SHAPING COWS' APPROACH TO HUMANS USING NEGATIVE AND POSITIVE REINFORCEMENT

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Negative reinforcement can be a powerful tool for behavior analysts, yet it is often overlooked as a treatment method. Pryor (1999) outlines a method for approaching a "timid" animal using a combination of negative reinforcement and positive reinforcement. When the animal stands still, the human operates a clicker, and then retreats from the animal. Gradually, the human moves closer to the animal through the clicking and retreating shaping process. Once the human is standing close enough, food may be offered as a positive reinforcer, and the negative reinforcer is canceled out. The purpose of this study was to experimentally demonstrate the click-retreat technique with cows. A multiple-baseline design across subjects was used to test this technique. Results show that the click and retreat technique was effective. Results are discussed in terms of the difference between the click-retreat technique and systematic desensitization

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INTRODUCTION

Behavior analysts and psychologists have long been interested in the treatment of phobias, fears, and anxiety-related disorders. Numerous treatment protocols have been developed to treat many different phobias such as "fear of heights, driving, a variety of animals, insects, classroom examinations, flying, water, going to school, rejection by another, authority figures, injections, crowds, physical injury, and even fear of death" (Rimm & Masters, 1979, p.42). Treatment options for clients with these phobias are varied across disciplines, and research has established the effectiveness of each – either stand-alone or as a component in a treatment package. However, it is unclear what treatment is more appropriate for a given problem. Sturgis and Scott (1984) express this concern by saying "Treatment continues to be administered in a haphazard manner with few attempts to match the treatment with the specific symptoms of the client. Furthermore, there has been no specification of which treatment elements are most appropriate for particular types of simple phobias" (p.92).

Two of the most popular and most researched approaches to treating phobias are systematic desensitization and *in vivo* (or contact) desensitization. Systematic desensitization is a three-step process first introduced by Joseph Wolpe (1958). The first step is relaxation training. Many forms of relaxation are used, however, progressive muscle relaxation is a popular choice that requires the client to first tense a muscle group, then relax it before moving on to the next muscle group (Miltenberger, 1997). The goal is to teach the client to discriminate between tensed and relaxed muscles so they are able to relax quickly when anxiety-provoking stimuli are present (Marks, 1969). The second step in systematic desensitization is the development of a hierarchy of events, situations, or scenes that elicit phobic responses. These scenes are ranked by the client in order from least to most anxiety-provoking using a scale called subjective units of discomfort

(SUDS). SUDS is a 0-100 scale depicting how much anxiety a stimulus elicits for the client (Martin & Pear, 1996). The final step of systematic desensitization involves exposing the client to scenes in the hierarchy while promoting relaxation. The therapist starts by introducing a scene that evokes little anxiety. Once the client can imagine that scene while staying relaxed without anxiety, the therapist introduces the next scene in the hierarchy (Marks, 1969).

In vivo or contact desensitization is similar to systematic desensitization. The difference is that the hierarchy is defined so that it can be presented in real-life rather than through imagery. Because much of the literature discusses the two procedures interchangeably, they are discussed simultaneously here, while making distinctions between the two, and further, describing the limitations of each.

An example of *in vivo* desensitization combined with modeling can be seen with the case presented by Newman and Adams (2004). In this case, a 17-year-old boy with a learning disability was treated for his phobia of dogs. His phobic reactions sometimes caused him to break free from his parents and run away, often into a busy road. Newman and Adams used a combined treatment package of *in vivo* desensitization and modeling to treat the boy's dog phobia. The mother was the model, simply showing the boy appropriate behaviors in the presence of a dog during the course of treatment. Their first step was to teach the boy deep relaxation that consisted of "a self-monitored breathing exercise (counting slow deep breaths), controlled vocalizations (remaining quiet or silent), controlled gaze (focusing on his mother instead of watching the dogs), and controlled movement (standing still)" (p.36). The hierarchy of exposure to dogs started with the dog being introduced on the other side of a window. Second, the boy stood in a doorway, while the leashed dog was outside. Next, the dog was brought into the boy's personal space, followed by contact with the dog – petting then walking alongside.

Finally, the dog was introduced at a park. All steps were repeated for a new dog. Each stage required 1-8 sessions for 26 sessions totaling over 980 minutes to complete. After 18 months, the authors were called again to repeat the treatment, this time using unleashed dogs. The parents reported that the previous treatment was still successful for the boy when faced with a leashed dog.

According to Wolpe (1958), systematic desensitization works to treat the client with a phobia by a process he called reciprocal inhibition where one response is inhibited by the presence of another, competing response (i.e., the anxiety response is inhibited by a relaxed body). Reciprocal inhibition is also referred to in the literature as counterconditioning, deconditioning, relearning, habituation, and desensitization (see Marks, 1969, p.184).

Another theory of how systematic desensitization works is posed by Williams and Chambless (1994). They state that systematic desensitization more likely works by "(a) enhancing imagery, enabling the client to process anxious stimuli more completely, and (b) reducing arousal to allow more rapid habituation" (p367). Rimm and Masters (1979) discuss a similar view in that desensitization is a coping mechanism whereby the client learns to cope with the anxiety. By learning to cope with anxiety, the client is better able to generalize the technique to other situations.

However, there is no supported research suggesting that one response (relaxation) takes the place of the other (anxiety). Marks (1969) notes:

> After successful treatment, patients rarely state that when they think of phobic images they experience relaxation instead of tension. That repeated exposure to phobic images alone is not enough suggests that extinction or habituation is only one aspect of the

mechanism of improvement. That verbal reinforcement significantly improves the results argues that operant conditioning plays an important part in the method. (p.203)

Clearly, reinforcement is present in these therapies. As a client moves through the hierarchy, the therapist provides approval and praise for continued improvement (Erfanian & Miltenberger, 1990; Luscre & Center, 1996; Marks; Martin & Pear, 1996; Miltenberger, 1997; Sturgis & Scott, 1984). Additionally, an expectation of improvement is apparent from the beginning of treatment (Marks).

Like Marks (1969), other researchers suggest that both respondent and operant conditioning are at work. For example, Martin and Pear (1996) state that Wolpian theory "capitalized on both operant conditioning as described by Skinner and respondent conditioning as described by Pavlov, meshed together in a theory that did not distinguish between the two types of conditioning" (p.387). Similarly, Miltenberger (1997) states that both operant and respondent behaviors are involved in phobia disorders. When an organism is afraid of a stimulus or situation, the individual exhibits respondent behaviors – autonomic nervous system arousal (i.e., rapid heart rate, sweating hands, muscle tension, etc.) – and operant behaviors – escape or avoidance. In behavioral terms, reciprocal inhibition can be viewed as respondent counterconditioning – a conditioned stimulus loses the ability to elicit a conditioned response when that conditioned stimulus is paired with a stimulus that elicits an incompatible response (Martin & Pear) – and combined with operant conditioning, positive reinforcement for continuing to make progress toward the feared stimulus.

Regardless of the exact mechanisms behind it, systematic desensitization has proved successful in treating clients with phobias. It does, however, have a number of limitations. First, it takes a long time (Conyers et al. 2004; Marks, 1969; Rye & Ullman, 2004). Relaxation training

alone can take up to six sessions for the client to be fully competent at putting his or her body into a relaxed state (Marks, 1969). Relaxation can induce sleepiness, poor concentration, and fear of losing control, which are all counterproductive to the desensitization stage.

Development and progression of the hierarchy is dependent on the complexity of the phobia, but can also take a long time. In addition, there is the problem of developing false, misleading, irrelevant, or fluctuating hierarchies. Further, not everyone can visualize images mentally, evoke emotional responses from imagery, or generalize from imagination to real-life situations. Sometimes a client may imagine a less intense image, or even intensify the image (Marks, 1969).

In vivo desensitization can help remedy these problems because the client's hierarchy of anxiety-provoking scenarios is experienced in real-life. While *in vivo* desensitization conquers the previous limitations of systematic desensitization, it too, has limitations. It can be costly. Treating someone for a fear of flying could add up quickly with the need to book several flights. Second, real-life situations may be difficult to control. For example, a person with social-anxiety needs the exposing environment to be very controlled so that the situation does not advance too quickly, or encountered too early. In addition, a client may refuse to cooperate due to anticipatory anxiety (Goodwin, 1983).

Problems with systematic desensitization have led researchers to continue looking for procedures that are more efficient. Some have more confidence in operant conditioning for treatment. Marks (1969) argued that operant conditioning techniques might prove superior to systematic desensitization, because "they would offer hope of cutting down the time spent by doctors and psychologists in treatment, since nurses [and others – friends, family, co-workers, etc.] can be easily trained to praise patients" (p.244). Reinforced practice is one operant

technique that can be used to treat phobia and anxiety-related disorders (Goodwin, 1983; Sturgis & Scott, 1984). Reinforced practice is a "…procedure involving the graded approach of a client toward the public object/situation with instructions to turn back whenever he or she experiences too much anxiety or discomfort" (Sturgis & Scott, p.126).

An example of reinforced practice is outlined with an anecdotal example from an agility dog training class. Agility is a dog sport in which a handler navigates a dog through a course of jumps, weave poles, tunnels, and other obstacles. In this case, the dog, who had previously navigated the dog-walk (see Figure 1) without difficulty, was jumping off and avoiding the obstacle during the class. The dog-walk is a narrow plank that looks like a tall bridge. The 12-ft upside carries the dog 4-ft from the ground, and then a 12-ft plank leads the dog over to the 12-ft downside. The dog was avoiding and jumping off the dog-walk and eventually would not even put a single foot on the upside plank so the handler began treating the dog for approximations to climbing the upside. The dog would get several treats for slight movements up the dog-walk. Eventually she would jump off the obstacle before completing it, and would start the process again. The handler would reinforce approximations of moving up the dog-walk.

Another promising operant process not discussed much in the treatment of phobia and anxiety-related disorders is negative reinforcement. Negative reinforcement is included as part of a treatment package in this study and may prove to have applications in the treatment of phobia and anxiety-related disorders. The individual is permitted to escape in the presence of the fearsome stimuli before overt signs of anxiety or fear reactions are present, thus, negatively reinforcing calmer behavior. Approximations toward the stimuli are made. Pryor (1999) introduced this technique to treat llamas with fear of human contact:

> Using the click to mark the behavior of standing still, with the scary person turning and going away again as the reinforcer, one can sometimes get within touching distance in five or ten minutes. The llama, as it were, is in control. As long as it stands still, it can make you go away! So it stands still, even when the person is right next to it. (p.6)

The principle of negative reinforcement has been used by animal trainers when working with animals who avoid human contact. Sutor (2000) suggests when introducing a horse to new stimuli to use the "approach-and-retreat" method of training. She describes the process:

> The approach-and-retreat method works this way: you begin to walk toward the horse with an object that you'd like the horse to become accustomed to, or less scared of. Watch the horse's body posture very closely. The instant you think the horse may even be *thinking* of moving away, you immediately turn and walk away from the horse. Wait a few seconds (or until the horse has relaxed), then repeat. (p.4)

Anecdotally, a similar procedure has worked with dogs according to D. Spence (personal communication, June 2004), an agility dog-trainer, who recommends using a click-retreat method for working with dogs that avoid human contact. In this method, the trainer has bits of food ready and a clicker, a conditioned reinforced used to mark the desired behavior. When the dog makes any approximation to approaching the trainer, the trainer clicks, tosses a piece of food in front of the dog, and then takes a large step backward away from the dog. Once the dog finds and eats the piece of food, the process starts again. The dog eventually closes the gap while the trainer simultaneously shapes the dog's movements into a position closer to the trainer. Eventually, the dog is eating out of the trainer's hand, and even allowing a quick pet or two. The entire process generally takes less than 15 min. However, it does need to be repeated a number of times by multiple people to fully overcome the dog's avoidance of humans.

When reinforced practice was not effective in training the dog that would not cross the agility dog-walk, the instructor suggested negative reinforcement. The dog was walked to the plank, given a piece of food, and then briefly released to escape. On subsequent trials, the dog was required to climb a bit higher, given a piece of food, then allowed to escape. In only a few minutes, after 5-6 trials, the dog was successfully navigating the entire obstacle. Results maintained at the next class session.

Negative reinforcement in the form that Pryor (1999) discusses could be applied to humans in addition to positive reinforcement. For instance, the example of the boy who was afraid of dogs easily could be adapted to a combined negative and positive reinforcement treatment package. The boy would be prepared before the dog was presented by instructing him to raise his hand if he feels "afraid." When treatment begins, the dog would be placed on the other side of a window (e.g., maybe 20-ft away). The boy is led toward the dog. Before the boy raises his hand, he would be allowed to escape by leading him away from the sight of the dog. On the next trial, the dog is slightly closer. Gradually, the child is exposed to the dog at closer distances until he is able to tolerate the presence of the dog nearby all along while the therapist is providing feedback and praise.

Using a procedure employing negative reinforcement in addition to positive reinforcement as components in the treatment package to treat individuals with phobias and anxiety disorders eliminates some of the problems associated with systematic and *in vivo* desensitization: First, by omitting the step requiring that the client learn to relax reduces the time required to overcome the phobia and anxiety disorder. Second, development of the hierarchy of narrations is simplified. The therapist begins at a comfortable point for the client.

The purpose of this research is to study the effects of a treatment package including components based on negative and positive reinforcement on escape behavior in cows. Cows were chosen because unless they are hand-raised under close human contact, do not generally accept human contact, and show fear-related behaviors (e.g., running away, and increased breathing rates). Negative reinforcement occurs when the subjects escape from human contact. The experimenter retreats from the cow when the cow is still and does not show overt signs of fear-related behaviors (i.e., moving away). Eventually, positive reinforcement in the form of cow pellets is added to negative reinforcement for standing still. By the end, only positive reinforcement is allowed by the experimenter offering cow pellets to reinforce the cow's behavior of approaching the experimenter.

METHOD

Subjects

Three cows were used as subjects: Betsy, a 4-year-old Black Angus/Hereford mix, along with Debbie and Gerdy, both 5-year-old Black Angus cows. All were born on the farm where the experiment took place, and had little human contact since birth. Human exposure was limited to the daily dispersal of food (cow pellets and hay), and a one-time ear tagging in the first weeks of life. No human contact was forced after ear tagging. The entire herd (made up of 24 cows, 1 bull and a number of calves) followed the owner from the pasture to the feeding area when he carried a bucket with cow pellets, but would not allow or initiate contact. Each subject participated in the study on 1 day for 1-2 hours.

Setting and Materials

All sessions took place in a 16-ft square pen with wire and panel fencing (see Figure 2). Two sides were made of cow panels consisting of metal bars, and two of temporary fencing made with mesh wiring. The temporary fencing was affixed to T-posts for stabilization; however, each cow had the strength to push the fence over. The cow entered the pen through the removal of one side of the temporary fencing. The experimenter had access to a gate located on one of the metal panels of fencing in the event that a quick escape was necessary. The materials used for sessions were a clicker, and a bucket of cow pellets. Cow pellets are cylinders approximately 1 inch in diameter and 2-4 inches long. They are composed of compressed grains, molasses, vitamins, and minerals that are primarily used as supplemental feed to field grass and hay particularly for breeding cows and calves. A clicker is an instrument commonly used in animal clicker training as a conditioned reinforcer. It is a small plastic handheld box that emits a

click when the trigger is depressed. The clicker is used to mark the instant a desirable behavior occurs and is followed by a reinforcer – in this case, escape and/or the cow pellets.

Measurement and Data Collection

The behaviors defined for this study were *stay*, *move away*, *approach,* and *touch.* Stay was defined as the cow remaining in one position during the duration of a trial. The clicker was operated on a trial following a successful stay – this is referred to as a *click.* Move away was defined as movement of at least one front leg that resulted in body movement away from the experimenter. This excluded instances when the leg was picked up and stomped down in response to flies or when a forward positioned leg was moved in-line with the other leg. Approach was defined as movement of at least one front leg that resulted in body movement toward the experimenter. Touch was defined as physical contact between any part of the experimenter to any part of the cow. While any physical contact would have counted, the experimenter touched only the cow's nose or face during the study.

For each trial a stay or move away was recorded. Stays and move aways were mutually exclusive. Approaches and touches were recorded during and between trials. Thus, either a move-away or a stay could be scored during trials, whereas approaches and touches could be scored during and after trials. For a given trial, both a move away and an approach could be recorded. The cow could move away during the trial; then approach the experimenter before the next trial began.

Data were collected on-site using paper and pencil. An observer recorded data on stays, approaches, touches, and move aways. All sessions were videotaped to review later for interobserver agreement (IOA).Overall, IOA was 95% for Betsy, 93% for Debbie, and 91% for Gerdy. A second observer recorded the target behaviors by watching videotapes of the sessions.

For subject 1, Betsy, IOA was collected up to trial 159 (out of 181 total trials) in phase 6.2 as the video stopped at the end of the tape with neither the data collector or experimenter noting this problem. Subjects 2 and 3 had their sessions recorded in entirety and, therefore, IOA was calculated for the full sessions. Percent agreement was calculated by dividing the number of agreements by the number of agreements and disagreements and multiplying by 100.

Design

The experimental designs were a multiple baseline across subjects, with a changing criterion design. During baseline, cows were exposed to 20, 40, and 60 trials respectively. Because the experimenter was essentially shaping the behavior of each subject, none had a predetermined number of trials to complete for each phase with the exception of baseline. Each phase changed the criteria, and each criterion consisted of an approximation toward the goal of approaching the experimenter. A subject needed 5 consecutive successful trials to move on to the next phase.

General Method

Because of the herd size and unpredictability of the subjects, the study design was limited to using each subject for one day. There was no way to insure that a previous subject would enter the pen again before another cow, or that a subject would even come up from the pasture on subsequent training days. Participation in the study was determined by which cow entered the pen first. Cow pellets were thrown on the ground to lure the cow into the pen. Once the cow was in the pen, finished eating all the cow pellets, and was calm, the experimenter entered through the side gate and stood in the corner with a bucket of cow pellets. The experimenter began each trial in the same corner throughout all phases, and returned to this corner upon completion of each trial with the exception of condition 3 phase 7. On the initiation of each trial, the

experimenter waited until the cow was still then began to move toward the cow. The experiment consisted of baseline and 3 conditions divided into 7 phases described in more detail below (also see Table 1). With the exception of baseline, the number of trials in each phase depended on each cow's responses. Subjects remained in each treatment phase until they engaged in 5 consecutive successful trials. The criterion to return to the previous phase was 10 consecutive unsuccessful trials.

Baseline

Baseline began with the experimenter in the corner walking toward the cow until the cow moved away. The experimenter then immediately retreated from the cow back to the corner. Baseline was completed this way to demonstrate that the cow would not become habituated to the experimenter's repeated approach. Betsy was exposed to 20 trials of baseline, while Gerdy and Debbie were exposed to 40 and 60 trials of baseline, respectively.

Condition 1 (Phases 1-3)

The first treatment condition consisted of phases 1 through 3. This condition began with the experimenter walking from the corner toward the cow. If the cow moved away, the experimenter waited until the cow stopped moving before retreating to the corner to begin the next trial. If the remained in the same place, the experimenter clicked, and then immediately retreated to the corner.

During the first phase of condition 1, the experimenter took one step toward the cow, then clicked and retreated if the cow stayed. In phases 2 and 3, the experimenter took 2, and 3 steps, respectively, toward the cow, then clicked and retreated if the cow remained in place.

Condition 2 (Phases 4-6)

During the second condition, a cow pellet was introduced into treatment. In phase 4, when the cow stayed when the experimenter approached within 3-ft from the cow's head, the experimenter operated the clicker, tossed a pellet on the ground toward the cow, and then retreated. If the cow moved away, the experimenter waited until the cow was still before returning to the corner to start the next trial.

During Phase 5, the experimenter approached within approximately 3-ft from the cow as in phase 4, but waited 2 s holding a food pellet toward the cow before clicking, tossing a pellet, and retreating. During the pause, a pellet was held out to the cow in an effort to prompt the cow to eat from the experimenter's hand. After the 2-s interval elapsed, and the cow stayed, the experimenter tossed the pellet on the ground just below the cow. Again, if the cow moved away, the experimenter waited until the cow was still before returning to the corner.

In Phase 6, the experimenter waited 3 s before clicking, treating, and retreating. During the 3-s interval, the pellet was offered to the cow. If the cow stayed, the pellet was dropped after 3 s. If the cow moved away, the experimenter waited until movement ceased then retreated to the corner without clicking or treating.

Additional subphases (5.2, 5.3, and 6.2) were used with for Betsy, Subject 1, for two reasons: First, lack of a clear goal existed when the study began. Initially, the experimenter hoped to touch the cow on the head, neck, or shoulder for at least 2 s. In Phase 5.2, the experimenter held one hand toward the cow as if to touch the neck or shoulder. It was evident immediately that this was not going to be possible given subject availability for the study (each subject was worked with for 1-2 hours in 1 day). During Phase 6.2, the experimenter approached the cow within 3-ft and clicked, delivered a cow pellet, and retreated when Betsy made any

forward movement toward the experimenter. Second, Betsy began exhibiting chained behavior during trials consisting of 1 step forward, a half step back, head bob, foot lifted, then stayed. Attempts were made to extinguish the behavior chain. In Phase 5.3, the experimenter waited until the subject's head was upright and had ceased bobbing up and down. Effort was continued in subsequent phases to reinforce prior to the onset of head-bobbing while still requiring that the condition's contingencies were met.

Condition 3 (Phase 7)

During the final phase (7), the experimenter waited in one position 6-8 feet from the cow for the cow to approach. Movements toward the experimenter were clicked and followed by a cow pellet tossed toward the cow. Once the cow approached the experimenter within 3-ft, the experimenter changed positions and started the process again. This occurred 3-5 times/subject. A single follow-up phase for the first subject, Betsy, was conducted on a subsequent training day. The follow-up session was presented exactly the same as in Phase 7.

RESULTS

Graphs 3, 4, and 5 illustrate the cumulative responses by trial across each subject for stays, move aways, approaches, and touches by phase for each subject. The x-axis represents each trial, whereas the y-axis is the number of cumulative responses/phase with the count returning to zero at the beginning of each new phase or subphase. The red squares represent move aways, blue diamonds are for stays. Green triangles and yellow circles represent approaches and touches, respectively.

Graph 3 presents the cumulative responses for Betsy in each phase. During baseline Betsy moved away each of 20 trials. She also approached the experimenter three times in the first part baseline. Approaches from Betsy extinguished early in baseline. During the first condition (phases 1-3), Betsy completed phase 1 in 16 trials, moving away 7 times. Three approaches were scored in phase 1, each after a move away. Phase 2 was completed in 10 trials, with only 2 move aways during trials 4 and 5. There was one approach on the third trial. It took only 6 trials to complete phase 3. Betsy moved away only once on the first trial in phase 3.

During the second condition, Phases 4-6, cow pellets were used. Betsy was exposed to additional subphases 5.2, 5.3, and 6.2 as the treatment goals were refined for the project, and in an attempt to extinguish parts of the behavior chain she developed. In phase 5, she moved away 7 of 18 trials, 5 of which occurred consecutively on trials 2-6. She approached the experimenter twice – both times after a move away. During phase 5.2, she moved away 3 times during the first half of 13 trials. She did not approach in this phase. In phase 5.3, she moved away 4 of 13 trials, and finished the phase with an approach. Betsy completed phase 6 in 8 trials, only moving away once on the third trial, followed by an approach. During phase 6.2, when the approach requirement was added for Betsy, she moved away 17 of 43 trials. Approaches and stays overlap

(refer to the graph), and successful trials were noted throughout the phase. Move aways were scattered throughout Phase 6.1 as opposed to previous phases, when most of the move aways occurred at the beginning of the phase. Betsy also touched the experimenter 10 times consistently over the entire phase. In phase 7, the third condition, Betsy completed the phase moving away 4 of 18 trials. She touched the experimenter 5 times, again consistently, throughout the phase. Finally, in the follow-up phase, Betsy approached the experimenter each of 24 trials.

Graph 4 presents the cumulative responses for the second subject, Debbie. During baseline, Debbie moved away in each of 40 trials. She approached the experimenter 12 times, but only twice after the first 15 trials. Debbie successfully mastered the first condition without moving away at all. Phases 1-3 each had 5 trials, all successful stays with no approaches. In condition 2 phase 4, Debbie moved away 17 of 43 trials. These were scattered throughout the phase. She also approached the experimenter 13 times. Move aways often occurred following an approach. For example, there were approaches scored on 4 consecutive trials that were scored as move aways. In phase 5, Debbie moved away 9 of 20 trials. Again, she had consistent interchanges of stays and move aways along with 9 approaches. She approached the experimenter following each of the last 5 successful trials. Finally, for condition 2, in phase 6, she moved away 20 of 54 trials. Move aways were more frequent at the beginning of this phase; however, the rate decreased in the second half of the phase. Approaches were more frequent during the first half as well. She also approached 13 times in phase 6. In phase 7, condition 3, Debbie did not move away at all, and consistently approached the experimenter 15 of 20 trials interspersed throughout the phase.

The third subject, Gerdy, showed very similar results as Debbie. She completed baseline moving away on each trial. She approached the experimenter almost 20 times, 16 of which

occurred during the first half of baseline with the rate decreasing in the second half. She did not approach the experimenter at all in the final 9 trials. Gerdy cleared the first condition, phases 1-3, as did Debbie with no move aways or approaches. In condition 1, all 15 trials were successful. In the second condition, phase 4, Gerdy had 16 stays and 17 move aways. However, she also had 10 approaches and touched the experimenter 3 times. The touches occurred in the last half of the session, and were followed by move aways. She approached the experimenter on the last 3 successful trials. Similarly, in phase 5 she had 14 stays, 9 move aways, 12 approaches, and 1 touch. The touch was in the beginning of the phase. Stays, move aways, and approaches occurred throughout the phase at consistent rates. Phase 6 was completed in 5 successful trials, with 4 approaches and one touch. Finally, in condition 3 phase 7 when the retreat portion was dropped, Gerdy approached the experimenter 27 times, and touched the experimenter once.

DISCUSSION

This study successfully demonstrated Pryor's (1999) technique using negative and positive reinforcement to shape approach in cows as subjects. Each subject successfully and calmly approached the experimenter reliably by the end of the session that lasted between approximately 1-2 hours.

During baseline, each subject started with a number of approaches to the experimenter, albeit, many of the approaches were actually aimed toward the bucket of cow pellets. This was possibly due to their history of being fed the cow pellets from the bucket, and since they were lured into the pen with the bucket and cow pellets. These approaches gradually extinguished across baseline trials.

Over the course of baseline, the topography of each cow's move aways changed. Initially, the subject's move aways were very determined and dramatic. The cow would quickly move away from the approaching experimenter, sometimes spinning about, snorting, and pacing. Eventually, each subject settled into a slight, calm step away that was just enough to cause the experimenter to turn and retreat. Data were not collected on this phenomenon, but it indicates that an amount of desensitization or habituation to the experimenter was apparent in the initial exposure to the experimenter. Regardless, during baseline the subjects never allowed the experimenter to approach close enough to be within touching distance.

By the end of the experiment, 2 of the 3 subjects (Betsy and Gerdy) had allowed the experimenter to touch them. Betsy and Gerdy initiated all the experimenter's touches. The experimenter held her hand out toward the cow with a pellet in hand. The cow's nose or head would typically just briefly touch the hand of the experimenter. Debbie never allowed the experimenter to touch her. Further, after an instance when the cow pellet was tossed and hit her

on the nose, her rate of moving away increased, and thereafter, she was more hesitant in her approaches. This occurred in one of the first trials in Condition 2, Phase 4 when the cow pellets were introduced.

The results of this training technique demonstrate how quickly it can be applied and achieve results. The first subject, Betsy was exposed to 20 baseline trials, and 161 treatment trials over 1 hour and 45 min. Debbie, the second subject, was exposed to 40 baseline trials and 152 treatment trials covering 90 min. Finally, Gerdy, the third subject, was exposed to 60 baseline trials and 103 treatment trials over 50-min of training time.

Decrease in treatment time can be attributed to a number of factors. First, as the experimenter gained experience in shaping the cow's behavior across subjects, the overall treatment time decreased. It cannot be assumed that only the experimenter's increasing shaping expertise was the reason for the decreased training time. Exposure to the experimenter during baseline should also be considered. Each subject was exposed to more baseline trials than the previous subjects, thus, allowing for more desensitization or habituation to the experimenter and possibly leading to an overall decrease in treatment time and trials. Review of the videotape also showed more discussion between the experimenter and data taker during the first subject's session as the exact contingencies for each phase were planned. Less time was needed for subject 2, and even less for subject 3.

In some conditions (e.g. conditions 1 and 2 for Betsy and condition 2 for Debbie and Gerdy), move aways seem more frequent, and might look like the procedure appears to be ineffective. However, this is partly due to an artifact of the measurement procedure. Move aways and approaches were often recorded in the same trials. The experimenter began the trial by walking toward the subject. The subject moved away. The experimenter remained until the

subject finally stopped moving then returned to her corner. Returning to the corner terminated the trial; however, the subject would approach the experimenter readjusting her body orientation toward the experimenter before the next trial began, and this was counted as an approach for the previous trial. Another reason for the increased move aways after Phase 3 is that the experimenter began approaching closer, and staying in approximation to the cow for longer periods. Also occurring beginning in Phase 4 is the addition of positive reinforcement (i.e., the cow pellets). The transfer from a negative to a positive reinforcer may have affected the subjects' rates of moving away as acclimation to the new contingencies occurred. Additional research should be conducted to analyze the transfer from negative to a positive reinforcement.

Two questions remain unanswered by this study. First, whether improvement would maintain over time is unknown because only one follow up condition was examined with one subject (Betsy). However, it is suspected that after a few sessions during which the cow comes into contact with positive reinforcement for moving toward and standing near humans the behavior would maintain given that no aversive stimulation was experienced. The farm owner reported that for some time after her sessions, Betsy continued to follow him very closely; although when contact was attempted, she lunged backwards avoiding physical contact. This also hints that perhaps generalization would occur. However, the study did not address whether improvement would generalize across settings and humans. Would the subject show improvement in other settings such as in the field, or to other humans (e.g., a veterinarian)? These questions remain unaddressed due to the subjects' availability. Because the experimenter was unable to insure that the same subject would be available on subsequent training days, the study's design was created to work with each subject for only one day. The single exception was Betsy, who on a subsequent training day, was lured into the pen for a follow-up session. During

that training day, she laid waiting outside of the pen while Debbie was in training. On the final training day (Gerdy's session), Betsy did not come up from the field, highlighting the need to complete a subject on 1 day. Future research with animals should demonstrate how the treatment package generalizes across handlers and settings, and how much treatment is needed to produce long-term maintenance.

Both respondent and operant behavior occurred with the cows as Marks (1969) and Miltenberger (1997) suggest. Presence of the experimenter elicits many behaviors including escape. However, contingencies (i.e., removal of the stimulus such as the experimenter) can be modified to manipulate avoidance or escape behavior. The situation might be similar to imprinting. An imprinted stimulus is "a stimulus that, by virtue of the conditions of its presentation, has become effective as a reinforcer" (Catania, 1998, p.392). Peterson (1960) showed that for a duckling, the response contingent on viewing the imprinted stimulus could be manipulated. At one time, it was thought that the imprinted stimulus elicited following. However, Peterson showed that a competing response could be reinforced by the presentation of the imprinted stimulus, thereby manipulating the contingencies of access to the imprinted stimulus according to Catania. Phobias, too, derive from respondent conditioning. The avoidance behaviors resulting from exposure to a fearsome stimulus is part of the two-factor theory that states that "avoidance responses are operant reinforced by termination of conditioned aversive stimuli established through a respondent process" (Catania, p.415).

The distinction between using negative reinforcement and positive reinforcement as components in a package, and reinforced practice is slight, but very important. In reinforced practice, the client is praised for continued improvement toward approaching the stimulus, but is also allowed to stop and turn back if necessary – non-contingent on advancement. This could

create a chain of approximations to the stimulus followed by escape leading to little or slow improvement. The shaping process toward the stimulus could take a very long time. In the example of the dog that suddenly stopped crossing the dog-walk, reinforced practice was used over several class sessions to try to shape the dog's advancement toward crossing the entire obstacle. Gains were made, but the process was slow. However, making escape contingent on improvement helped considerably. Within 5-6 trials, the dog was completing the entire dog-walk without hesitation, and further, crossed the obstacle twice more before the class was over without the need for negative reinforcement or shaping. Improvements maintained to the next class session. These results should be interpreted cautiously, however, as they are only anecdotal, and not supported by data.

While this study may not help Sturgis and Scott's (1984) quest to identify "which treatment elements are most appropriate for particular types of simple phobias" (p.92), it does provide an additional procedure to be added to a comprehensive treatment package that is designed for the needs of an individual. This technique could be applied to humans with phobias or other anxiety-related disorders maintained by negative reinforcement. It is unknown whether or not it would be effective for attention-maintained phobias.

In comparison to systematic desensitization, using a treatment package including negative reinforcement is faster because it omits the relaxation-training phase and the development of a hierarchy of narrations is not needed. The subject never has to learn to relax in the presence of an anxiety-provoking stimulus, and the problems associated with systematic desensitization are avoided. In addition, difficulties in the development of hierarchies are avoided. The therapist need not worry if the client is being truthful when developing the hierarchy, or whether the client is visualizing the correct scene. The therapist begins at a level

that the client can easily manage without anxiety and increases the criterion gradually over time or trials allowing escape between trials. This is conducted all while the therapist is closely watching for overt signs of fear or anxiety. A signal from the client such as a raised hand can alert the therapist that exposure to the stimuli has gone too quickly, and then, the therapist can readjust the treatment. This, too, allows the client power to control the advancement so that it is neither too slow nor too fast. Furthermore, this technique lessens the intensity of the fear response, thereby making it much less aversive overall.

Further study is needed to apply negative reinforcement as a component in a treatment package for humans experiencing a variety of phobias and anxiety-related disorders. From these studies, modification of the technique could be analyzed specific to client and/or disorder needs in addition to the specific combination of other treatment options. Animal trainers have known for some time that the process of negative reinforcement can be a useful tool when working with fear-driven behavior of animals. It is time for behavior analysts and psychologists to start using this technology as well to treat clients without eliciting overt aversive emotions.

Condition	Phase	Criterion
Baseline	Baseline	Set trials – 20, 40, & 60
Condition 1	Phase 1	One step; Click & retreat
	Phase 2	Two steps; Click & retreat
	Phase 3	Three steps; Click & retreat
Condition 2	Phase 4	Within 3-ft; Click, deliver cow pellet, & retreat
	Phase 5	Within 3-ft for 2s; Click, deliver cow pellet & retreat
	Phase 6	Within 3-ft for 3s; Click, deliver cow pellet & retreat
Condition 3	Phase 7 & Follow-up	Wait for approach; Click & deliver cow pellet

Table 1

Conditions and Phases

Figure 1. Agility dog walk structure.

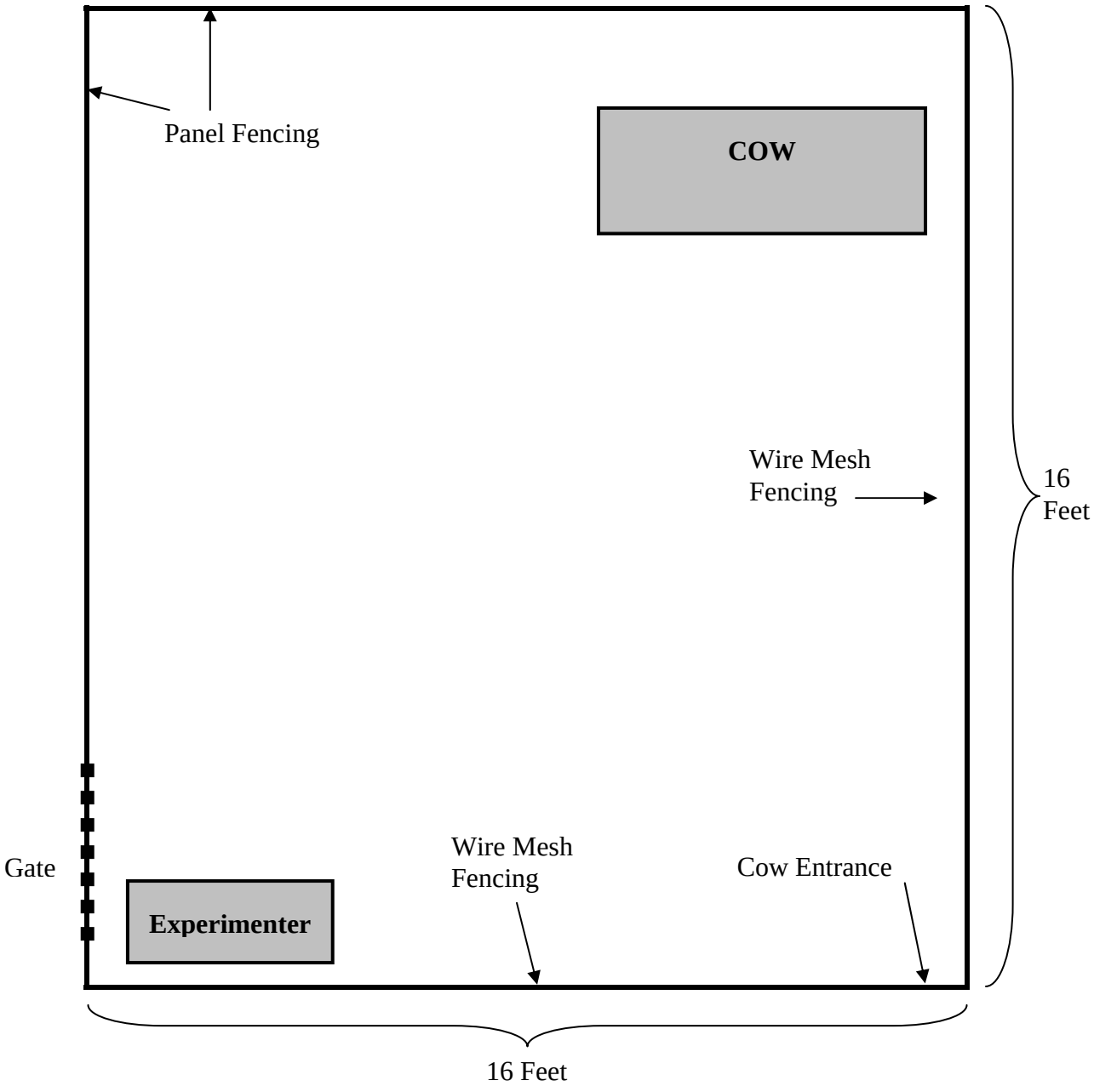

Figure 2. Training pen diagram.

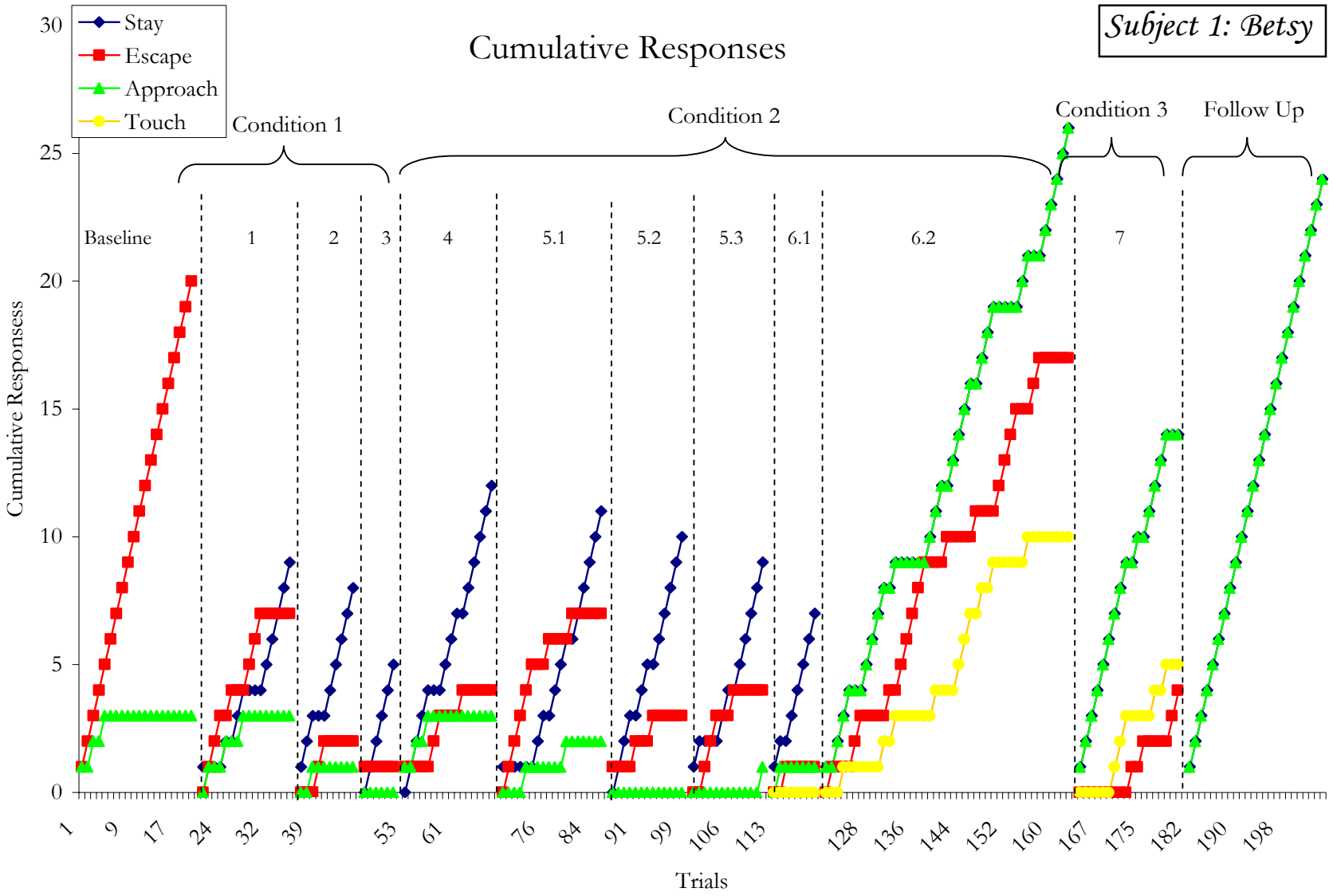

Figure 3. Graph of subject 1, Betsy.

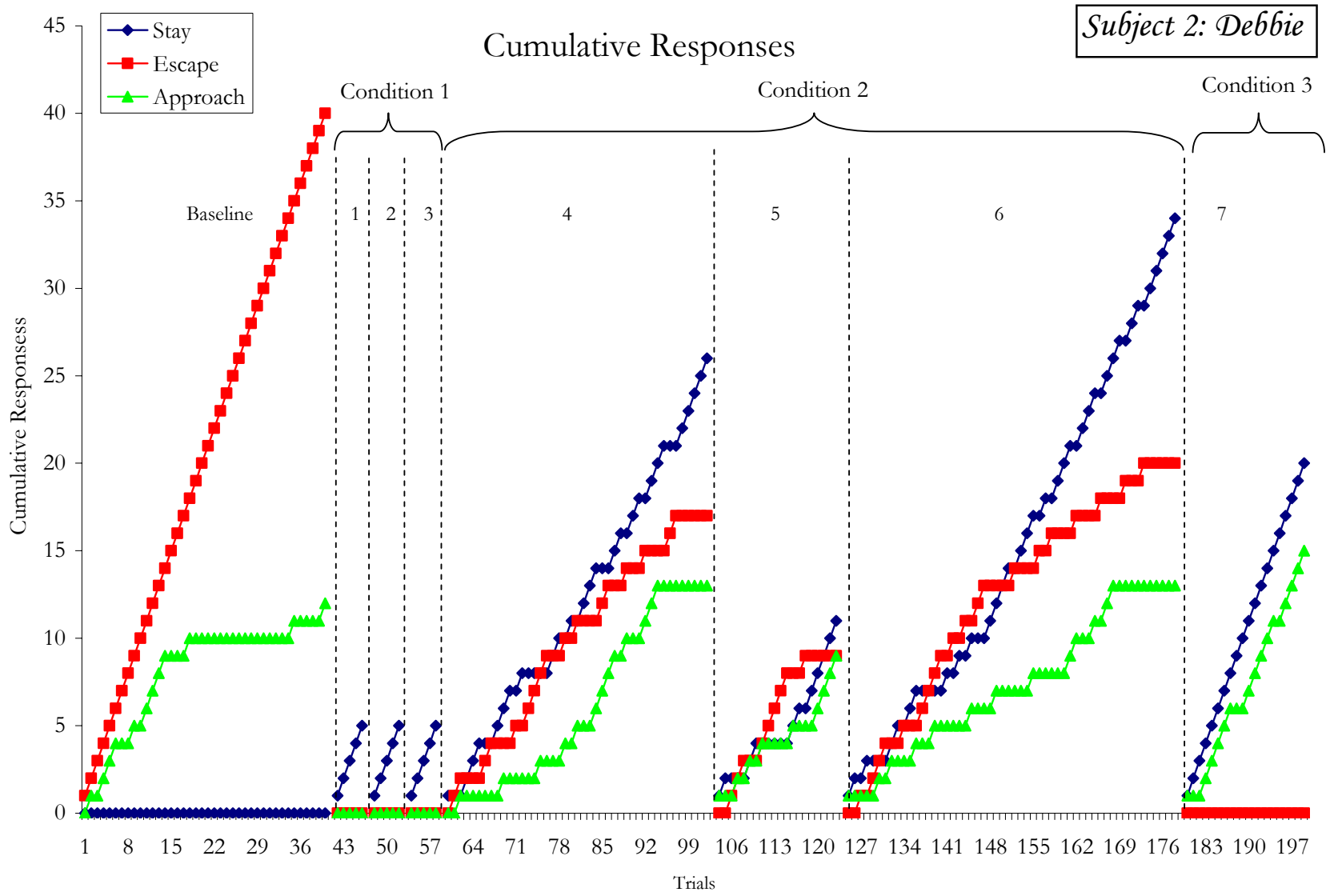

Figure 4. Graph of subject 2, Debbie.

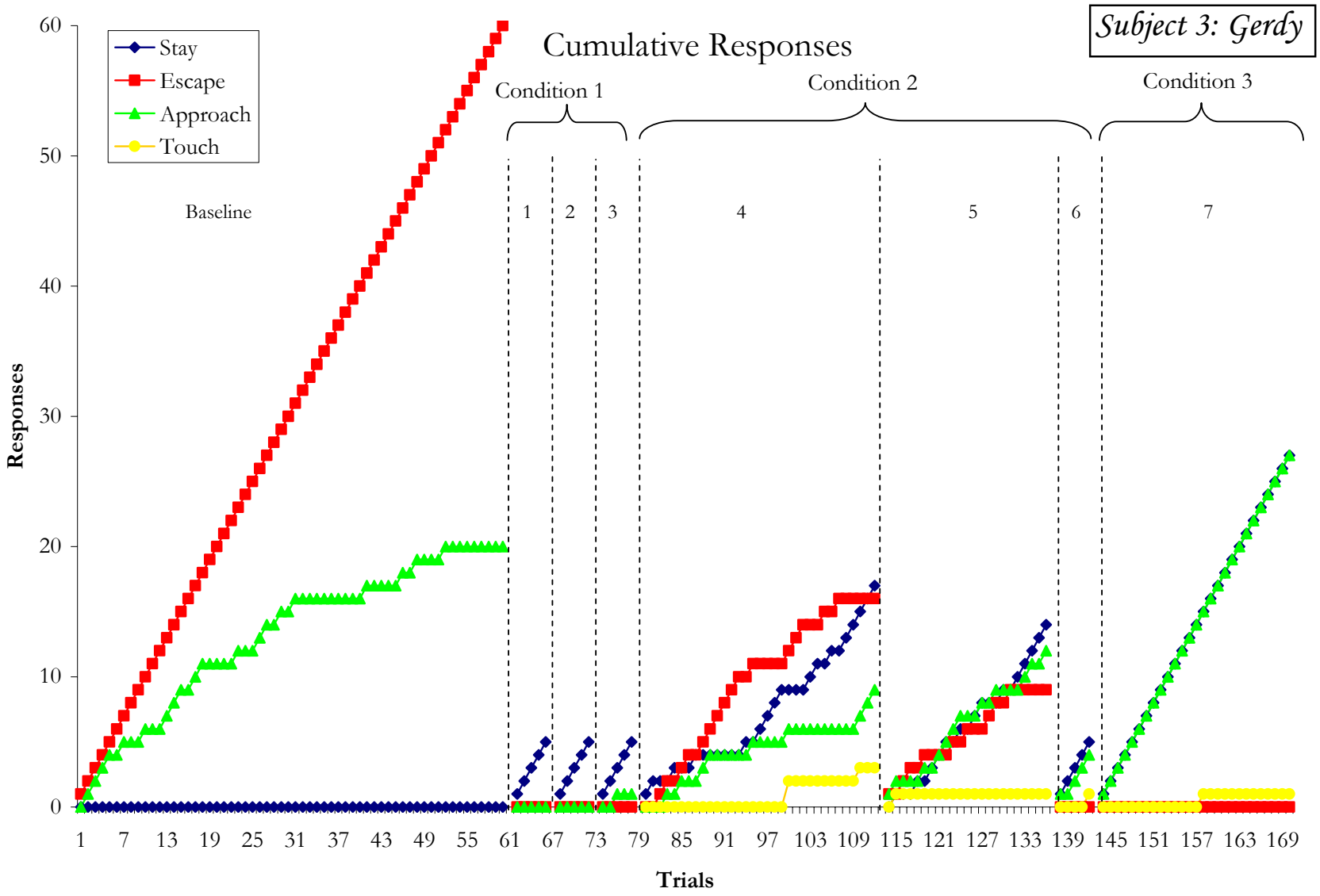

Figure 5. Graph of subject 3, Gerdy.

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