment integrity was variable across contexts during follow-up of generalization programming. All dog aggression remained at zero levels. However, Maddie remained aggressive towards strangers at the front door (i.e., across stimulus classes). Follow-up was conducted in the respective owner's instruction setting. Therefore, it is unknown if treatment integrity would have been maintained at higher levels if follow-up was conducted in the generalization programming setting. Follow-up during generalization programming assessed not only generalization across time, but also setting. It is possible that treatment integrity could be increased in the natural setting with minimal additional training. Further, it may be important for owners to engage in higher levels of treatment integrity prior to ending generalization programming. Finally, owners and experts rated goals, procedures, and effects highly. This

suggests that the goals were appropriate, procedures were acceptable, and the effects were clinically significant accordingly to owners and experts.

#### Additional Factors Influencing Behavior *Owner Adherence*

The program was effective for all participants, however the immediacy at which owners acquired treatment integrity varied. Initially, the program seemed to be most effective for Dyad C. For example, Owner C was the first to begin fading food pairings because the intensity of precursors were diminished. The immediate effectiveness may be due to (a) owner acquisition and (b) owner adherence. Owner C acquired high levels of treatment integrity almost immediately. In addition, Owner C's adherence to the program was the most stringent. Owner C was the only owner that followed the "Learn to Earn" program nearly 100% throughout the program. Additionally, they sought out additional exposures with other stimulus dogs outside of the experimental arrangement. Other owners did not comply with the "Learn to Earn" program with the same adherence. Further, during instruction, Dogs B and D were rarely exposed to other stimulus dogs outside of the experimental conditions. In clinical settings, owners are encouraged to expose dogs to a minimum of five stimulus dogs three or more days per week. This anecdotal evidence suggests that the program needs to be introduced as a comprehensive training package with all components.

#### *Social Support*

An additional variable, during both instruction and generalization programming, that may have influenced owner treatment integrity was social support. Evidence for the benefit of social support in the form of a single person (referred to as "individual social support" for purposes of this manuscript) that is close to the participant (i.e., spouse) may be seen in two of



the owners during instruction. For three of the owners (Owners A, C, and D), an additional person was present during the study. The other two owners were single individuals who lived alone. From the data, it appears that individual social support may have had an effect on acquisition. Owners C and D initially performed at the highest level. Both had partners that seemed to be actively involved (e.g., reported progress, asked questions) in the program. During the experimental arrangement, the supporting partner appeared to be engaged, offered eye contact, and stood near the implementer. The individual occasionally offered feedback to the implementer and asked questions during feedback periods. Owners A, B, and E eventually performed at a high level, however their data was initially variable. Owner A's partner did not report progress and stood away from his partner during each trial. He rarely reported progress and never asked questions. During the first instruction meeting he was present only for the first 10 minutes. Owners B and E lived alone, and therefore, were given no individual social support during implementation. This anecdotal evidence may suggest that individual social support increases treatment integrity. This finding is supported by previous research.

Previous research has combined individual social support with other components to create a packaged intervention (see Rapp, Miltenberger, Long, Elliott, & Lumley, 1998; Galassi, Galassi, & Litz, 1974). Other research has examined social support more extensively as an independent variable. Woods, Miltenberger, and Lumley (1996) sequentially implemented four treatments for the reduction of tics in children. Initially children were exposed to awareness training (i.e., taught to identify and to note the occurrence of the tic). Following awareness training children were exposed to awareness training and self-monitoring (i.e., taught to record the occurrence of a tic). For those participants who continued to engage in tic behavior, social

support was given and individuals were taught a competing response. During social support children were given a support person to deliver praise when appropriate behaviors were displayed. Children were taught to engage in an incompatible response when they initially displayed a tic and anytime they felt as if they were about to tic. When awareness training alone or when combined with self-monitoring did not reduce tic behavior to desirable levels, the addition of social support and competing response did. These data suggest individual social support may increase owner treatment integrity. Not only does individual social support improve the performance of the individual being supported, it has been shown to improve the performance of the supporter (Cushing & Kennedy, 1997). Although not measured in the current study, it is possible that those owners who support their partner during implementation increase their own ability to implement treatment.

Harris, Greco, Wysocki, and White (2001) compared therapies with aspects of family support (i.e., individual social support) with that of group support for children with diabetes. Although not robust, there may have been some evidence that individual social support was more effective than group support in creating behavior change in adolescents with diabetes. Based on anecdotal evidence from the current study and previous research, it is recommended that, when possible, an individual (e.g., family member, friend) be present and encouraged to be actively involved in implementation.

Unfortunately, some individuals may not have access to such support. Therefore, groups are constructed to create a supporting environment. Support groups are a common component of many therapies. Previous research has demonstrated the positive effects of group support in the form of an Alcoholics Anonymous (AA) group. Bond, Kaskutas, and Weisner (2003) examined

the effects of AA on sustained abstinence from alcohol. Verbal reports from participants indicated that abstinence was most commonly correlated with continued group support from other AA members. More recently, Tonigan and Rice (2010) found that abstinence from alcohol, marijuana, and cocaine were most commonly predicted by AA attendance. Further, individual social support (i.e., having a sponsor) when initially attending AA meetings was correlated with increased abstinence from alcohol, marijuana, and cocaine.

Group support has a positive impact not only on individuals, but on the family structure. Parents who have children with special needs have benefitted from group support (Adesida & Foreman, 1999). Observations and interviews have found that group support resulted in increased parental positive feelings (i.e., decreased isolation, improved relationship with child). Saewyc and Edinburch (2010) examined the effects of an intervention with a group support component on protective factors and risk behavior in runaway girls. The effects of the intervention included increased protective factors (e.g., self-esteem, family connectedness) and decreased risk behaviors (e.g., alcohol or drug use). Collectively, these studies offer possible evidence that group support has an effect upon individual behavior. In the current study, group support may have similarly influenced individual performance. Although not directly measured, group members often shared stories and support to one another. Based on observations from the current study, and previous research, it is possible that group support had a positive effect on treatment integrity.

#### *Other Benefits to Generalization Programming in Group Format*

Groups were not only a source of social support, but are often rated highly by group members. Latner, Stunkard, Wilson, and Jackson (2006) examined the social validity of group

support on obesity. Participants rated group support as the second highest valued aspect of therapy. The research also reported that participants rated group support helpful in the sustained use of the treatment. In the current study, participants rated generalization programming similarly high. Another benefit of group instruction is the access to additional training at a reduction in cost. potential reduction in cost. Instruction may range from \$50-\$300 per hour. If owners are able to participate in generalization programming after initial instruction, they may be able to receive significantly more training at a lower cost. Further, generalization programming offers individuals an increased opportunity to respond in more challenging contexts. Increasing opportunities to respond (i.e., programming generalization) may be partially responsible for improved treatment integrity.

#### Possible Outcomes *Maximizing Owner and Dog Rights*

There are additional possible outcomes not directly measured in the experiment. The current procedures were designed to target owner behavior, with the end result of improved dog behavior. Improved dog behavior may maximize owner and dog rights. For owners, freedom and self-esteem may be considered. Prior to the intervention, owners were at risk for a loss of freedom and self-esteem. They remained at risk during baseline conditions. Components of the intervention may have put the owners at risk of diminished self-esteem (e.g., getting verbal feedback when members of the group were present). However, the intervention ultimately preserved owner freedom and self-esteem (e.g., freedom from negative social attention, freedom from aversive feelings, increased ability to reduce aggressive behavior).

Considerations for dogs include survival, welfare, and freedom. Prior to the intervention, dogs were at risk for loss of survival, welfare, and freedom. Reducing aggression decreased their

risks for euthanasia and encouraged more frequent outings, thereby maximizing survival, welfare, and freedom. Dogs lost the freedom of choosing when and how much to eat with the introduction of the intervention. However, the benefits of the intervention outweighed the risks associated with dog aggression. In summary, the intervention likely to preserved survival, welfare, self-esteem, and freedom for participants.

#### Limitations and Future Research

The current study controlled for several threats to interval validity. Possible threats included history, maturation, mortality, instrumentation, selection bias, and testing and observation. Many threats were controlled for, but there remained some threats to history, subject mortality, instrumentation, and testing and observation. During instruction history was controlled for by seeing a change in behavior when and only when the intervention was implemented. The staggered introduction allowed for changes to be seen in one participant when the intervention was implemented. The participant served as their own control. However, during generalization programming equal number of trials (one trial per challenging context) were collected during baseline. Equal amounts is a threat to history. Individuals were exposed to equal amounts of challenging contexts prior to the introduction of the intervention. Future research should collect more data in baseline during generalization programming, with varying verification periods.

Subject mortality remained a threat for in the proposed study. Owners participated because they were unable to effectively reduce their dog's aggressive behavior. Dogs were nominated to participate because of their high rates of aggression. An attempt was made to control for subject mortality (i.e., withdrawing or euthanasia) by offering continued contact with data and evidence of improved dog behavior. Those dogs that displayed aggression towards other

stimuli (e.g., strangers, owners, cats) were at an increased risk for euthanasia because the intervention did not specifically target those stimuli. This was evident with Dog A (i.e., Captain), who was euthanized after biting his owner. Therefore, mortality remained a threat and was a limitation. Future research could simultaneously and directly target owner implementation across other stimuli. Further, the experimenter was unaware that Captain had a history of exhibiting aggression towards the owner. Therefore, a more thorough interview prior to treatment may need to be developed to ensure each context is targeted.

Instrumentation remained a threat in the study. In the video tapes, the stimulus dogs were not in sight. During instruction, it was unethical to video those society members without getting consent, which was impractical to get. Therefore, the presence of the stimulus dog was assumed. During generalization programming, it was difficult to clearly see both dogs participating in the trial. Another difficulty arose when standardizing the trial duration. It was impossible to have stimulus dogs walk at the same rate. Therefore, a range of distance was used rather than an exact distance to enable equal length trials. In addition, there was an attempt to expose each dyad to equal quality stimuli across each trial, however that was impossible. Certain stimulus dogs elicited more aggression than others. For example, Lego was more aggressive with small, barking dogs than with large, quiet dogs. These limitations are a result of collecting data in the natural environment. An additional limitation relating to instrumentation was the method used to measure precursor behavior. Precursor behavior was measured on its presence or absence. Based on the data, there was not a quantitative difference, but there was a dramatic difference in the qualitative aspect of precursors. Future research could examine the effects of the intervention on precursor behavior using a more sensitive or qualitative measure.

Testing and observation remained a threat in the study. Owners were likely reactive to the presence of the experimenter throughout the intervention. However, increasing treatment integrity across all observed conditions was the goal of the intervention. Future studies could examine ways of maintaining integrity while minimizing subject reactivity in the presence of the researcher or other experimental arrangements, thereby assessing sustainability. For example, during generalization programming data could be collected during times in which the owner was blind to observation. An additional threat to testing and observation was present when feedback was given to owners in the form of sharing process and outcome data. Owners' comprehension was not assessed to determine if they understood visual analysis. Therefore, it is possible that owners did not have access to the data being shared. Future research should ensure that consumers comprehend data being shared. The final threat to testing and observation was the presence of individual support. Two individuals may have accessed additional training and coaching from their spouse outside of the experimental arrangement. Future research should avoid additional coaching or measure the extent to which individual support is given outside of the experimental arrangement.

In addition to threats to internal validity, threats to external validity were considered. They included multiple treatment interference, selection bias, interactive effects of data collection, and experimental arrangement. Experimental arrangement remained a threat to external validity. In the study, the implementer was the experimenter and a dog trainer. This is a unique arrangement that limits the generality of the intervention.

### Contributions to the Literature

This research contributes to the literature in several ways. The first body of research that the current study contributes to is the treatment integrity literature. The current findings support previous research that has demonstrated the effects of performance feedback in the form of praise, corrective feedback, and sharing process and outcome data on treatment integrity (Witt, Noell, LaFleur, & Mortenson, 1997; Mortenson & Witt, 1998; Noell et al., 2000; Noell, Duhon, Gatti, & Connell, 2002; Rodriguez, Loman, & Horner, 2009; Auld, Belfiore, & Scheeler, 2010). The current study extended the use of instructional methods to dog owners and dogs. Secondly, the current study extends previous research by examining the effects of consumer management procedures on the extent to which a respondent treatment is implemented. Therefore, the current study has extended previous findings to a virtually unexplored population using a virtually unexplored treatment (i.e., classical counterconditioning).

Not only does the current study extend previous research to a different population and treatment, but it surpasses and extends the degree to which previous research has programmed for generalization. The current study specifically targeted generalization of treatment integrity in multiple contexts (i.e., walking, transitioning, engaging in conversation). Previous research has not targeted generalization of treatment integrity to the degree that the current study did. Previous research has programmed common stimuli and assessed generalization (see Scheeler, Bruno, Grubb, & Seavey, 2009) and assessed generalization across time and settings (Boudah et al., 2001, Greenwood & Abbot, 2001; Han & Weiss, 2005). However, the generality of treatment integrity in more challenging contexts has not been analyzed. Therefore, the current study expands the degree to which generality of treatment integrity is analyzed.



Next, the current study supports previous research that demonstrates maintenance of target behavior despite decrements in treatment integrity. Aggression was relatively low during baseline of generalization programming. However, it is not surprising that dogs did not engage in high levels of aggression. Previous research has demonstrated the effects of an end user's (i.e., student) exposure to high levels of treatment integrity. Peter St. Pipkin et al. (2010) examined the effects of decrements in treatment integrity on levels of performance (i.e., appropriate and inappropriate behavior in a DRA procedure). The results indicate that if an individual is exposed to high levels of treatment integrity, their performance may maintain even if there are decrements in treatment integrity. Therefore, this study supports previous research that demonstrates that treatment integrity does not have to be perfect in order to have a positive influence on the end user.

Lastly, it supports previous findings that reducing effort increases use by caregivers. However, previous research has used parents and therapists as implementers. No study has examined reducing effort animal caregivers, more specifically dog owners. Like Friman et al. (1985), Friman et al. (1987), and Ross, Friman, and Christophersen (1993) this study used reduced effort as part of a larger intervention package. The current study contributes to the consumer management literature by examining the effects of altering typical treatment to reduce effort of implementation with the effect of increased treatment integrity.

The second body of research the current study contributes to is the applied animal behavior literature. Currently, studies reporting the effects of specific treatments to reduce aggression in dogs are limited. Most publications review dog characteristics (e.g., breed, age), personality traits, and treatment. Much of the treatment is combined with drug therapy or broad

in its description (see Line & Voith, 1986; Sherman, Reisner, Taliaferro, Houpt, 1996; Dodman, Donnelly, Shuster, Mertens, Rand, Miczek, 1996; Dodman, Moon, and Zelin, 1996; Guy et al., 2001). Few published studies exist examining the effects of a single behavioral treatment. Orihel and Fraser (2008) examined the effects of differential reinforcement of alternative behavior (DRA) on aggression in shelter dogs. Dogs were prompted to sit in the presence of other dogs (i.e., eliciting stimuli). Treatment reduced aggression in 6 of 9 participants. However, the effects of treatment were not maintained at a 1-week follow up. In a pilot study, the author reported the effects of classical counterconditioning on aggressive behavior at the front door. Currently, no published studies have examined the effects of classical counterconditioning on dog-dog reactivity using single subject design. In addition to reporting the effects of classical counterconditioning on aggression in dogs, the current study contributes to the applied animal literature by having owners serve as implementers. Currently, there are no published studies which use dog owners as implementers of any treatment.

Finally, the current research contributes to the literature on Pavlovian conditioning. The current findings support previous research that Pavlovian conditioning is effective in reducing behaviors associated with fear or aggression across species (Gale, Sturmfels, & Gale, 1966; Pearce & Dickinson, 1975; Kroll, 1975). However, these previous studies have examined Pavlovian conditioning in species other than dogs and in a different paradigm. Classical counterconditioning is commonly recommended as a treatment to reduce reactivity in dogs (see Wright, Reid, & Rozier), but empirically validated studies reporting its effect on aggression are difficult to find.

### Plan for Future Dissemination

The intervention will be scaled up in the Kansas City community and the procedures will be replicated by the same dog trainer in close contact with the experimenter, but without constant supervision. In doing so, modifications may be made according to feedback from the trainer. One modification may include the treatment used with the intervention. In the current intervention, only partial treatment for aggressive behavior was used. In an attempt to reduce complexity of data collection and reliability, additional steps were not implemented for dogs that may be recommended for use in practice (e.g., incorporating DRI after several weeks of classical counterconditioning). Additional components may be added to the intervention. This includes different forms of feedback and simplification of data collection. Future research could compare the effects of sharing process and outcome data with videotaped trials as feedback. This may significantly reduce effort when using this intervention in practice. Eventually, future research could examine the effects of the current intervention with other treatments for aggression in dogs (e.g., operant counterconditioning, CAT). The program could be altered to target other treatments for dogs and eventually target other treatments for other species. Once modification have been made, a larger scale dissemination will be planned.

Eventually, a slogan or brand will be developed that encompasses the goal of the intervention. The intervention will be displayed on the experimenter's dog training website. The website will review the intervention, show video of before and after, and offer support to other trainers via video chat. Videos and manuals will be produced to layout components of the intervention. The material will be presented at dog training conferences. Seminars and workshops will be held in order to train other dog trainers. Trainers will be encouraged to fit the

intervention to their clients' needs (e.g., individual owner deficits), but be encouraged to adhere to the components of the intervention. Trainers who adopt the intervention and owners that are exposed to the intervention will be later contacted about its effectiveness. Video recordings could be electronically sent to the experimenter for viewing.

In summary, the current study contributes to several lines of research. The study demonstrated that verbal instruction, modeling, and performance feedback can be used to teach owners how to effectively implement a modified classical counterconditioning protocol. Secondly, these methods, when used with effective treatments for dog aggression, influenced dog behavior with the result of zero or near zero levels of aggression. Finally, the intervention was rated positively by participants and experts in the field.

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Appendix A  
Social Validity of Goals Rating Form

Owner's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Intervention: \_\_\_\_\_

Dog Behavior: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the importance of the problem behavior and goals of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree   2-disagree   3-slightly disagree   4-slightly agree   5-agree   6-strongly agree**

Dog aggression is problematic to society.

1      2      3      4      5      6

Dog aggression interferes with my daily life.

1      2      3      4      5      6

Dog aggression is dangerous to me or other individuals (humans or dogs).

1      2      3      4      5      6

Reducing aggressive/reactive behavior is important to me.

1      2      3      4      5      6

Reducing aggressive behavior improves the life of the dog displaying the behavior.

1      2      3      4      5      6

It is important that owners can reduce aggressive/reactive behavior with the help of a dog trainer.

1      2      3      4      5      6

Treatment should reduce aggression to near zero levels.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Procedures Rating Form

Owner's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Intervention: \_\_\_\_\_

Dog Behavior: \_\_\_\_\_

The purpose of this questionnaire is to gather information that will help in the selection of treatments for dogs. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree 2-disagree 3-slightly disagree 4-slightly agree 5-agree 6-strongly agree**

This would be an acceptable intervention for the dog's behavior.

1      2      3      4      5      6

I would suggest the use of this intervention to other owners.

1      2      3      4      5      6

The dog's behavior problem was severe enough to warrant the use of this intervention.

1      2      3      4      5      6

Most owners would find this intervention suitable for the behavior problem described.

1      2      3      4      5      6

I would be willing to use this intervention with other dogs that I own.

1      2      3      4      5      6

This intervention would *not* result in negative side effects for the dog.

1      2      3      4      5      6

This intervention would be appropriate for a variety of dogs who behave similarly.

1      2      3      4      5      6

This intervention is consistent with my ethical guidelines for training.

1      2      3      4      5      6

The intervention is a fair way to handle the dog's behavior.

1      2      3      4      5      6

The intervention is reasonable for the behavior described.

1      2      3      4      5      6

I liked the procedures I used in this intervention.

1      2      3      4      5      6

This intervention is a good way to handle the dog's behavior problem.

1      2      3      4      5      6

Overall, this intervention was beneficial for my dog.

1      2      3      4      5      6

Comments regarding this form:

The purpose of this questionnaire is to gather information that will help dog trainers in their work with owners. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree 2-disagree 3-slightly disagree 4-slightly agree 5-agree 6-strongly agree**

The instruction package would be an acceptable way to help owners implement the intervention.

1 2 3 4 5 6

The generalization package is an acceptable way to help owners implement the intervention.

1 2 3 4 5 6

I am comfortable with all of the components in the instruction package.

1 2 3 4 5 6

I am comfortable with all of the components in the generalization programming package.

1 2 3 4 5 6

I would recommend the use of the instruction package to other owners.

1 2 3 4 5 6

I would recommend the use of the generalization programming package to other owners.

1 2 3 4 5 6

The instruction package made it the the procedures of the intervention clear enough to me.

1 2 3 4 5 6

The generalization programming package made the procedures of the intervention clear enough to me.

1 2 3 4 5 6

I would be willing to use the instruction package again.

1 2 3 4 5 6

I would be willing to use the generalization programming package again.

1 2 3 4 5 6

The instruction package was a fair way to teach me how to implement the intervention.

1 2 3 4 5 6

The generalization programming package was a fair way to teach me how to implement the intervention.

1 2 3 4 5 6

The instruction package would not result in negative side effects for other owners.

1 2 3 4 5 6

The generalization programming package would not result in negative side effects for other owners.

1 2 3 4 5 6

I like the procedures used to assist me in implementing the intervention plan with my dog.

1 2 3 4 5 6

Overall, the procedures used would be beneficial for other owners.

1 2 3 4 5 6

Comments regarding this form:

## Social Validity of Effects Rating Form

Owner's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Intervention: \_\_\_\_\_

Dog Behavior: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the effects of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Classical counterconditioning was effective in reducing aggressive behavior.

1      2      3      4      5      6

The instruction package was effective at improving implementation.

1      2      3      4      5      6

The generalization programming package was effective at improving implementation.

1      2      3      4      5      6

Classical counterconditioning reduced aggression to appropriate levels.

1      2      3      4      5      6

The effects of classical counterconditioning will be maintained over time.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the instruction package.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the generalization programming package.

1      2      3      4      5      6

Comments regarding this form:



## Social Validity of Goals Rating Form

Trainer's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the importance of the problem behavior and goals of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Dog aggression is problematic to society.

1      2      3      4      5      6

Dog aggression interferes with a my or an owner's daily life.

1      2      3      4      5      6

Dog aggression is dangerous to me or other individuals (humans or dogs).

1      2      3      4      5      6

Reducing aggressive behavior is important to me.

1      2      3      4      5      6

Reducing aggressive behavior is important to an owner.

1      2      3      4      5      6

Reducing aggressive behavior improves the life of the dog displaying the behavior.

1      2      3      4      5      6

It is important that owners can reduce aggressive behavior with the help of a dog trainer.

1      2      3      4      5      6

Treatment should reduce aggression to near zero levels.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Procedures Rating Form

Trainer's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information that will help in the selection of treatments for dogs. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

This would be an acceptable intervention for the dog's behavior.

1      2      3      4      5      6

I would consider using this intervention with my clients or recommending it to my clients.

1      2      3      4      5      6

The dog's behavior problem was severe enough to warrant the use of this intervention.

1      2      3      4      5      6

Most owners would find this intervention suitable for the behavior problem described.

1      2      3      4      5      6

This intervention would *not* result in negative side effects for dogs.

1      2      3      4      5      6

This intervention would be appropriate for a variety of dogs who behave similarly.

1      2      3      4      5      6

This intervention is consistent with my ethical guidelines for training.

1      2      3      4      5      6

The intervention is a fair way to handle the dog's behavior.

1      2      3      4      5      6

The intervention is reasonable for the behavior described.

1      2      3      4      5      6

I liked the procedures used in this intervention.

1      2      3      4      5      6

This intervention is a good way to handle the dog's behavior problem.

1      2      3      4      5      6

Overall, this intervention was beneficial for the dogs who participated.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Effects Rating Form

Trainer's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the effects of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Classical counterconditioning was effective in reducing aggressive behavior.

1      2      3      4      5      6

The instruction package was effective at improving implementation.

1      2      3      4      5      6

The programming generalization package was effective at improving implementation.

1      2      3      4      5      6

Classical counterconditioning reduced aggression to appropriate levels.

1      2      3      4      5      6

The effects of classical counterconditioning will be maintained over time.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the private training package.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the group training package.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Goals Rating Form

Veterinarian's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the importance of the problem behavior and goals of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Dog aggression is problematic to society.

1      2      3      4      5      6

Dog aggression interferes with a my or an owner's daily life.

1      2      3      4      5      6

Dog aggression is dangerous to me or other individuals (humans or dogs).

1      2      3      4      5      6

Reducing aggressive behavior is important to me.

1      2      3      4      5      6

Reducing aggressive behavior is important to an owner.

1      2      3      4      5      6

Reducing aggressive behavior improves the life of the dog displaying the behavior.

1      2      3      4      5      6

It is important that owners can reduce aggressive behavior with the help of a dog trainer.

1      2      3      4      5      6

Treatment should reduce aggression to near zero levels.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Procedures Rating Form

Veterinarian's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information that will help in the selection of treatments for dogs. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

This would be an acceptable intervention for the dog's behavior.

1      2      3      4      5      6

I would suggest the use of this intervention to owners.

1      2      3      4      5      6

The dog's behavior problem was severe enough to warrant the use of this intervention.

1      2      3      4      5      6

Most owners would find this intervention suitable for the behavior problem described.

1      2      3      4      5      6

This intervention would *not* result in negative side effects for the dogs.

1      2      3      4      5      6

This intervention would be appropriate for a variety of dogs who behave similarly.

1      2      3      4      5      6

This intervention is consistent with my ethical guidelines for training.

1      2      3      4      5      6

The intervention is a fair way to handle the dog's behavior.

1      2      3      4      5      6

The intervention is reasonable for the behavior described.

1      2      3      4      5      6

I liked the procedures used in this intervention.

1      2      3      4      5      6

This intervention is a good way to handle the dog's behavior problem.

1      2      3      4      5      6

Overall, this intervention was beneficial for the dogs who participated.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Effects Rating Form

Veterinarian's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the effects of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Classical counterconditioning was effective in reducing aggressive behavior.

1      2      3      4      5      6

The instruction package was effective at improving implementation.

1      2      3      4      5      6

The programming generalization package was effective at improving implementation.

1      2      3      4      5      6

Classical counterconditioning reduced aggression to appropriate levels.

1      2      3      4      5      6

The effects of classical counterconditioning will be maintained over time.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the instruction package.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the programming generalization package.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Goals Rating Form

Rescue Personnel's Name: \_\_\_\_\_

Date:

The purpose of this questionnaire is to gather information on the importance of the problem behavior and goals of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Dog aggression is problematic to society.

1      2      3      4      5      6

Dog aggression interferes with a handler's or owner's daily life.

1      2      3      4      5      6

Dog aggression is dangerous to me or other individuals (humans or dogs).

1      2      3      4      5      6

Reducing aggressive behavior is important to those handling dogs.

1      2      3      4      5      6

It is important to adopters that dogs do not display aggression.

1      2      3      4      5      6

Reducing aggressive behavior improves the life of the dog displaying the behavior.

1      2      3      4      5      6

It is important that owners can reduce aggressive behavior with the help of a dog trainer.

1      2      3      4      5      6

Treatment should reduce aggression/reactivity to near zero levels.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Procedures Rating Form

Rescue Personnel's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information that will help in the selection of treatments for dogs. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

This would be an acceptable intervention for the dog's behavior.

1      2      3      4      5      6

I would suggest the use of this intervention to other professionals or owners.

1      2      3      4      5      6

The dog's behavior problem was severe enough to warrant the use of this intervention.

1      2      3      4      5      6

Most handlers would find this intervention suitable for the behavior problem described.

1      2      3      4      5      6

This intervention would *not* result in negative side effects for the dogs.

1      2      3      4      5      6

This intervention would be appropriate for a variety of dogs who behave similarly.

1      2      3      4      5      6

This intervention is consistent with my ethical guidelines for training.

1      2      3      4      5      6

The intervention is a fair way to handle the dog's behavior.

1      2      3      4      5      6

The intervention is reasonable for the behavior described.

1      2      3      4      5      6

I liked the procedures used in this intervention.

1      2      3      4      5      6

This intervention is a good way to handle the dog's behavior problem.

1      2      3      4      5      6

Overall, this intervention was beneficial for the dogs who participated.

1      2      3      4      5      6

Comments regarding this form:



## Social Validity of Effects Rating Form

Rescue Personnel's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the effects of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Classical counterconditioning was effective in reducing aggressive behavior.

1      2      3      4      5      6

The instruction package was effective at improving implementation.

1      2      3      4      5      6

The generalization programming package was effective at improving implementation.

1      2      3      4      5      6

Classical counterconditioning reduced aggression to appropriate levels.

1      2      3      4      5      6

The effects of classical counterconditioning will be maintained over time.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the instruction package.

1      2      3      4      5      6

The use of classical counterconditioning will continue because of the programming generalization package.

1      2      3      4      5      6

Comments regarding this form:

## Social Validity of Effects Rating Form

Researcher's Name: \_\_\_\_\_ Date: \_\_\_\_\_

The purpose of this questionnaire is to gather information on the effects of treatment. Please circle the number which best describes your agreement or disagreement with each statement.

**1- strongly disagree    2-disagree    3-slightly disagree    4-slightly agree    5-agree    6-strongly agree**

Classical counterconditioning was effective in reducing aggressive behavior.

1      2      3      4      5      6

The private training package was effective at improving implementation.

1      2      3      4      5      6

The group training package was effective at improving implementation.

1      2      3      4      5      6

Classical counterconditioning reduced aggression to appropriate levels.

1      2      3      4      5      6

The effects of classical counterconditioning will be maintained over time.

1      2      3      4      5      6

The use of classical counterconditioning will continue as a result of the instruction package.

1      2      3      4      5      6

The use of classical counterconditioning will continue as a result of the programming generalization package.

1      2      3      4      5      6

Comments regarding this form:

Appendix B  
Data Sheet for Owner Treatment Integrity

Dyad observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Exp Cond	Trial	Time												%
		:05	EC EO C NA	:10	EC EO C NA	:15	EC EO C NA	:20	EC EO C NA	:25	EC EO C NA	:30	EC EO C NA	
Notes:														
		:05	EC EO C NA	:10	EC EO C NA	:15	EC EO C NA	:20	EC EO C NA	:25	EC EO C NA	:30	EC EO C NA	
Notes:														
		:05	EC EO C NA	:10	EC EO C NA	:15	EC EO C NA	:20	EC EO C NA	:25	EC EO C NA	:30	EC EO C NA	
Notes:														
		:05	EC EO C NA	:10	EC EO C NA	:15	EC EO C NA	:20	EC EO C NA	:25	EC EO C NA	:30	EC EO C NA	
Notes:														
		:05	EC EO C NA	:10	EC EO C NA	:15	EC EO C NA	:20	EC EO C NA	:25	EC EO C NA	:30	EC EO C NA	
Notes:														
		:05	EC EO C NA	:10	EC EO C NA	:15	EC EO C NA	:20	EC EO C NA	:25	EC EO C NA	:30	EC EO C NA	
Notes:														

EO = error of omission (did not implement the treatment step); EC = error of commission (implemented the treatment step in the absence of precursor behavior or added a treatment step); C = correct implementation

Appendix C  
Dog Aggression Data Sheet

Dyad observed: \_\_\_\_\_

Date: \_\_\_\_\_

Observer: \_\_\_\_\_

Exp Cond	Trial	Time										%		
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														

Appendix D  
Dog Precursor Behavior Data Sheet

Dyad observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Exp Cond	Trial	Time										%		
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														
		:05		:10		:15		:20		:25		:30		
Notes:														

Precursor behaviors observed or comments:

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## Appendix E Procedural Fidelity Checklists

Appendix E  
Pre-treatment Procedural Fidelity Checklist (Private Instruction)

Researcher observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Pre-treatment Training Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E
Fit dog for and verbally explain Gentle Leader according to Appendix G.					
Introduced "Learn to Earn Program" according to Appendix K.					
Identify edible (out of three options) used by 1) interviewing the owner and 2) selecting the strongest SR+.					
Verbally explain CC according to Appendix I.					
Watch and verbally review video recordings of precursors behaviors.					
Instruct owners to independently identify precursor behaviors to until meeting criteria.					
Load bridge according to Appendix F.					

+ = yes  
 - = no  
 n/a = not applicable

\* completed one time

Number of + / Total number of steps X 100 = \_\_\_\_\_ Procedural fidelity percentage for pre-treatment training: \_\_\_\_\_

Treatment Procedural Fidelity Checklist (Private Instruction)

Researcher/Dyad observed: \_\_\_\_\_

Date: \_\_\_\_\_

Observer: \_\_\_\_\_

Private Instruction Treatment Steps		Trials											
Review Learn to Earn checklist <sup>1</sup> .													
Model for owner with one stimulus dog <sup>1</sup> .													
Prompt owners up to 3 times in 4 seconds if they do not implement (refrain during fading).													
Deliver treat to dog if owner fails to implement after 3 prompts (refrain during fading).													
Deliver praise for correct implementation after the trial is complete (deliver after meeting during fading).													
Deliver corrective feedback after the trial is complete (deliver after meeting during fading).													
Email and call owner to provide and discuss data in graphic format <sup>2</sup> (refrain from during fading).													

= Yes  
 - = no  
 n/a = not applicable  
 Number of + / Total number of steps X 100 = Procedural fidelity percentage for group training: \_\_\_\_\_

\* completed each time experimenter meets with owner  
<sup>1</sup> conducted once prior to 1st trial  
<sup>2</sup> conducted once the following day

Probe Procedural Fidelity Checklist (Private Instruction)

Researcher/Dyad observed: \_\_\_\_\_

Date: \_\_\_\_\_

Observer: \_\_\_\_\_

Probe Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E
Meet in the private instruction setting with each owner independently over the course of private training.					
Construct an exposure to another dog (using a dog trainer and his dog as a dyad) in one challenging context for owners.					
Instruct each owner to “do what they normally do.”					
Refrain from providing prompts, praise, corrective feedback, or any other assistance.					
Construct an exposure to another dog (using a dog trainer and his dog as a dyad) in a second challenging context for owners.					
Instruct each owner to “do what they normally do.”					
Refrain from providing prompts, praise, corrective feedback, or any other assistance.					
Construct an exposure to another dog (using a dog trainer and his dog as a dyad) in a third challenging context for owners.					
Instruct each owner to “do what they normally do”					



Refrain from providing prompts, praise, corrective feedback, or any other assistance.						
Construct an exposure to a different eliciting stimulus.						
Instruct each owner to “do what they normally do”						
Refrain from providing prompts, praise, corrective feedback, or any other assistance.						

\* completed once at probe session

- = Yes
- = no
- n/a = not applicable

Number of + / Total number of steps X 100 = Procedural fidelity percentage for group training: \_\_\_\_\_

Follow-up Procedural Fidelity Checklist (Private Instruction)

Researcher/Dyad observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Follow-up Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E	Dyad F
Meet in the private training setting with each owner independently 1-week after last meeting						
Instruct each owner to “do what they normally do”						
Refrain from providing prompts, praise, corrective feedback, or any other assistance.						

\* completed once at follow-up trial

- + = Yes
- = no
- n/a = not applicable

Number of + / Total number of steps    X 100 =                      Procedural fidelity percentage for follow-up: \_\_\_\_\_

Habituation Procedural Fidelity Checklist (Group Instruction)

Researcher observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Habituation Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E	Dyad F
Verbally instruct owner to take their dog off-leash.						
Verbally instruct the owner to allow their dog to move freely around area.						
Verbally instruct the owner to offer their dog a treat.						
Verbally instruct the owner to ask their dog to do an obedience behavior.						
Observe and record whether the dog interacts with the owner.						
If dog meets criteria, habituation ends.						
If dog does not meet criteria, schedule another habituation period with owner.						

+ = yes

- = no

n/a = not applicable

Number of + / Total number of steps X 100 =

\* completed once before any group meetings each habituation meeting

Procedural fidelity percentage for habituation: \_\_\_\_\_

Safety Protocol Procedural Fidelity Checklist (Group Instruction)

Researcher observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Safety Protocol Steps	Performance
Have owners enter the training facility without their dog.	
Instruct owners to keep their dog on leash throughout all of the meetings.	
Instruct owners to enter and exit independently of other dyads.	
Instruct owners to keep their dog in the car until instructed to retrieve them.	

+ = yes \* completed once at the first group meeting and prior to baseline

- = no

n/a = not applicable

Number of + / Total number of steps X 100 = Procedural fidelity percentage for safety protocol: \_\_\_\_\_

Treatment Procedural Fidelity Checklist (Group Instruction)

Researcher/Dyad observed: \_\_\_\_\_

Date: \_\_\_\_\_

Observer: \_\_\_\_\_

Group Instruction Treatment Steps	Trials																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Construct a challenging context for exposures to other dyads.																				
Model for group in that challenging context.																				
Prompt owners up to 3 times in 4 seconds if they do not implement (refrain from during fading).																				
Deliver treat to dog if owner fails to implement after 3 prompts (refrain from during fading).																				
Deliver praise for correct implementation after the trial (deliver after meeting during fading).																				
Deliver corrective feedback after the trial (deliver after meeting during fading).																				
Email and call owner and provide and review data in graphic format (refrain from during fading).																				

\* a new sheet is completed each time the group meets

+ = yes

- = no

n/a = not applicable

Number of + / Total number of steps X 100 =

Procedural fidelity percentage for group instruction: \_\_\_\_\_

Probe Procedural Fidelity Checklist (Group Instruction)

Researcher/Dyad observed: \_\_\_\_\_

Date: \_\_\_\_\_

Observer: \_\_\_\_\_

Probe Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E	Dyad F
Meet in the private training setting with each owner independently throughout group training.						
Construct an exposure to another dog using a dog trainer and his dog.						
Instruct each owner to “do what they normally do.”						
Refrain from providing prompts, praise, corrective feedback, or any other assistance.						

+ = yes

- = no

n/a = not applicable

\* completed once at probe trial

Follow-up Procedural Fidelity Checklist (Group Instruction)

Researcher observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Follow-up Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E	Dyad F
Meet in the private instruction setting with each owner independently 1-week after last meeting.						
Construct an exposure to another dog (using a dog trainer and his dog as a dyad) in one challenging context for owners.						
Instruct each owner to “do what they normally do.”						
Refrain from providing prompts, praise, corrective feedback, or any other assistance.						
Construct an exposure to another dog (using a dog trainer and his dog as a dyad) in a second challenging context for owners.						
Instruct each owner to “do what they normally do.”						
Refrain from providing prompts, praise, corrective feedback, or any other assistance.						
Construct an exposure to another dog (using a dog trainer and his dog as a dyad) in a third challenging context for owners.						
Instruct each owner to “do what they normally do.”						

Refrain from providing prompts, praise, corrective feedback, or any other assistance.								
Construct an exposure to a different eliciting stimulus.								
Instruct each owner to “do what they normally do.”								
Refrain from providing prompts, praise, corrective feedback, or any other assistance.								

\* completed once at each follow-up meeting

- + = yes
- = no
- n/a = not applicable

Number of + / Total number of steps    X 100 =                      Procedural fidelity percentage for follow-up: \_\_\_\_\_



### Appendix F Checklist for Establishing “Yes” as a Bridge

Establishing “Yes” as a Bridge Checklist

Researcher observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Loading Bridge Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E	Dyad F
Ask owners what bridge they would like to use. Assist in the selection.						
Say bridge (e.g., “yes”) and deliver a treat.						
Repeat several times.						
Wait for dog to get distracted and say the bridge. If they turn their head, deliver a treat, and stop loading bridge.						
Wait for dog to get distracted and say the bridge. If they do not respond, deliver a treat, and continue loading.						
Instruct owners to load the bridge 1-3 times over the course of the next week.						

\* completed one time

+ = yes  
 - = no  
 n/a = not applicable

Number of + / Total number of steps X 100 = \_\_\_\_\_ Procedural fidelity percentage for loading bridge: \_\_\_\_\_

### Appendix G Checklist for Introducing the Gentle Leader™

#### Introducing the Gentle Leader™ Checklist

Researcher observed: \_\_\_\_\_ Date: \_\_\_\_\_ Observer: \_\_\_\_\_

Introducing the Gentle Leader™ Steps	Dyad A	Dyad B	Dyad C	Dyad D	Dyad E
The experimenter holds the nose loop of GL, lures the dog's nose through with a treat, and feeds a treat.					
The experimenter repeats until the dog is freely approaching the GL.					
While the dog's nose is through the loop, the experimenter measures the width of their neck by wrapping the collar around their neck.					
The experimenter adjusts the neck clip according to the measurement.					
If dog exhibits aggression at any time, the experimenter stops and instructs the owner to follow Appendix G.					

+ = yes  
 - = no  
 n/a = not applicable

\* completed one time

## Appendix H Preparing Your Dog for the Gentle Leader™

After your trainer has helped fit your dog for the Gentle Leader™, these steps can help you get your dog more comfortable walking on the Gentle Leader™. Hold the top of the nose loop with your left hand. Using your right hand, lure the dog's nose through the loop of the Gentle Leader™ and feed 1-5 treats. Repeat a minimum of 10 times or until they approach the loop without hesitation, whichever comes last. Next, lure their nose through the loop, feed a treat, and scatter 10 small treats on the floor near their nose. This will encourage them to lower their head to eat the treats. When your dog lowers their head, clip the neck piece behind their ears and feed another treat. Immediately remove the Gentle Leader™. Repeat a minimum of 10 times or until they approach the Gentle Leader™ without hesitation, whichever comes last. Put on the Gentle Leader™ using the luring system previously described. This time take one small step and lure your dog towards you. Feed a treat and repeat. If at any time your dog begins rubbing their nose on the floor begin feeding faster and take smaller steps. Once you've taken five small steps with your dog, remove the Gentle Leader™. Repeat a minimum of 10 times or until your dog is no longer rubbing their nose to the ground, whichever comes last. Then attach the leash and repeat in the house, avoiding any leash tension. Continue walking your dog around the house for 5-7 days or until they are not rubbing their face. Finally, take your dog out for a walk with the Gentle Leader™, feeding treats every few feet.

## Appendix I Sample Script

“Counterconditioning is a treatment that can help reduce aggression. In counterconditioning we pair other dogs with a treat. Each time your dog’s \_(insert body part) does (insert X)\_\_ as they are looking at another dog they should receive a very tasty treat. The goal of this is that your dog will start associated pleasant things with the sight of another dog.

To help you with your timing, you should also use a word or sound that tells your dog that a tasty treat is coming. Some people like to use a clicker and some like to use a word. I recommend you use the word “yes”. What would you like to use?

Remember, each time your dog’s \_(insert body part) does (insert X)\_\_ while looking at another dog they should receive a treat. They are not required to do an obedience command or look at you before you give them a treat. In fact, you should not feed them if they are looking at you. Also, don’t pet them or try to distract them from the other dog. Just wait for their \_(insert body part) to (insert X)\_\_ and give them a treat. Remember, they receive a treat each time their \_(insert body part) does (insert X)\_\_ while seeing another dog. They should not receive a treat when they are looking at you.

Sometimes it can be difficult to use this technique. There are a couple of other situations that should signal to you to start using it. If another dog is barking at your dog, you should begin treating despite what your dog is doing. Also, if your dog vocalizes at all, you should begin feeding faster and try to move away from the other dog to create some distance between your

dog and the other dog. Once you have created that distance you should then start implementing again. It is also important to know that you will not reward your dog for behaving aggressively if you begin treating them. In fact, you will reduce their aggressive behavior.

## Appendix J

Please circle all that apply.

1. When should I feed my dog a treat?
  - a.) when they look at another dog
  - b.) when they see another dog and then look back at me
  - c.) when they are barking
  - d.) when they ignore the other dog
  
2. If my dog begins barking what should that signal to me?
  - a.) This treatment is not working for my dog. I should move on to another option for treatment.
  - b.) I am not feeding treats fast enough. I need to watch my dog more closely.
  - d.) I should block their view with my body to distract them
  - e.) There is no hope for my dog. They should be isolated for safety.
  
3. What do dogs often do before they become aggressive?
  - a.) look away from the other dog
  - b.) wag their tail
  - c.) open their mouth
  - d.) lean towards the target
  
4. What should I do if my dog continues staring at another dog or person?
  - a.) using a head collar, redirect their head away from the target
  - b.) keep feeding treats
  - c.) ask them to sit
  - d.) call their name to distract them
  - e.) praise
  
5. How do I know how many treats to feed when other dogs are around?
  - a.) If my dog becomes aggressive I should feed more treats.
  - b.) If my dog is really calm I should feed more treats.
  - c.) I should feed a treat each time there is another dog around.
  - d.) I should feed 1 treat every 10 seconds.
  - e.) I should watch my dog's body to figure out when I should feed.

## Appendix K

### Learn to Earn Program

This program is designed to encourage your dog to listen to you by restricting their resources to times in which they follow your instructions. It includes the following components:

- 24 hour watch and confine. This is designed to maintain consistency throughout the entire program.
- Your dog needs to work for all of his or her meals in the form of obedience (hand-feed).  
If your dog ignores your commands put his or her food away.
- Practice obedience daily for a minimum of 30 minutes.
- Exercise 20 minutes 2 times per day.
- No free treats. Your dog should do obedience to earn treats.
- No free praise and affection (petting). Your dog must work for affection in the form of obedience.
- Off of all furniture and beds.