Investigating the Effect that Training Classes Have on Reactive Behaviors in Dogs

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Abstract

Canine reactivity, including vocalizing and pulling towards other conspecifics, is a common behavioral issue experienced by owners of companion dogs. Due to its prevalence, a variety of training options are necessary to alleviate this concern for dog owners. Training classes are often an accessible and valuable method of increasing desirable behaviors in dogs but has not been previously researched in terms of reducing behaviors linked to canine reactivity. This study's aim was to highlight any additional side benefits that group training might have on the reduction of behaviors related to reactivity and does not impact the benefits of group training classes that prior research supports. Using a pretest posttest design this study compared a period of no owner interaction and one of owner interaction before and after the completion of a 5-week group training class for adolescent dogs. We found no significant differences in any of the target behaviors during the No Interaction period and the Owner Interaction period saw an increase in owner attention and a decrease in attention towards the target dog. Both vocalization and leash pulling showed decreasing trends between the pre- and posttest during the Owner Interaction period as well, but it did not rise to the level of statistical significance. When comparing testing states, the Owner Interaction period saw a significant increase in owner attention and significant decreases in vocalization, leash pulling, and attention towards the target dog when compared to the No Interaction period. These results suggest that without owner intervention there is neither a positive nor a negative change in the target behaviors. It appears that owner intervention may play a significant role in seeing possible changes in behaviors linked to reactivity.

Introduction

Reactive Behaviors

Reactive behaviors towards other conspecifics is a common behavioral issue seen among dogs who are kept as companion animals (Hiby et al., 2004; Stephens-Lewis et al., 2024). The American Kennel Club defines a dog showing reactivity as a dog who displays unusual and excessive levels of arousal around common stimuli (Gibeault, 2024). This overreaction is often displayed through vocalizations, such as barking, whining, lunging, and/or pulling towards the stimulus and, within the dog training profession, is often thought to be motivated by fear, frustration, or excitement (Gibeault, 2024). While not considered aggression, reactivity is often a precursor behavior (i.e., behaviors that come before other behaviors) to aggressive behaviors which can cause unnecessary stress to the animal and damage to the human-animal bond (Echterling-Savage et al., 2014; Stephens-Lewis et al., 2024). Additionally, Arata et al. (2014) surveyed 5,610 dog owners and found that dogs who were reactive to stimuli were more likely to also display aggression towards humans and other dogs. Despite the potentially detrimental issues linked to canine reactivity there is limited research with a focus on techniques to reduce its prevalence.

Reactive behaviors are frequently reported by dog owners. Through self-reports from 364 dog owners Hiby et al. (2004) found that 52% said their companion dogs barked at other dogs and 75% barked at people. Similarly, Tiira and Lohi (2016) found that out of the 3,284 dogs participating in a Finland-based study, around 35.1% barked at unfamiliar dogs and 37.3% barked at unfamiliar people. In a United Kingdom-based study, Casey et al. (2013) found that behaviors such as barking, lunging, growling, or biting, towards other dogs was a significant problem, with over a fifth of owners reporting that their dog displayed aggression and reactive

behaviors towards other dogs outside of their household. The pervasiveness of the issue may even be underestimated, as surveys to collect this data are often conducted with owners of dogs at public events, where owners of aggressive and reactive dogs would be less likely to attend (Casey et al., 2013). Dogs engaging in these disruptive behaviors, such as barking and lunging, frequently causes owners to relinquish these dogs or turn to professionals to help reduce or eliminate these behaviors (Stephens-Lewis et al., 2024).

Current Interventions for Reactivity

The data on treatments for reactivity as a canine behavioral issue typically come from studies with a focus on treatments for canine aggression. Aggression is defined as the actions of barking, lunging, growling, or biting at a stimulus (Casey et al., 2013). Thus, despite the focus being canine aggression and not canine reactivity, the behaviors of focus within these studies highlight similar behaviors of concern within both aggression and reactivity. Due to the overlap of target behaviors between aggression and reactivity, aggression interventions may be used as a foundation for the development and integration of new treatment that specifically targets reactivity. Arata et al. (2014) cited reactivity towards stimuli such as owners, strangers, or other dogs as a significant factor which should be accounted for when treating and preventing canine aggression. Even when reactivity is not being specifically cited within these studies, both vocalization and lunging directed towards a stimulus are often being measured, which continues to display this overlap of behaviors between reactivity and aggression (Echterling-Savage et al., 2014).

Research investigating techniques to reduce aggression has found that behavior modification programs including counterconditioning may have the most efficacy in terms of reducing aggressive behaviors. Dinwoodie et al. (2021) supported the use of behavior

modification programs which practiced systematic desensitization and counterconditioning to decrease aggressive behaviors. Specifically, this research suggests that successful programs focus on short and frequent training sessions with activities geared towards habituation, relaxation protocols, and communication between dogs and owners (Dinwoodie et al., 2021). Echterling-Savage et al. (2014) also focused on using a modified version of a conditioning program, the Aggression Reduction Procedure, to make these treatments more accessible to the owners of the dogs. They had the dog's owners deliver an edible reinforcer upon seeing precursor behaviors, such as prolonged staring toward the stimulus dog, to reduce the prevalence of more severe behaviors, such as vocalizing and lunging (Echterling-Savage et al., 2014). This focus on treatments for aggression, within current research, limits treatments for reactivity to an aggression centered approach instead of treating reactive behaviors as their own individual problem behaviors.

Socialization, the process of desensitizing a dog to potential future environments, is a common method used to prevent problem behaviors from developing and, through continued socialization in group classes, might also aid in reducing reactive behaviors in dogs (Howell et al., 2015). Howell et al. (2015) stated that early socialization should take place during the dog's critical socialization period which is prior to 12 weeks of age and includes controlled and appetitive or neutral exposure to new sights, sounds, objects, and animals. It is observed that adult dogs who receive proper early socialization display less fear or aggression towards novel stimuli than dogs who did not have access to this socialization process (Howell et al., 2015). The benefits of social exposure are likely to extend beyond the canine socialization period as literature has found that exposure to strangers after the socialization period of 5 to 12 weeks of age was still effective in increasing positive responses to people (Kutsumi et al., 2012).

Supporting this, Gfrerer et al. (2018) found that weekly social exposure to other conspecifics for adult working dogs, which are primarily kept separate from other dogs, decreased their offensive and defensive behaviors towards unfamiliar dogs. These results then suggest an inverse relationship between continued socialization and reactive behaviors even as dogs age. Finding opportunities for well-controlled social exposure for their dogs is challenging for many owners and thus owners often turn to group classes to meet this need.

Positive Reinforcement Training Classes

Training classes are an accessible avenue for dog owners to achieve opportunities for continued social exposure. Classes are also common tools used to help with problem behaviors, train basic obedience behaviors, and help to increase owner-oriented attention in their dogs (González-Martínez et al., 2019; Seksel, Mazurski, & Taylor, 1999; Deldalle & Gaunet, 2014). According to the American Kennel Club, a typical beginner training class, not focused on puppy training, starts at the age of five months and up (Santo, 2024). The trainers teaching these courses often focus on common problem behaviors and basic manners such as leash walking, sit, stand, down, stay, and recall. A typical training class is usually no larger than eight dogs and ensures that all dogs and owners are given the necessary support to be able to participate and successfully manage their dogs. Deldalle and Gaunet (2014) suggested that training classes also offer opportunities to strengthen interactions between owner and dog. This is accomplished through ongoing positive interactions supported in the class and may be seen through the dog offering a higher rate of attention to the owner throughout the class (Deldalle & Gaunet, 2014). Increased levels of interactions may aid in successful obedience training for the owners. Training classes are a tool for owners to teach obedience behaviors to their dogs, but their effects on the presence of reactive behaviors has not been measured. Training classes have been found to have

both immediate and long-lasting effects on the behaviors of the dogs who attend them. Seksel, Mazurski, & Taylor (1999), found that training classes displayed a positive and direct impact on a dog's obedience and saw an earlier acquisition of cues than dogs who received no formal training. Additionally, Kutsumi et al. (2013) used the Canine Behavior Assessment and Research Questionnaire and reported improved responses to commands for dogs who received formal training, regardless of age, as compared to those who did not receive formal training. More recent studies found similar trends wherein dogs who attended training classes were found to be significantly more likely to give attention to and listen to the cues of their owners 1 year after the completion of the class than dogs who did not attend classes (González-Martínez et al., 2019). Through both immediate cue acquisition and long-term cue retention, training classes appear to be an effective resource for obedience training.

Training focusing on reward-based training methods, instead of aversive methods, may support dog welfare more effectively (Rooney & Cowan, 2011). Reward-based training methods rely on positive reinforcement and use the contingent delivery of appetitive stimuli to increase likelihood of behavior that preceded the stimulus (Deldalle & Gaunet, 2014). Aversive methods are considered to rely on both positive punishment and negative reinforcement, which rely on the presentation or removal of an aversive stimulus to attempt to reduce or increase behavior, respectively (Ziv, 2017). Within current canine research there is evidence to support the welfare benefits of reward-based training. For example, Deldalle & Gaunet (2014) reported that dogs in a positive reinforcement training class gave their owners more attention and exhibited fewer stress-related behaviors than those in the negative reinforcement training class. Through an observational study, Rooney & Cowan (2011) determined that reward-based training promoted healthy human-dog interactions, enhanced canine learning, and had the most positive impacts on

dog welfare. This trend of improved human-dog interactions was also supported in LaFollette et al. (2019). Which, while primarily focused on relationships between veterans and their service dogs, also investigated the effects of different training methods on human-dog relationships. Their results indicated that veterans who reported using mostly positive reinforcement methods also reported more perceived closeness, attention, trainability, and playfulness than those who reported using mostly positive punishment methods (LaFollette et al., 2019). Additionally, Hiby et al. (2004) reported that dogs trained with positive punishment do not appear to be more obedient and may actually have an increased number of reported problem behaviors than dogs who were trained with reward-based methods. These results provide support that the training methodology that is most likely to have greater overall welfare benefits for the participants is positive reinforcement. Therefore, when attempting to use training classes as a proactive approach to the presence of reactive behaviors, a known welfare concern, a reward-based training class is an evidence-based approach.

Current research emphasizes the benefits of reward-based training, the behavioral benefits of continued socialization with other dogs, and the link to training classes as a successful method for increasing desired behaviors in dogs (Deldalle & Gaunet, 2014; Howell et al., 2015; Kutsumi et al., 2012). The current study brings these concepts together by investigating the relationship between positive reinforcement group training classes and the presence of problem behaviors linked to reactivity in dogs. Specifically, the target behaviors vocalization and leash pulling were the measures of reactivity engagement. Additional target behaviors (looking at the target dog, looking at the owner, resting behaviors, and receiving treats) were included to assess additional changes in behavior. We hypothesized that after taking these classes the subject dogs

would exhibit fewer behaviors linked to reactivity and that there would be an increase in owner-oriented behaviors.

Methods

Design

We used a quasi-experimental, pretest-posttest design, approved by the Institutional Animal Care and Use Committee, to assess the reactivity of leashed dogs before and after taking part in an obedience class for adolescent dogs. During the pretest and posttest phases, the participant dogs were exposed to a neutral "target" dog while on leash and we measured their responses to the neutral dog. We video recorded the behavior of the dog prior to taking the group training class and again after the completion of this class. The amount of time engaging in certain behaviors was compared. These behaviors of focus were vocalization, pulling on the leash, looking at the target dog, looking at the owner, resting behaviors, and receiving treats. The behaviors of focus were chosen due to being behaviors linked to reactivity itself (e.g., Arata et al., 2014); being precursor behaviors to reactivity, as defined in Echterling-Savage et al. (2014); or are relaxed behaviors, such as sitting or lying down, as discussed in Dinwoodie et al. (2021).

Subjects

Three class sections of dogs were enrolled in a 5-week obedience class at a Snohomish County, WA dog daycare, *The Dog Spot* to participate. The three class sections had five dogs each (15 dogs total), and dogs were invited to participate two weeks prior to the start of the class during an in-person orientation. No prior training experience was necessary to participate in the study, and all dogs had to be between the ages of 6 months to 2 years. Additionally, to be included in the study, attendance at all classes was mandatory, and any dogs who missed a session were excluded from the study. Dogs who did not engage in at least one of the behaviors

related to reactivity (vocalization and leash pulling) during the pretest were excluded from the study. All class attendees were invited to join, and all 15 dogs were exposed to the same curriculum regardless of participation in the study. Of the 15 class attendees, seven dogs finished with participation in the study. With three dogs having attended the same session and the other two sessions having two participants each. All owners signed forms of consent agreeing to have their dogs participate in the study and to be filmed for the entirety of the testing sessions.

Setting

All classes and testing took place at *The Dog Spot*, a dog daycare and training facility located in Snohomish County in Washington state. Classes took place in the main training room, which was rectangular room approximately 10 m by 7.5 m. In the main training room, the dogs stayed at least 3 m away from other class members with an obstructed view of the other dogs throughout the 1-hr class session.

All testing took place in a neutral testing room, which was 10 m by 3.72 m. When in the testing room, the subject and target dog were 4 m apart, with an unobstructed view of one another. The subject dogs were only exposed to this room during the pre- and posttesting sessions.

Training Classes

Dogs attended one group training class per week for 5 weeks in between pretesting and posttesting. The class used positive reinforcement training to teach basic obedience cues. Subjects followed positive reinforcement training techniques for the duration of the five classes. The behaviors of focus were name recognition (looking towards their owner after their name is said), attention towards the owner (rewarding the dog any time they look towards their owner throughout class), remaining in place as the owner walks away from the dog, laying down on a

mat, the ability to walk with a loose leash, recall word response (returning to their owner when they hear the cue 'come'), waiting for a food bowl, waiting at a door, how to ignoring high quality objects, targeting a hand with their nose, and getting into side position on cue. Throughout the classes, the dogs experienced weekly exposure to people and dogs through the other members attending the class. The structure of each class consisted of a review of the prior week's skills and learning one to two new skills. Training in the group class is a non-study specific procedure that owners initiated at an established training facility regardless of participation in this study.

Testing Sessions

Subjects took part in two experimental sessions, each comprised of a 3-min acclimation phase which preceded the two 1-min testing phases, during which they were exposed to a neutral target dog. These three phases took place in succession immediately after each other. The initial experimental session took place three to five days before the first day of the group training class. The final experimental session took place three to five days after the final day of the group training class.

Target dog

All pre- and posttests were conducted with the same neutral "target" dog, a male, 4-year-old Staffordshire terrier mix with no history of reactive behaviors. The target dog and the handler were unknown to all the subject dogs and were not seen by participants outside of the pre- and posttesting.

Procedure

When the owners first arrived on their testing day they received verbal instructions for the following procedures: the acclimation phase, the No Interaction period, and the Owner

Interaction period (see individual sections for the instructions provided). These procedures were consistent across the pre- and posttests and instructions were always given by the class instructor. During the two 1-min experimental sessions, the subject and target dog remained within the eyesight of one another and on leash for the duration of the test. The dogs never received the opportunity to greet the target dog on or off leash throughout the duration of the study.

Acclimation Phase

During the 3-min acclimation phase, owners were to allow the dog to freely explore the room off leash while they remained in the room with their dog. Owners were free to engage with their dog or let them explore independently. No other humans or dogs were present in the room during this phase. At the end of the 3-min phase, indicated by the experimenter knocking on the door, the dog was then put on leash by the owner and both moved to be across the room from where the target dog and handler entered through the door.

No Interaction Period

The No Interaction period was then initiated when the target dog and handler entered the room. The target dog and handler stayed across the room from the subject and remained there for the entirety of the testing phases. For this phase, owners had been instructed to not engage in any interactions with their dog, aside from keeping a secure hold of the leash in order to not allow their dog to move closer than 4m from the target dog. The target dog and handler sat directly behind the camera and faced away from the subject dogs, while the target dog received treats to maintain his quiet behavior, for all testing periods.

Owner Interaction Period

Immediately after the No Interaction period, the 1-min long Owner Interaction period began and was initiated by a hand signal from the handler of the target dog. For the Owner Interaction period, the owners had been instructed to engage with their dog through any means they wanted and to continue holding onto the leash as to not allow their dog to get closer than 4m to the target dog. Verbally given examples for interactions were verbal praise, petting, or owner provided treats. Owners were not provided with a schedule to deliver the stimuli and remained up to owners' own discretion when to provide these stimuli to their dogs. The target dog and handler remained in the same position as the prior testing period for the entirety of this period as well.

Measurements and Analysis

All testing sessions were video recorded for later analysis. Responses were continuously recorded, to determine the time spent engaging in the target behaviors during the pre- and posttests. We then used Wilcoxon Signed-Rank tests to compare results from the pre- and posttests to determine if the differences in means were significant. Duration of behaviors included bouts that lasted longer than 1 second and bouts ended with one second of pause by the dog. All statistical analyses were done through SPSS or Excel. See Table 1 for names and descriptions of the behaviors of focus for this study.

Table 1

Behaviors of Focus and Their Operational Definitions.

Behavior	Description	Units Recorded
Vocalization	any sound the dog makes, including barking, whining, growling, and howling	Duration (s)
Attention towards owner	the dog orientates its head and eyes to focus on the owner for longer than one second	Duration (s)
Attention towards target dog	the dog orienting its head and eyes to focus on the camera for longer than one second	Duration (s)

Resting behaviors	the dog sitting or lying down for longer than one second	Duration (s)
Pulling on leash	the dog moving away from the owner with the leash fully extended	Duration (s)
Receiving a treat	the dog receiving and consuming a treat	Frequency

Arata et al. (2014); Echterling-Savage et al. (2014); Dinwoodie et al. (2021)

Results

Participant Characteristics

Subject dogs consisted of three males and four females and were a variety of breeds (see Table 2 for dog demographics). Dogs ranged in age from 6 months to 2 years.

Table 2
Dog demographics

Subjects	Age	Sex	Breed	Pretest Leash Pulling		Posttest Leash Pulling		Pretest Vocalizing		Posttest Vocalizing	
				NI	OI	NI	OI	NI	OI	NI	OI
Male 1	11 months	Altered Male	Doberman mix	3s	48s	13s	23s	20s	25s	14s	8s
Female 1	7 months	Altered Female	Chihuahua mix	6s	3s	12s	0s	0s	0s	8s	3s
Male 2	1 year	Altered Male	German Shepard mix	18s	0s	34s	1s	42s	7s	46s	6s
Female 2	9 months	Altered Female	Labrador retriever/ Pitbull	31s	15s	21s	0s	45s	22s	37s	5s
Female 3	1.5 years	Altered Female	Pitbull/ boxer mix	16s	8s	2s	0s	3s	0s	0s	0s
Female 4	6 months	Altered Female	Pitbull mix	54s	33s	43s	4s	21s	7s	0s	6s
Male 3	1.5 years	Altered Male	Labrador retriever/ Great Pyrenees	24s	19s	31s	1s	54s	38s	48s	26s

NI indicates No Interaction period. OI indicates Owner Interaction period

Pre versus Posttests

We used Wilcoxon Signed-Rank tests to compare the behaviors between the Pre- and Posttest for both the No Interaction and Owner Interaction periods to determine if the differences in means were significant. We found no significant differences in any of the target behaviors during the No Interaction period when we compared the pre- to posttest (Table 3). Three participants (Female 1, Female 4, and Male 1) were removed from the statistical analysis for the Owner Interaction period due to the owners not interacting with them during this period. During the Owner Interaction period we found a significant increase in owner attention and treats received and a significant decrease in attention towards the target dog (Table 4). Both vocalization and leash pulling showed decreasing trends between the pre- and posttest during this period as well, but it did not rise to the level of statistical significance (Table 4).

Table 3
Results of the Wilcoxon signed-rank analyses of the Pre vs Post Test No Interaction period

Behavior	z	p	Pretest Mdn	Posttest Mdn	N
Vocalization	-1.103	.27	21s	14s	7
Pulling	-0.085	.933	18s	21s	7
Owner attention	-1.633	.102	0s	2s	7
Attention to target dog	-1.781	.075	53s	51s	7
Resting behaviors	-1.572	.116	12s	33s	7
Receiving treats	-	-	-	-	-

Table 4
Results of the Wilcoxon signed-rank analyses of the Pre vs Post Test Owner Interaction period

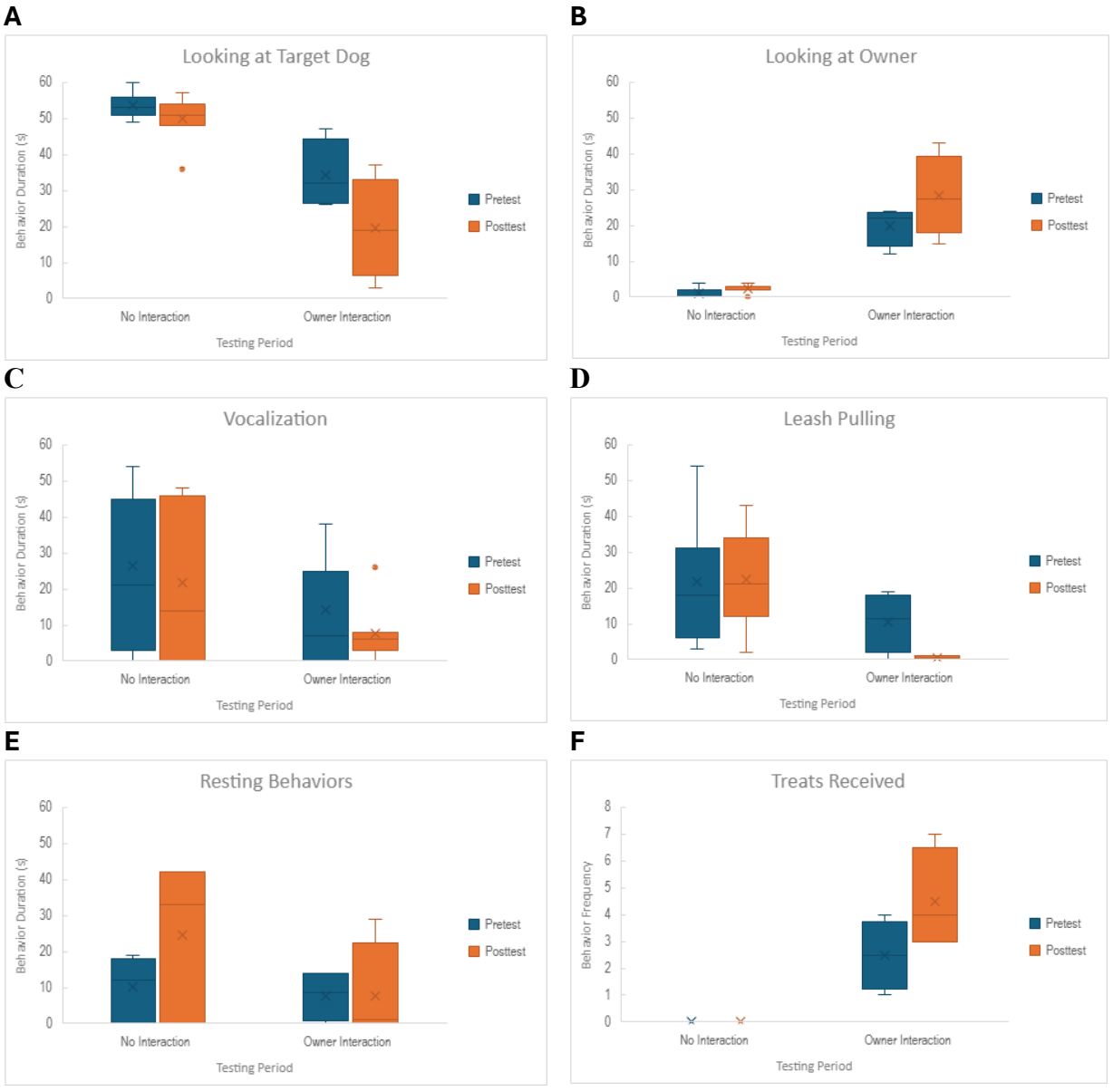
Behavior	z	p	Pretest Mdn	Posttest Mdn	N
Vocalization	-1.604	0.109	14.5s	5.5s	4

Pulling	-1.461	0.144	11.5s	0.5s	4
Owner attention	-1.841	0.066*	21s	15s	4
Attention to target dog	-1.826	0.068*	32s	19s	4
Resting behaviors	0	1	8.5s	1s	4
Receiving treats	-1.841	0.066*	2.5	4	4

Note. 3 subjects removed due to receiving no owner interaction during this period. *Indicates significant results, p>.10

Figure 1

Target Behaviors Between the Pre- and Posttest for both No Interaction and Owner Interaction Periods



Note. Graphs display median results from all subjects. X indicates the mean. The bar indicates the median. *p>.10

Comparing Conditions: No Interaction vs Owner Interaction

We also used Wilcoxon Signed-Rank tests to compare the behaviors between the No Interaction and Owner Interaction periods for both the pre- and posttests to determine if the differences in means were statistically significant (Figure 2). Although this was a separate analysis on the same data as we analyzed for the pre- vs posttest differences, we did not correct for multiple comparisons due to the small sample size of our exploratory study and the increased chance for Type II errors. Between the conditions of No Interaction to Owner Interaction there was a significant increase in owner attention, and significant decreases in attention to the target dog, vocalization, and leash pulling during the pretest (Table 5). One participant (Male 1) was removed from the statistical analysis due to the owners not interacting with them during the Owner Interaction period during the pretest. The posttest, between the conditions of No Interaction to Owner Interaction, saw the same trends in owner attention, attention towards the target dog, and leash pulling (Table 6). Three participants (Female 1, Female 4, and Male 1) were removed from the statistical analysis due to the owners not interacting with them during the Owner Interaction period during the posttest.

Table 5

Wilcoxon signed-rank analyses of the No Interaction vs Owner Interaction Pretest period

Behavior	z	p	No Interaction Mdn	Owner Interaction Mdn	N
Vocalization	-2.023	0.043*	21s	7s	6
Pulling	-2.201	0.028*	12s	3s	6
Owner attention	-2.201	0.028*	0s	21s	6

Attention to target dog	-2.214	0.027*	53s	28s	6
Resting behaviors	-9.948	0.343	12s	3s	6

Note. 1 subject removed due to receiving no owner interaction during Owner Interaction period. *Indicates significant results, p>.05

No Interaction vs Owner Interaction Posttest

Table 6

Wilcoxon signed-rank analyses of the No Interaction vs Owner Interaction Posttest period

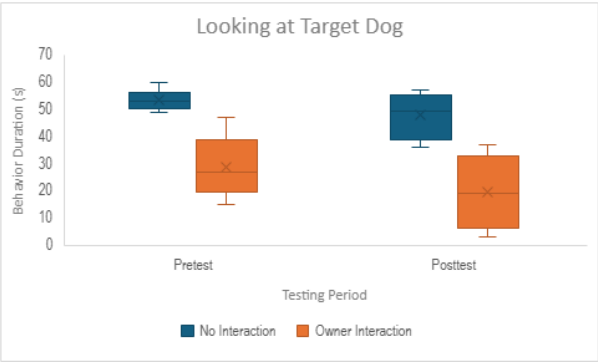
Behavior	z	p	No Interaction Mdn	Owner Interaction Mdn	N
Vocalization	-1.604	0.109	14s	6s	4
Pulling	-1.826	0.068*	21s	1s	4
Owner attention	-1.826	0.068*	2s	15s	4
Attention to target dog	-1.826	0.068*	51s	37s	4
Resting behaviors	-1.461	0.144	33s	2s	4

Note. 3 subjects removed due to receiving no owner interaction during Owner Interaction period. *Indicates significant results, p>.10

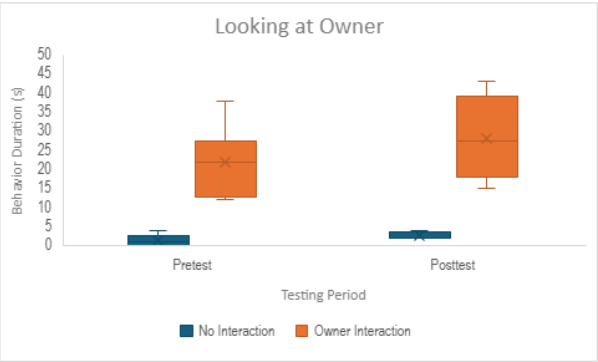
Figure 2

Behavior Comparisons for No Interaction and Owner Interaction Pre- and Posttests

A



B



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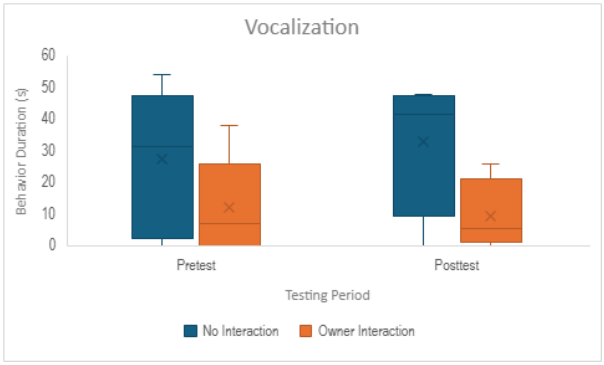

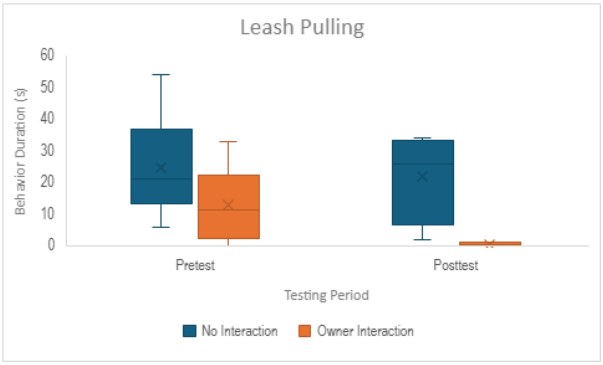

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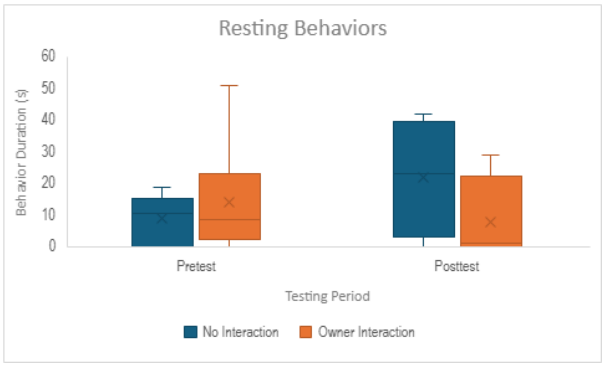

Note. X indicates the mean, and the bar indicates the median. Pretest $p>.05$, Posttest $p>.10$

Discussion

The purpose of this study was to determine if dogs showed any significant changes in attention towards the owner, attention towards the target dog, leash pulling, vocalization, resting behaviors, and receiving treats after taking a five-week group training class, and additionally whether behaviors varied between conditions in which the owner did or did not interact with the dog. We found that after taking this class attention towards the owner significantly increased and attention towards the target dog significantly decreased during the Owner Interaction period. Additionally, the behaviors vocalization and leash pulling, also saw a general decreasing trend after the intervention during the Owner Interaction period; however, after removing the three participants who received no interaction during this period the population may not have been large enough to determine if this was a statistically significant effect. The No Interaction period saw no significant changes in any behavior across the intervention.

The decreasing trend in the dogs engaging in pulling on the leash and in vocalization are valuable as these may be considered reactive behaviors both within the profession of dog training, as seen from the American Kennel Club, and within studies as well (e.g., Arata et al., 2014; Casey et al., 2013; Gibeault, 2024). Problem behaviors and the owners' inability to handle them are common reasons for dog relinquishment (Stephens-Lewis et al., 2024). Reduction in these common and more disruptive reactive behaviors could aid in decreasing the likelihood of companion dogs being rehomed. Further research, with a larger sample size, would be needed to determine if this decreasing trend is truly statistically significant.

The reduced sample size during the Owner Interaction period may be due to the lack of standardization in how the owners interacted with their dogs. Three dogs did not receive a single treat during the posttest Owner Interaction period, with one of these dogs also not receiving a treat during the pretest Owner Interaction period. For these dogs, this period likely became a second consecutive No Interaction period and did not provide information on how receiving interaction from owners changed their behavior. Future studies may see more significant results through standardizing how the owners are to interact with the dogs during the Owner Interaction period and ensuring the owners follow those procedures. This could be achieved through setting a predetermined schedule in which the owners must offer their dog a treat at specific intervals.

We also saw no significant changes across the No Interaction period; the dogs did not seem to improve or worsen in regard to the target behaviors. These results suggest that while taking a training class may not increase problem behaviors, it also may not passively improve them, and explicit training is likely required to change them. That is, the lack of significant changes during the No Interaction period may be related to the dogs not being taught what to do in the presence of another dog. Classes were focused on the new skill of the day, and there was

never a time in class where the dogs were stationary with direct sightlines to one another. Because the dogs were rarely exposed to this and not taught what to do in this situation, they were then left without direction during this period of the test as their owners ignored them. Without this owner engagement, the dogs may begin practicing precursor behaviors, such as staring at the target dog, which could lead to engaging in reactive behaviors, such as vocalizing and pulling on the leash. This suggests that we may not be able to expect generalization just from attending classes and instead may need to train for this situation explicitly. Findings from other studies have highlighted the success of systematic desensitization and counterconditioning training for problem behaviors in dogs (Echterling-Savage et al., 2014) and visual stimulation with the sight of other dogs is likely an important component of desensitization and counterconditioning. Greater behavior change may be seen after adding a similar training program to group classes which may help set the dogs up for better success.

Due to seeing behavior changes solely during the Owner Interaction period a statistical analysis was performed on the behavior changes between the conditions of the pre- and posttests. This allowed us to see if the period of Owner Interaction produced fewer problem behaviors than the No Interaction period. Overall, the Owner Interaction period did see a significant increase in owner attention and significant decreases in vocalization, leash pulling, and attention towards the target dog when compared to the No Interaction period. These results suggest that in regards to addressing behaviors linked to reactivity, the timing of and manner in which the owners are interacting with their dogs may be the more important variable.

The decrease in attention towards the target dog and the increase in attention to the owner are valuable changes, in addition to the decreases in vocalization and leash pulling, as these attention behaviors are precursor behaviors for canine reactivity. Addressing precursor behaviors

can be helpful in predicting and reducing the more severe behaviors, such as vocalizing and pulling on the leash (Heath & Smith, 2019). Seeing less engagement in attention towards a target dog and an increase in engagement of attention towards the owner could potentially reduce the frequency of the more those more disruptive reactive behaviors. In their study on reducing aggression, Echterling-Savage et al. (2014) defined precursor behaviors as attention towards a stimulus, through staring or pointing their ears at the stimulus, and determined that addressing behaviors at the precursor stage played a vital role in seeing success in their Aggression Reduction Protocol. Seeing this reduction in precursor behaviors to reactivity, an increase in owner orientated attention, and no increases in reactive behaviors during the Owner Interaction period, as well as no behavior change during the No Interaction period, suggests that the more important variable may be the likelihood or manner of interaction between the human and the dog and is not a natural byproduct of the classes. That is, owners may need to be explicitly taught how and when to interact with their dogs to support positive behavior change in their dogs and will not necessarily learn that behavior without explicit coaching.

If the more important factor in reduction of reactive behaviors is human and dog engagement, then group training classes could be an excellent vehicle for this practice. Past studies have supported the benefits of classes in terms of socialization, earlier cue acquisition and retention, and an increase in attention to owners when compared to dogs who did not receive formal training (Seksel, Mazurski, & Taylor, 1999; González-Martínez et al., 2019; Kutsumi et al., 2013). Additionally, classes provide accessible and helpful training for the owners through both demonstrations by the teacher and receiving immediate feedback to improve their training abilities (Howell et al., 2015; Greenebaum, 2010). This approach is supported as being beneficial through research from Howard and DiGennaro Reed (2014) which found that when teaching

humans to train dogs, the more effective approach was one that included an element of modeling the training and giving feedback about the training itself alongside written instructions and watching video models. Therefore, supplementing group training with intentional owner education of canine body language and precursor behaviors could lead to more successful and timely interventions from the dog owners. Greenebaum's (2010) study discussed that a dog training class with goals of promoting owner education alongside improving canine obedience was successful in achieving these goals. These training classes, which had a focus on positive reinforcement, prioritized teaching effective human-dog communication through understanding of the underlying causes of their dog's behavior; how to recognize stress and anxiety in canine body language; and on building a collaborative team between the human and dog (Greenebaum, 2010). Training with a focus on owner education is vital, as it is the human who is responsible for engineering the dog's environment and becoming equipped with greater knowledge on how dogs communicate can lead to greater training success. These results were consistent with other studies (Deldalle & Gaunet, 2014; d'Angelo, et al., 2022) suggesting that training classes produce higher rates of owner-oriented attention from dogs. Which suggests that to then decrease the presence of reactive behaviors, classes may need to prioritize the owners' understanding of canine behavior and promote positive engagement with their dogs.

Limitations and Future Research

This study focused on changes in dogs' reactive behaviors rather than the behavior of the owners. Future research may wish to focus on how the owners' interactions with their dogs and their impressions of their dog's behavior changed after taking the course. This would allow for greater information on the state of the human-dog bond prior to and after completion of a group training class. Another limitation is that the sample size was small and there were issues with

treatment integrity by the owners, which may have limited the ability to determine possible effects from the treatment. Additionally, there may have been carry-over effects from the No Interaction and the Owner Interaction periods. These effects may have significantly affected the dogs who received minimal human interaction during the Owner Interaction period and therefore experienced a 2-min No Interaction period instead of the projected 1-min. Future research may need to adjust the instructions on what the Owner Interaction period entailed to have more standardized interactions and potentially lead to more significant results emerging.

A longitudinal study focused on the presence of behaviors after the conclusion of the course may also help to determine if the effects seen from attending the class remain significant after its conclusion. Additionally, a course which includes systematic desensitization and counterconditioning as compared to a course similar to the one in this study, may also allow for a better understanding of the limitations of certain styles of group classes.

Conclusion

These results highlight the benefits and shortcomings of training classes for adolescent dogs especially as pertaining to addressing behaviors linked to canine reactivity. This study's aim was to highlight any additional side benefits that group training might have on the reduction of behaviors related to reactivity and does not impact the benefits of group training classes that prior research supports. These results suggest that without owner intervention there is neither a positive nor a negative change in the target behaviors. It appears that owner intervention may play a significant role in seeing possible changes in behaviors linked to reactivity. Behavior identification and intervention skills likely need to be explicitly taught to ensure all owners see improvement in the ways they interact with their dogs and in their ability to know how and when to intervene.

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