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Author Note

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Abstract

Many dogs are relinquished to animal shelters and subsequently euthanized each year due to problem behaviors, such as excessive barking (ASPCA, n.d.). Unfortunately, punishment-based procedures (e.g., bark collars) have been commonly used to reduce these behaviors, despite negative side-effects such as escape and aggression. Functional communication training (FCT) involves teaching a replacement behavior that is functionally equivalent to the problem behavior and is a documented strategy to reduce problem behaviors in humans (e.g., Carr & Durand, 1985). In the current study, one 11-month old dog who had a history of whining, mouthing, and pawing was taught to mand (request) for outside, food, play, and rub via voice-recorded buttons based on when motivating operations (MOs) for these stimuli were known to be present. The results showed a decrease in problem behaviors and an increase in independent mands following intervention. Findings, limitations, and areas of future research are discussed.

Keywords: animal communication; functional communication training; mand training; voice recorded buttons

1.0 Reducing a Dog's Problem Behavior Using Functional Communication Training: A Case Study

Every year 3.1 million dogs are relinquished to animal shelters, 47% of which are due to problem behaviors, such as excessive barking (ASPCA, n.d.). Additionally, although 2,000,000 dogs are adopted each year from animal shelters, the time in which a dog remains in a shelter can facilitate higher rates of problem behavior compared to when the dog was admitted and these disruptive behaviors within the shelter have been shown to influence the adopter's consideration of re-homing the animal (ASPCA, n.d.; Herron et al., 2014; Kwan & Bain, 2013; Wells, 2004). Further, problem behaviors within the shelter contribute to why 390,000 shelter dogs are euthanized each year (American Humane, 2016; ASPCA, n.d.). Thus, interventions aimed at reducing problem behavior both prior to initial relinquishment and within the shelter should be considered an important area of animal research.

Dog owners have historically targeted the reduction of problem behavior within the home prior to relinquishment primarily using punishment-based procedures. For example, Hiby et al. (2004) noted that approximately 84% of the 364 owners surveyed reported the use of punishment procedures when training their dogs (e.g., bark collars, etc.). Although commonly reported as a training method, using punishment procedures may increase other unwanted behaviors such as avoidance, escape, and aggression (Lerman & Vorndran, 2002). Further, problem behavior has been shown to recover following an initial decrease and may increase in intensity or frequency following punishment-based procedures (Cooper et al., 2020). Thus, the use of punishment may in turn exacerbate the original problem, leading to increased rates of relinquishment.

Reinforcement-based procedures can minimize the unwanted side effects that can result from punishment techniques (BACB, 2020; Certification Council for Professional Dog Trainers, 2009; Cooper et al., 2020; Protopopova et al., 2016), and have been shown to increase desirable behavior and decrease problem behaviors in the shelter setting. For example, Protopopova and Wynne (2015) implemented two different interventions including a differential reinforcement of other behavior (DRO) procedure and a procedure in which food was paired with the presence of a human. Both procedures resulted in the decrease of undesired behavior. In another study, Herron et al. (2014) assessed the effects of environmental enrichment on problem behavior in sheltered dogs. The experimenters targeted behaviors associated with fearfulness including the position and body posture of the dog while in their cage or kennel and the dog displaying a tucked tail and pinned ears, among others. The experimenters delivered toys and treats contingent on desirable behaviors (e.g., eye contact, approaching the front of the kennel, etc.). Results showed that although decreases in the targeted behaviors were not observed, the researchers noted that the use of these interventions prevented these behaviors from worsening and that an increase in desirable behavior was observed (Herron et al., 2014).

Feuerbacher and Wynne (2016) used a functional analysis (FA) to determine the function (cause) of a dog’s problem behavior. The study concluded that providing attention to the dog after problem behaviors were emitted could aid in the maintenance of the behaviors and thus, they suggested providing the same reinforcer (i.e., attention) contingent on appropriate behaviors. Hall et al. (2015) studied the relationship between canine compulsive behaviors and environmental factors. The owners noted the antecedents and consequences of the dogs’ behaviors which suggested that the dogs’ excessive behaviors may have been maintained by owner attention which was later confirmed.

Although previous research utilizing FAs to assess the function of non-human problem behavior are encouraging, there is paucity in the research assessing function-based treatments.

One of these treatments, known as functional communication training (FCT), consists of teaching a form of communication that is functionally equivalent to the problem behavior (e.g., Carr & Durand, 1985; Winborn et al., 2002; Wu et al., 2021). FCT generally involves identifying the function of problem behaviors, choosing appropriate alternative responses, generally in the form of a mand (request), that meet the same function as the problem behavior, and reinforcing the alternative behavior while no longer providing reinforcement for problem behaviors (Tiger et al., 2008).

Because dogs have too few response topographies that can be shaped into communicative responses, using a selection-based procedure such as buttons, could be an effective modality to be used during FCT (Michael, 1985). Zeagler et al. (2014) examined the use of a touchscreen to teach dogs to communicate with humans in the event of an emergency (e.g., calling 911). Their results demonstrated that the dogs were able to touch circles on the screen with their noses and with further training they could potentially learn to apply these skills to emergency situations. Moreover, Rossi and Ades (2007) trained a dog to request walk, pet, urine, toy, food, crate, and water using a keyboard. However, it was noted that the dog may have been dependent on the trainer’s vocal prompts, and it was unclear if the dogs would utilize the keyboard independently.

Robinson (2021) examined the use of communication buttons to teach mands to a dog in which the trainer collaborated with the pet owner through a group training class. Results showed that the dog pressed the corresponding buttons for food puzzle, go to room, and for stuffed Kong treats. However, several limitations were noted in the study. First, there was poor stimulus control for the button, “Go to room.” Because the door to outside was near the dog’s room, he was intermittently reinforced by being let into his room as well as being let outside after pressing the button. Thus, the owner noted that they were unclear if button pressing occurred as a mand for going to his room or for going outside. Second, the targets were arbitrarily chosen. FCT typically focuses on teaching an individual to mand to gain access to a stimulus (e.g., attention, a tangible item) or to remove a stimulus (e.g., a non-preferred item or activity), rather than engaging in the problem behavior to obtain those needs. Thus, to teach mands effectively, motivating operations (MOs) must be considered. MOs temporarily alter the value of a stimulus change and alter behavior to obtain that stimulus change (Cooper et al., 2020). For example, food ingestion may be considered an MO that temporarily decreases the value of food and decreases food-seeking behaviors whereas food deprivation may increase the value of food and increase behavior that has resulted in food in the past (Cooper et al., 2020; O'Rreilly et al., 2012; Skinner, 1957). Thus, ensuring that the appropriate MOs are in place prior to teaching mands is essential for the consequence to serve as an effective reinforcer following the mand. For example, one would not expect receiving food to be an effective reinforcer for asking for food if an MO for food was not present. Although previous studies have shown promising results and although numerous training packages have been sold online related to communication buttons, there is little, if any, peer-reviewed research that exists on this topic and it is unclear if MOs are being manipulated and controlled. Third, the consequences provided to the dog when he pushed the button varied and was always paired with the owner either giving treats, toys, or praise. Thus, it was unclear if the dog was pressing the button to access mand-specific reinforcement or to access owner attention or other unrelated consequences.

Given the number of dogs relinquished to animal shelters and euthanized each year, more research is needed to provide accessible interventions for owners and trainers to reduce problem behavior. Thus, the purpose of the current study was to examine the use of FCT to teach a dog to communicate via voice recorded buttons. Problem behaviors targeted for reduction included whining, mouthing, and pawing.

2.0 Method

2.1 Participant

One 11-month-old male Labrador retriever, Oswald, participated in the current study. All procedures took place within the primary investigator’s home in which the dog resided. After consulting with the University, it was determined that Institutional Animal Care and Use Committee (IACUC) approval was not required due to the animal being privately owned, and the study not being federally-funded.

2.2 Apparatus and Materials

The primary investigator used four communication buttons (see Figure 1) in which she recorded herself stating, “outside,” “play,” “rub,” and “food” (one word per button). After the words were recorded, the buttons could be activated by depressing each button (without having to hold the button down longer than 1 s). Because previous research has shown that dogs discriminate between shades of blues and yellows, the buttons were painted to accommodate this (Llera & Buzhardt, n.d.). To further facilitate discrimination between the buttons for the primary investigator, the corresponding word was written on each button. A phone application (see Figure 2) was used to record the frequency of problem behaviors as well as independent and prompted mands. Because the application was unable to save the data collected after a session, the primary investigator transferred the data to data sheets at the end of the session.

Data were recorded on the prompt level used, the number of prompted and independent mands, the percentage of independence for mands (i.e., button pressing), correspondence between behavior and the button pressed (e.g., after pressing the play button, Oswald engaging in play with the owner rather than engaging in problem behavior such as whining by the front door to be let outside), the location of the button, if problem behavior occurred during prompting, and the frequency of problem behavior. Additionally, end of session descriptive notes was used to track any extenuating circumstances that could have affected Oswald's behavior (e.g., illness). Example data sheets and end of session notes are available upon request.

2.3 Pre-Experimental Conditions

An interview was conducted with Oswald's co-owner to gather information on the frequency and severity of Oswald's problem behaviors and the circumstances under which they normally occurred (e.g., Fisher et al., 2021). This was to ensure that socially significant behaviors were chosen for reduction, to aid in the operational definitions of behavior, and to determine collateral behavior that reliably occurred with known MOs (interview responses available upon request).

Additionally, to minimize reactivity to the buttons and the increased presence of the primary investigator prior to the start of baseline, the primary investigator placed each button in the location in which publicly observable behaviors reliably occurred with known or assumed MOs. For example, the outside button was located near the front door based on a history in which Oswald commonly exhibited observable behaviors such as standing by or sitting in front of the door after a period of time in which the owner was at work and outside was inaccessible. After the buttons were placed in their designated locations for a period of 1 day, the baseline condition began.

2.4 Dependent Variables and Response Definitions

The primary dependent variables were the frequency of problem behaviors and the percentage of independence for button pressing. Problem behaviors included whining, mouthing, and pawing. Whining was defined as Oswald emitting long and high-pitched vocal sounds that occurred at a lower intensity and volume than barking. Mouthing was defined as Oswald using his tongue in a back-and-forth motion on a person's hand repeatedly or putting his open mouth on a person’s hand with his teeth contacting their skin. Pawing was defined as Oswald’s nails or pads of the foot contacting a person's skin in a back-and-forth motion. A prompted mand was defined as the investigator guiding Oswald to depress the button with either a full physical prompt, a partial physical prompt, a gestural prompt, or a positional prompt. Full physical prompting included the primary investigator holding Oswald’s paw and guiding him to depress the button. Partial physical prompting included the primary investigator touching Oswald’s elbow to guide him to depress the button. Positional prompting included the primary investigator placing the button, from its original location, 1 ft (30.48 cm) in front of Oswald. Gestural prompting included the primary investigator putting their finger to the button. An independent mand was defined as Oswald depressing the button in the absence of prompts. The frequency of each problem behavior was measured using a noiseless phone application.

2.5 Experimental Design

A multiple baseline design across behavior was used for this study. This design allowed for the demonstration that decreases in problem behavior and acquisition of button pressing did not occur until intervention was implemented for each button. The primary investigator ordered the introduction of the intervention for each button to minimize the likelihood that a carryover effect would occur. Because the toy and rub conditions both involved the button moving based on the location of Oswald and the primary investigator, these conditions were separated by the outside and food conditions, which were in distinct and consistent locations.

2.6 Interobserver Agreement (IOA) and Treatment Integrity (TI)

Interobserver agreement (IOA) and treatment integrity (TI) data were collected by Oswald's co-owner. IOA and TI were each collected for 32% of sessions. To calculate IOA, the observer collected data on the frequency of problem behaviors simultaneously but independently from the primary investigator. The observer also collected data on the frequency of independent and prompted mands. Trial-by-trial IOA was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 to obtain a percentage. TI data were collected using a checklist to record if procedures were implemented correctly (checklist available upon request). TI was calculated by dividing the number of correctly implemented steps by the total number of steps and multiplying by 100 to obtain a percentage. IOA averaged 96.8% (range, 94-100%) and TI was 100%.

2.7 General Procedure

This study included a baseline condition followed by intervention in which button pressing for outside, play, food, and rub was targeted. During intervention, each button was targeted (i.e., opportunities were contrived) for a minimum of 10 trials per day with the exception of the outside button, as there were a varying and limited number of trial opportunities in which Oswald needed to go outside to use the bathroom throughout the day. At the onset of each trial, the primary investigator contrived an MO corresponding to the specific button (see individual intervention phases below for more information), probed for independence, and then provided a prompt at a 0 s delay, in which mand-specific reinforcement was immediately delivered. Trials continued until either 10 trials were recorded for that specific button or until behaviors associated with satiation were demonstrated (e.g., walking away from food dish or investigator). The order of training targets varied across each day (e.g., six trials in a row contrived for the food button followed by Oswald walking away from the food bowl, followed by three trials in a row contrived for the rub button, etc.)

Most to least prompting procedures were used (i.e., full physical faded to partial physical faded to positional faded to gestural faded to independence) to teach Oswald to depress the buttons. All prompting was administered in the absence of eye contact and all other interaction from the primary investigator. Errorless teaching was introduced during the first week of intervention by using full physical prompting. If Oswald completed the targeted prompt level for three consecutive days with 100% accuracy in the absence of problem behavior, the primary investigator then introduced the next prompt level. The first trial of each session was probed for independence and the remainder of the trials were completed at the targeted prompt level. If Oswald engaged in problem behavior outside of when trials were contrived (e.g., if Oswald began pawing at the primary investigator while seated on the couch in the absence of a trial being contrived), or during prompting procedures, the primary investigator waited until problem behavior ceased for 10 s and then initiated a trial at the current prompt level.

2.8 Experimental Conditions

2.8.1 Baseline

During baseline, each button was present in the locations described above, but no prompts were delivered by the primary investigator to interact with the button. The purpose of this condition was to demonstrate that the presence of the buttons alone would not result in a change in problem behavior or in the acquisition of button pressing. If Oswald pressed the button or engaged in problem behavior during baseline, no differential consequences occurred.

2.8.2 Intervention

2.8.2.1 Rub Condition. To contrive an MO for rub, the primary investigator pet Oswald for 1 min and then withdrew all interaction from Oswald and waited 10 s to probe for independence with button pressing. The investigator then immediately initiated the second trial by delivering the corresponding prompt level at a 0 s delay and then delivering mand-specific reinforcement in the form of petting for 30 s.

2.8.2.2 Outside Condition. When Oswald engaged in collateral behavior that reliably occurred with known MOs (i.e., sitting by the front door), the primary investigator initiated a trial by providing the targeted prompt level at a 0 s delay for Oswald to depress the button and then provided mand-specific reinforcement by letting him outside.

2.8.2.3 Play Condition. To contrive an MO during the play condition, the primary investigator engaged in play with Oswald, using one of his dog toys, for 1 min and then withdrew all interaction and waited 10 s to probe for independence with button pressing. The primary investigator then immediately initiated the next trial by providing the corresponding prompt level at a 0 s delay. Once button pressing occurred, mand-specific reinforcement was delivered in the form of play with the primary investigator for 1 min.

2.8.2.4 Food Condition. The primary investigator contrived an MO during the food condition during times in which Oswald was normally fed. The primary investigator began a trial by waiting 10 s to probe for independence for button pressing. The investigator then immediately initiated the second trial in which the corresponding prompt level was delivered at a 0 s delay and mand-specific reinforcement was delivered, which consisted of the primary investigator pouring one cup of food into his bowl (which was 25% less than his normal food amount). Once Oswald ate the food given, the next trial began.

3.0 Results

Figure 3 shows the frequency of problem behaviors and the percentage of independent button pressing. During baseline, independent button pressing occurred at 0% across all sessions and conditions. During baseline for the rub condition, the frequency of problem behavior was 94. Following intervention, the percentage of independent button pressing averaged 59.3% (range, 26-88%) for the rub button and the frequency of problem behaviors averaged 35.6 (range, 21-90). During baseline for the food condition, the frequency of problem behaviors averaged 86 (range, 74-94). After intervention, the percentage of independent button pressing averaged 61.3% (range, 22-88%) for the rub and food buttons combined and the frequency of problem behaviors averaged 32 (range, 21-57). During baseline for the play condition, the frequency of problem behaviors averaged 67.6 (range, 34-94). After intervention, the percentage of independent button pressing averaged 62.9% (range, 22-88%) for the rub, food, and play buttons combined and the frequency of problem behaviors averaged 31.4 (range, 21-57). During baseline for the outside condition, the frequency of problem behaviors averaged 64.1 (range, 34-94). Following intervention, the percentage of independent button pressing averaged 66% (range, 29-88%) for the rub, food, play, and outside buttons combined and the frequency of problem behaviors averaged 29.2 (range, 21-42).

Figure 4 depicts the frequency of prompted and independent mands (i.e., button presses) across conditions. During baseline, zero independent and prompted mands occurred across all sessions. Following intervention, the frequency of prompted mands averaged 22 (range, 7-50) and the frequency of independent mands averaged 33 (range, 6-55).

4.0 Discussion

The purpose of the current study was to examine the use of FCT to reduce problem behavior for one dog via voice-recorded buttons. The results demonstrated an increase in independent button pressing following intervention as well as a reduction in problem behavior. Reducing problem behaviors with dogs, such as excessive barking, pawing, or whining, among others, is an important area of research given the number of dogs relinquished and euthanized each year due to these issues. These results are promising and extend previous research which has demonstrated the effectiveness of FCT to reduce problem behavior in human populations. Although training packages involving communication buttons seem to be an increasing trend on social media, it is unclear how the training targets are selected and if the trainers are incorporating known MOs for the individual buttons. Thus, the current study appears to be the first to incorporate MOs within training for communication buttons.

Although these results are encouraging, there are several limitations that require further attention. First, as Oswald began to use the rub button independently, his problem behaviors began to decrease across all conditions, while the play, food, and outside buttons were still in the baseline phase. This suggests that independence for pressing one button may have impacted problem behavior associated with multiple MOs, however this requires future research. Further, although there appeared to be a decrease in problem behavior overall following the introduction of the rub button (impacting the experimental control of the study), acquisition in button pressing did not occur for the other buttons until the intervention was introduced, which increases the level of experimental control.

Second, it is unclear if Oswald discriminated between the buttons due to the locations that the buttons were placed. Because two of the buttons were in specific areas of the home and the others followed the dog, the buttons typically did not appear within close proximity to one another. Thus, it cannot be determined if Oswald would demonstrate the same independence with button pressing and display behavior corresponding to the button pressed (e.g., eating the food given to him following a button press for food), if the buttons were placed next to each other. However, the primary investigator noted one occurrence in which an MO for play was demonstrated via collateral behavior in the same location that the food button was normally located, resulting in the play and food buttons appearing next to one another. Oswald was observed to first approach the food button, stop, and then instead approach the play button in which he pressed the button and received play. This showed that although discrimination was not specifically programmed for, Oswald distinguished between the two buttons in this scenario. Future research should program and test for discrimination by placing the buttons next to one another across various locations. It is also important to note that Oswald engaged in button pressing when the primary investigator was present, indicating that the presence of the owner may have served as a positive audience for button pressing, given their correlation with the availability of reinforcement (Miguel, 2017; Skinner, 1957). Future research should examine if training can incorporate traveling to the owner to first gain their attention when the owner is in the other room before pressing the button (e.g., Charlop-Christy et al., 2002).

Third, the training targets were based on MOs known to be present via publicly observable behaviors and the primary investigator did not conduct an FA to confirm functions of problem behavior prior to selecting the targets as replacement behaviors. It should be noted that Oswald received mand-specific reinforcement and no other differential consequences were provided contingent on button pressing. Thus, it is unlikely that the observed increases in independent button pressing would have occurred if the consequence did not function as reinforcement. However, although mand-specific reinforcement resulted in an increase in independent button pressing, it cannot be determined if the targets selected were functionally equivalent to the problem behaviors targeted for reduction. Future research should first confirm functions of problem behavior prior to selecting replacement behaviors to teach within FCT. Further, the use of preference assessments may help to determine varying preference levels corresponding to different MOs (e.g., if there is an MO present for food, determining which type of food is highest preferred; e.g., Vicars et al., 2014).

Fourth, the percentage of independence with button pressing was calculated by dividing the number of total independent trials across all buttons each day by the total number trials. Thus, individual percentages of independence for each button were not reported. Future research should calculate and present individual percentages for each button trained. Finally, the results are limited in that the current study only included one participant and it is unclear if results would differ when replicated with other dogs of the same age and breed and with other breeds. Future research should incorporate a variety of participants. Additionally, maintenance and generalization data were not collected. Thus, it is unclear the extent that button pressing and reductions in problem behavior would maintain across time and generalize across situations.

The results of the current study provide preliminary evidence that using communication buttons within FCT may be an effective and efficient way to reduce problem behavior for dogs. Shelters, foster homes, support animals (Trainer, 2016), and animal owners may be able to implement these procedures to decrease the number of animals relinquished and euthanized each year as well as increase adoption rates.

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