THE EFFECTS OF FEEDBACK AND PERFORMANCE OF THE SHAPEE ON THE SHAPER'S USE OF REINFORCEMENT

by

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B.A., University of Victoria, 1985

A THESIS SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Department

of

Psychology

ACCEPTED
FACULTY OF GRADUATE STUDIES
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DEAN
DATE April 18, 1988

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UNIVERSITY OF VICTORIA
January 1988

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Abstract

Research from a variety of settings suggests that people responsible for executing behavioral interventions ("trainers") often display a reluctance to apply systematic intervention contingencies. The present study found evidence for reluctance on the part of trainers to use positive reinforcement in a computer simulation of shaping. A 2 by 3 factorial design was used to study the effects of differential feedback and varying levels of deteriorating shapee performance on the shaping behavior of 200 undergraduate students. Reluctance to reinforce was found to vary depending on the feedback condition, and on the severity of deterioration received. Possible explanations for shaper reluctance to reinforce were explored, implications for applied training programs discussed, and ideas for future research proposed.

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ACKNOWLEDGEMENT

I would like to express my sincere thanks to Dr. Loren Acker for patiently shaping my academic behavior. His sometimes unusual behavior and radical philosophy made my graduate school experience enlightening and enjoyable. I would also like to thank Dr. Bram Goldwater whose assistance went far beyond the call of duty for a committee member. His incredibly organized and logical thought process was invaluable throughout both the research and writing of this thesis.

My gratitude also extends to Dr. R. May for his statistical advice, Dr. G. Hett for his help and encouragement as a committee member, and Dr. J. Parsons for his insights into behavioral psychology and for providing me with a variety of academic experiences.

Finally, I would like to express my deepest appreciation to my family and friends whose love and support contributed to my academic success more than they know.

Introduction

Investigations into behavioral intervention programs almost invariably focus on the effects of the therapist or trainer on the client or trainee. Although this focus is appropriate--the goal of behavioral intervention is the modification of the client's behavior--the most essential ingredient for successful intervention is appropriate therapist/trainer responding (Tharp and Wetzel, 1969).

In a typical applied setting a supervisor, consulting psychologist, experimental psychologist, or some other professional (hereafter referred to as the "supervisor") attempts to train parents, teachers, nurses, prison guards, research assistants, or some other mediator (hereafter referred to as the "trainer") in behavior modification principles so that he or she can then attempt modification of the behavior of a child, student, patient, inmate, etc. (hereafter referred to as the "trainee") (Acker, 1980). Successful intervention depends on all three components--supervisor, trainer, and trainee. However, since it is the trainer who is responsible for executing the behavioral intervention,

the efficacy of the program often depends on his or her performance. In Tharp and Wetzel's (1969) words, "...behavior modification in the natural environment stands or falls on the effectiveness of the behavior of the mediator" (p. 51). Thus, training and maintenance of trainer skills is an issue of considerable importance, and one that surprisingly has been paid little empirical attention.

There exists a very basic phenomenon related to trainer behavior which is recognized by supervisors and applied researchers, but which lacks the benefit of extensive empirical support. This phenomenon is best described as a low frequency of engaging in appropriate intervention behaviors. Nurses, teachers, aides, and parents often require the establishment of special contingencies to initiate and maintain such intervention behavior. For example, Pommer and Streedbeck (1974) found that instructions alone were insufficient to maintain staff behavior (including both the maintenance of the residence in which the staff worked and engaging in pre-established behavioral programs relating to the care of the children living there). Only when contingent monetary rewards were introduced did the staff's performance improve and stay improved. In a similar vein, Pomerleau, Bobrove, and Smith (1973) investigated the effects of rewarding psychiatric aides for the

behavioral improvement of their patients. The aides worked in an institution in which a token economy was established for the purpose of increasing social interaction among patients and reducing the frequency of maladaptive behaviors. Results showed that when aides were given feedback as to their patient's improvement there was an increase in the patient's appropriate behavior relative to baseline. Furthermore, when cash awards were offered to the aide with the best patient score, even greater improvements in patient behavior resulted. These studies suggest that contingencies must often be established to initiate and/or maintain trainer intervention. In both situations the trainers must have displayed a low frequency of engaging in behaviors appropriate to the behavioral interventions previously established at both institutions, otherwise these two treatments would not have been necessary.

Further evidence (albeit indirect) for trainers' low probability of engaging in intervention comes from literature in which the <u>trainees</u> are taught to use behavioral techniques on the trainers. In each case this unusual form of intervention was initiated because the trainers themselves were not using high enough rates of reinforcement for appropriate trainee behavior. For example, Fedoravicius (1973) reported a case study in which a set of parents failed to properly reinforce

their son's appropriate behavior, so the son was trained to modify his parents' responses to his behavior. This innovative treatment was successful in reducing arguments and increasing positive interactions. In a similar study, a fourteen-year-old boy was trained to reinforce his teacher's positive behavior towards him, and to ignore harsh, unpleasant behavior. This treatment was successful in increasing positive teacher-student contacts, and decreasing negative teacher-student contacts (Gray, Graubard, and Rosenberg, 1974). Finally, Polirstok and Greer (1977) trained a student who was classified as having behavioral problems to both verbally and nonverbally reinforce her teachers' use of reinforcement. Treatment resulted in an increase in reinforcement from three out of four teachers and a decrease in disapproval for all four teachers. Again, had the trainers in these situations delivered higher frequencies of reinforcement (i.e., appropriately applied the positive reinforcement intervention) the training of the trainees in behavioral principles would not have been necessary.

This more specific phenomenon of a low frequency of applying positive reinforcement--the topic of the present investigation--has received little direct empirical attention. There have been, however, a number of studies investigating teachers' natural rates of

approval and disapproval in the classroom. White (1975) initiated this research with her study of "natural" or "existing" rates of verbal approval and disapproval. Her investigation (covering grades 1-12, excluding grade 11) revealed that overall, teachers dispensed more disapproval than approval in the classroom. Heller and White (1975) also found higher disapproval rates than approval in their investigation of junior high school teachers. Furthermore, Thomas, Presland, Grant, and Glynn (1978) replicated the predominance of disapproval with grade 7 classrooms in New Zealand. Perhaps the more important contribution of these studies is not that disapproval prevails over approval, but rather that overall rates of approval were found to be very low. In reviewing this literature, Van Houten (1979) claims: "from what is currently known about optimal rates of teacher praise, ... it is unlikely that these rates would represent good standards for applied behavior analysts working with problems in the public schools" (p. 585).

Three more recent studies found evidence contrary to that presented by White (1975). These investigations all included nonverbal as well as verbal teacher responses, and this addition has been cited as one reason for the discrepancy with the earlier research. Nafpaktitis, Mayer, and Butterworth (1985); Wyatt and

Hawkins (1987); and Merrett and Wheldall (1987) all found that teachers gave more approval than disapproval in the classroom. However, Wyatt and Hawkins (1987) raise the issue of teachers' ineffective use of approval and state that teachers sometimes provide reinforcing consequences for noncompliance rather than for compliance. Furthermore, despite their findings of more approval than disapproval, Merrett and Wheldall (1987) concluded that their results still "...provide confirmation for the subjective view that parents and teachers find it difficult to ignore bad behavior and to praise good behavior" (p. 101). And again, regardless of whether there is more disapproval than approval--the rate of approval is too low. "Such lean rates of approval would be appropriate intermittent reinforcement to maintain well established behaviors but are unlikely to be effective in teaching new behavior repertoires in young children" (Merrett & Wheldall, 1987, p. 101).

A direct demonstration of this low rate of approval comes from a study by Strain, Lambert, Kerr, Stagg, and Lenkner (1983). In their investigation of children's compliance to teachers' requests and the consequences provided for compliance, they supported the results of White (1975), Heller and White (1975), and Thomas et al. (1978) by finding that teachers generally give more negative feedback (in the form of negative verbal

behaviors) than positive feedback (in the form of positive verbal and gestural behaviors) to their students. Furthermore, they provide evidence that the general amount of feedback given in classrooms (including both positive and negative feedback) is quite low. More specifically, their teachers provided positive feedback for student compliance in only 10 out of every 100 episodes of compliance. Similarly, 12 out of every 100 episodes of noncompliance were followed by negative feedback. These numbers do seem extremely low and are surely not optimal levels for teaching. Furthermore, Strain et al. (1983), like Wyatt and Hawkins (1987) acknowledged the problem of ineffective use of contingencies: "while earlier reports have shown that negative feedback is given more often than positive, this study shows that a good proportion of positive feedback provided may be contingent on noncompliance" (p. 248).

In a similar vein, Thompson, White, and Morgan (1982) studied teacher-student interactions with mainstreamed mildly handicapped students and found that the students received more neutral feedback than either praise or criticism. They concluded that teachers are not using effective behavior management and classroom techniques. Further, Seymour and Sanson-Fisher (1975) investigated the effects of teacher attention on the behavior of two

delinquent girls, and their baseline data revealed that prior to treatment the teacher of these girls "... rarely gave positive attention to even the appropriate behavior of most girls" (p. 111). Similarly, Cossairt, Hall and Hopkins (1973) in their study on the effectiveness of instructions, feedback, and social praise on increasing teacher praise for student attending behavior, took a baseline of teacher praise before introducing any kind of treatment and found that none of the three teachers involved in the study gave any praise for appropriate student attending behavior. In summary, these studies demonstrate that "trainers" often display a low probability of delivering positive reinforcement contingent upon desirable behaviors.

The first step towards explaining this low frequency of using positive reinforcement involves analyzing the trainer's behavior as one would analyze the trainee's behavior. Loeber and Weisman (1975) correctly point out that trainer behavior, like trainee behavior, should be analyzed in terms of a three-term contingency including discriminative stimuli, responses, and consequences. In theory, a discriminative stimulus should set the occasion for an appropriate trainer response which is then reinforced. If trainer behavior is not given effective discriminative stimuli and appropriate consequences, the behavior will likely not be

maintained. Studies outlined earlier by Pommer and Steedbeck (1974), and Pomerleau, et al. (1973) provide support for the notion that trainer behavior requires consequences; in both cases contingencies had to be established to maintain the behavior of the trainers.

Often supervisors assume that "natural" consequences will maintain trainer behavior; that is, an improvement in the trainee's behavior is assumed to reinforce the trainer's behavior. While this may often be the case, many researchers claim that a change in trainee behavior is not reinforcing to all trainers (eg., Acker, 1980; Loeber & Weisman, 1975; Macmillan & Kolvin, 1977). An interesting empirical demonstration of this claim was conducted by Loeber (1971). Trainers (the subjects in this study) were asked to apply a treatment involving a combination of immediate reinforcement for appropriate behavior and punishment for inappropriate behavior. Loeber investigated the differential effects that patient's improvement and promise of monetary reward would have on the number of errors make by the trainers (i.e., number of incorrect uses of reinforcement and punishment). Although he expected both conditions to increase trainer accuracy, his expectations were borne out only for the promise of monetary reward condition. Improvement or nonimprovement of the patient had no influence on the number of errors made by the trainers.

In some situations a change in trainee behavior may not be reinforcing to a trainer because the trainee's goal behavior has been selected by the supervisor. In this case, the goal behavior may be highly reinforcing to the supervisor, but may not be at all reinforcing (in fact it may be aversive) for the trainer (L.E. Acker, personal communication, April 1986). In the same vein, Acker (1980) points out that the trainer's initial procedure of choice is often to suppress undesirable trainee behavior, but that supervisors often suggest reinforcing an incompatible behavior instead. Although this approach is frequently therapeutically effective, it faces one large obstacle--the seductivity of punishment as a behavioral tool. Trainers may oppose supervisors' suggestions to forego punishing undesirable behaviors and begin reinforcing desirable behaviors because of the reinforcing nature punishment holds for the user (Martin & Pear, 1983; Kazdin, 1984; Acker, 1980; Heller & White, 1975). Punishment may be appealing because of the usual rapid reduction of the undesirable behavior, which in turn provides immediate negative reinforcement for the user. The effects of positive reinforcement for desirable behavior, on the other hand, are usually less immediate and therefore less effective as reinforcers. The previously reviewed studies on teachers' natural rates of approval and

disapproval cite this as being a likely explanation for high rates of teacher disapproval--teachers find the results of disapproval more reinforcing than for approval. In White's (1975) words: "giving approval for appropriate pupil instructional behaviors may not be particularly reinforcing for teachers, because the giving of approval does not result in any outcome that is obviously due to the immediate effectiveness of the teacher" (p.371). Unfortunately, socially sanctioned punishment usually results in only temporary suppression of the undesirable behavior, and is often accompanied by unpleasant emotional side effects (Martin & Pear, 1983; Kazdin 1984; Acker, 1980). Clearly, the use of positive reinforcement for desirable behaviors is far more effective in the long run, however the problem of trainer's low probability of using it remains.

Considering many trainers' preference for punishing undesirable behavior, and with the uncertainty of an improvement in the trainee's goal behavior acting as an effective reinforcer for trainer responding, it seems that external consequences may often be required to maintain appropriate trainer behavior. One such consequence which has been found to be effective is simply to provide feedback to the trainer as to his or her performance. Many researchers have found feedback to be effective and necessary for establishing and

maintaining trainer behavior (eg. Gladstone & Spencer, 1977; and Willis & Gueldenpfenning, 1981). Bernstein (1982), in her review of the training of behavior change agents, investigated several training "packages" which have proven to be effective. She found feedback to be a component in each and every package. Bernstein concluded that one method for obtaining generalization of behavior change skills is to set up formal feedback systems to evaluate whether or not trainers are displaying appropriate behavior (p. 17).

A study by Acker, Goldwater, and Agnew (unpublished raw data, 1986) evidenced the existence of a low probability of reinforcing behavior on the part of trainers, and provided support for the effectiveness of feedback in increasing this probability. The study examined the behavior of subjects engaged in the behavioral technique of shaping. Shaping refers to the selective use of reinforcement and nonreinforcement to gradually change the topography of behavior until a final desired behavior is reliably emitted. Using a low frequency of reinforcement during shaping has particularly severe consequences since applied research suggests that a consistently high frequency of reinforcement (approximately 70-80%) is crucial for effective shaping (see Gelfand & Hartman, 1975; Gambrill, 1977; and Jackson & Wallace, 1974).

Subjects' shaping behavior was examined via a computer program designed to train persons in the use of this technique. Since this program was used in the present investigation an overview of it will be presented here. In the past, the shaping of human and animal behavior has been investigated in both laboratory and applied settings. Both settings have methodological merits, especially when the behavior of interest is that of the shapee. However, when shaper behavior is the focus of attention, these settings present some limitations. Computer simulations can alleviate many of these limitations and provide a uniquely "clean" vehicle for collecting data on the behavior of the shaper. The computer program developed and used by Acker et al. (and used in the present study) has several advantages. The computer automatically records target shaper responses, thereby eliminating human recording error. Furthermore, the behavior of the computerized shapee is controlled by the experimenter and can therefore be manipulated for experimental purposes and accurately recorded and evaluated. A potential problem with utilizing computer simulations of human and/or animal behavior revolves around the issue of generality. In particular, to what extent can the results of experiments which make use of such simulations be generalized to real world situations (if that is the experimenter's intent)? These issues

will be dealt with in the general discussion section of this paper.

The task presented to subjects in the study by Acker et al. (1986) was to "shape" the behavior of a computer "animal". More specifically, subjects were asked to train the animal to make its way from the left hand side of the computer screen to the far right hand side, and eventually move consistently in a straight horizontal line. The animal was preprogrammed to move across the screen in directions ranging from 0 degrees (straight up, or "due north") to 180 degrees (straight down, or "due south"), the target movement being 90 degrees ("due east"). Subjects shaped the direction of the animal's moves through the use of "positive reinforcement" (in the form of a "beep" triggered by a key press). Thus, using reinforcement and the withholding of reinforcement, subjects attempted to shape the animal's behavior until it was consistently moving "due east" (in a straight, horizontal line). (See Appendix A for a detailed description of the program.) The dependent variable in this experiment was the frequency of reinforcement applied by each subject. The computer program required a minimal reinforcement frequency of 67% in order to successfully shape the behavior of the animal. This frequency was adopted after a review of the literature (as mentioned earlier) suggested that in

proper shaping a reinforcement frequency of 70-80% should be maintained (Gelfand & Hartman, 1975; Gambrill, 1977; and Jackson & Wallace, 1974). Of course, until they were so instructed, subjects would not be expected to be able to verbalize this requirement.

Acker et al. (1986) investigated five different experimental conditions. The first three conditions represented sequential increases in the amount of instruction given to subjects, the fourth condition involved providing feedback to subjects, and the fifth condition involved providing prompts in addition to feedback. In the first condition subjects were given minimal instructions (including presentation of the goal of the task, instruction to make use of shaping, and a brief description of what shaping involves) and were given no instruction as to how much reinforcement should be used. Subjects in this condition reinforced, on average, only 43% of all instances of the animal's behavior. Since by the nature of the program, a frequency of reinforcement greater than 67% was required for successful shaping, few subjects (24%) actually managed to shape the animal's behavior. (Compared to the literature cited earlier, this frequency of reinforcement [43%] seems quite high, however, subjects in this experiment had only two possible responses--to reinforce or to withhold reinforcement. Teachers in a

classroom have a variety of potential responses, praise being only one.) The second condition of the experiment involved giving subjects a more detailed explanation of how to shape, and suggesting they use a high but unspecified frequency of reinforcement. These subjects reinforced only 54% of all approximations to the behavior, still lower than the target of 70-80%, and again, few of them successfully shaped (25%). In the third condition a rule-of-thumb was spelled out for subjects--specifically that they should reinforce 70-80% of all instances of the behavior. Under this condition, subjects still only reinforced at a frequency of 58%, and only 36% of them successfully shaped. The fourth experimental condition involved adding feedback to the program. These subjects received instructions containing the 70-80% rule, and in addition received feedback at the end of each transit as to the frequency of reinforcement they were actually using (it characteristically requires the computer "animal" to cross the screen two or more times before shaping can occur, and each series of moves which culminates in the crossing of the screen is referred to as a "transit"). Subjects in this condition finally boosted their use of reinforcement to 70%, and 85% of them successfully shaped. These results suggest that periodic feedback can be a very important factor in training situations--a

topic which will be discussed in greater detail later. The final condition of the experiment involved adding "prompts" to the previous condition. In addition to receiving periodic feedback as to their use of reinforcement, these subjects were prompted on the computer screen to increase their reinforcement frequency whenever their immediately preceding use of reinforcement dropped significantly below 70% (see method section for a complete description of the prompt condition). With the addition of prompts, subjects reinforced 71% of all instances of the animal's behavior--virtually the same as the feedback condition without prompts, and 71% of these subjects successfully shaped.

Of all statistical analyses performed on these data, the comparisons of the differences between the three groups who received the 70-80% rule but varying levels of feedback are of particular interest for the present study. Both the group receiving feedback-alone and the group receiving feedback-plus-prompts reinforced at a significantly higher frequency than the group receiving no feedback at all, thereby demonstrating the effectiveness of feedback. Further, no significant difference was found between the amount of reinforcement used by subjects in the feedback-alone condition and subjects in the feedback-plus-prompts condition,

suggesting that although feedback can control shaper reinforcing behavior, the addition of prompts has no supplemental effect. Acker et al. (1986) provided further support for their finding that feedback is a critical component in raising the overall use of reinforcement by demonstrating that subjects in the feedback-alone condition reinforced at a significantly lower frequency before receiving feedback than afterward (59% and 72% respectively). In brief, these results suggest that without being given specific instructions to use a high frequency of reinforcement, and without being given feedback as to actual use of reinforcement, subjects attempting to shape behavior show a low frequency of reinforcement.

Closer inspection of the Acker et al. (1986) data provided insight into what form this low frequency of reinforcement took, and pointed to issues requiring further investigation. Move by move inspection of the data from the no feedback condition revealed that the frequency of reinforcement displayed was the result of subjects having selectively reinforced those moves which represented relatively close approximations to the goal move (e.g., moves between 60 and 120 degrees, where the goal move was 90 degrees) and having withheld reinforcement for those moves further away from the goal move (i.e., moves less than 60 and greater than 120

degrees). Furthermore, these data suggested that, by definition, these subjects were not engaging in shaping (i.e., starting at the shapee's level of competence and reinforcing gradual improvements towards the goal move, as well as successively adjusting their criterion for reinforcement as a function of changes in the form of the shapee's behavior). Rather, they were engaging in straight forward differential reinforcement (reinforcing only "good" moves and not reinforcing "poor" moves). Additional evidence for this came from the analysis of the percent of subjects who successfully shaped the animal's behavior. In the no feedback condition only 36% of subjects were successful. In comparison, subjects in both feedback conditions not only raised their frequency of reinforcement to 70%, but in addition, an average of 78% of these subjects successfully shaped the animal's behavior. (No significant difference was found between the number of successful shapers in the feedback-alone and the feedback-plus-prompts conditions.)

Although subjects who received feedback displayed higher scores on both measures noted (percent of moves reinforced and percent of successful shapers), these indices are rather crude in terms of assessing particular shaping <u>skills</u>. Shaping the behavior of an organism requires that the shaper make use of a "sliding

criterion" when determining which shapee responses are to be reinforced. Behaviors which are reinforced at one point in a shaping program may not be reinforced at another point. Overall, the task for the shaper is to slowly raise their criterion, reinforcing closer and closer approximations to the final form of the behavior. However, the training of an organism, especially a human being, does not always progress at a steady rate. Plateaus are often reached, and in fact, shapee behavior may temporarily deteriorate. Thus, when the shapee's behavior dictates, the shaper must also lower his or her criterion temporarily and reinforce behavior which represents no improvement, or even deterioration. Since reinforcing temporary deteriorations is a critical skill for effective shaping it seemed deserving of experimental attention.

The computer program used in the study by Acker et al. (1986) provided an opportunity for experimental manipulation of shapee behavior, thus the present study made use of this program to examine the likelihood of shapers' lowering their criteria for reinforcement during temporary deteriorations in shapee behavior. Two short probe periods of deterioration were programmed into the shapee's behavior, one probe representing a fairly moderate deterioration and one probe representing a more severe deterioration.

Because feedback was found to be helpful in increasing subjects' overall frequency of reinforcement in the study by Acker et al. (1986), one goal of the present study was to investigate whether or not this feedback (provided by the computer program) was enough to maintain the shapers' reinforcing behavior in the face of the two probes of deteriorating performance on the part of the shapee. In other words, after being given the 70-80% rule and feedback on their actual use of reinforcement, would shapers lower their criteria temporarily and reinforce poorer behavior, or would they return to a low frequency of reinforcement during the deteriorations? In addition, considering the finding of Acker et al. of a non-significant difference between subjects receiving feedback-alone and those receiving feedback-plus-prompts, a further purpose of the preprogrammed deteriorations was to provide a more sensitive measure to discriminate between these conditions. Since the prompts did not affect the overall frequency of reinforcement in the previous study, it was hypothesized that their effect might only be seen under more extreme conditions--for example, when shapee behavior showed a distinct deterioration. The additional instructional aid provided to shapers in the form of the prompts, as opposed to receiving only periodic feedback on their percent use of reinforcement,

was expected to have a greater effect under the condition of the more severe deterioration in shapee behavior.

In short, the purpose of the present study was to investigate whether shapers would lower their criteria for reinforcement during deteriorations in shapee behavior. It was predicted that all subjects would use a low frequency of reinforcement during these deteriorations but that the actual frequencies used would vary depending on the severity of the deterioration and on the presence of feedback and/or prompts. More specifically, the following hypotheses were tested: (1) subjects in all conditions would reinforce less of the probe moves relative to their overall use of reinforcement; (2) those subjects receiving the less severe deterioration, regardless of feedback condition, would reinforce more of the probe moves than those subjects receiving the more severe deterioration, (3) the no feedback conditions, at both levels of deterioration, would reinforce fewer of the probe moves than both feedback conditions (feedback-alone and feedback-plus-prompts), and (4) the feedback-plus-prompts condition would reinforce more of the more severe deterioration moves than the feedback condition, but within the less severe deterioration there would not

necessarily be a difference between these two conditions.

Method

Subjects and Setting

Subjects were 200 undergraduate students enrolled in an introductory course in applied behavioral psychology at the University of Victoria. Students were offered four percentage points towards their final grade for participation in the experiment, and they were told it would provide them with a laboratory-type experience in shaping behavior.

Subjects were tested in a classroom containing twelve Apple IIe computers with dual disk drives. The number of subjects tested at any one time ranged from four to twelve.

Apparatus

Shaping Program

Subjects' shaping behavior was examined via a computer simulation of a training situation. The computer program presents the subject or "shaper" with the task of shaping the behavior of a computer "animal" named Sidney Slug. The goal of the program is for the shaper to train the animal to make its way from the left hand

side of the computer screen to the far right hand side, and eventually move consistently in a straight, horizontal line (i.e., easterly direction). The animal is initially able to move across the screen in directions ranging from 0 degrees (straight up, or "due north") to 180 degrees (straight down, or "due south"), the target movement being 90 degrees ("due east"). The moves are rounded off to the nearest 10 degrees so the actual number of potential directions of a move is 19. The task for the shaper is to "shape" the direction of the animal's moves from being in any direction from 0 degrees to 180 degrees to just being 90 degrees (due east). Shapers have at their disposal one computer key which, when depressed within one second after the animal makes a move, serves to "reinforce" that particular move (i.e. that particular direction), by increasing the likelihood of that move being repeated on future trials. Thus, using reinforcement and the withholding of reinforcement, shapers can shape the animal's behavior until it is consistently moving "due east" (in a straight, horizontal line). (See Appendix A for a detailed description of the program.)

Because of the limited space on a computer screen the task is rarely completed the first time the animal reaches the far right hand (eastern) side of the screen.

Therefore, at that time the screen is erased and the animal is placed back in the middle of the screen and allowed to continue on the journey. Each series of moves that culminate in the animal crossing the right hand boundary, whether successful or not, is called a "transit".

Throughout the shaping process the computer maintains a record of the direction of each of the animal's moves and whether or not the shaper reinforced it.

In order to investigate whether shapers would lower their criteria for reinforcement, seven preprogrammed, fixed moves were inserted into the original program to begin shortly after the start of the second transit. These fixed moves (referred to as a "probe") served to provide all shapers with a similar experience of deteriorating performance on the part of the animal. Two different probes were designed. The first probe represented a progressive deterioration in the animal's performance, and is thus referred to as the "progressive deterioration". This probe began with a repetition of the fourth move of the second transit, whatever that move may have been as determined, in part, by the shaper's skill up to that time. The following six moves each represented a 15 degree deterioration from the move just prior to it. An example of a progressive

deterioration is 80, 80, 65, 50, 35, 20, 5, 0. The first move of the probe was made to be a repetition of the previous move to add some stability to the animal's behavior before introducing the actual deterioration. These two identical moves in a row were thought to provide a "baseline" for the shaper against which the next moves would appear as distinct deteriorations. If and when the probe moves reached either 0 degrees or 180 degrees, they did not decrease or increase beyond those angles, rather the animal continued moving in either 0 or 180 degree moves (the computer program does not allow moves in westerly directions).

The second probe, referred to as the "uniform deterioration", represented an initial deterioration and then a maintenance of that initial deterioration. As with the progressive deterioration, the uniform deterioration began with a repetition of the fourth move of the second transit. The next move was a 20 degree deterioration from the first move. The remaining probe moves proceeded at the same angle, thus representing a maintenance of the original deterioration. Again, where the deterioration involved an angle of 0 or 180 degrees the remainder of the probe moves were in that direction. An example of a uniform deterioration is 70, 70, 50, 50, 50, 50, 50, 50.

After the seven probe moves were completed the regular program resumed. The shapers' reinforcing behavior for the duration of the probe was taken into account and used in the determination of the moves following cessation of the probe (see Appendix A).

A second independent variable, in addition to the type of deteriorating probe received, was the amount of feedback provided to the shapers. Though all shapers were initially given a "rule" to reinforce 70-80% of the animal's moves, one of three levels of feedback could be provided to any shaper about their actual use of reinforcement, depending on their condition: (1) "no feedback"--shapers in this condition received no feedback as to their use of reinforcement; (2) "feedback-alone"--at the end of each transit a message appeared on the screen informing shapers in this condition of the percent of the animal's moves they reinforced over that transit and, if their use of reinforcement was below 70%, they were reminded to reinforce 70-80% of the animal's moves; 3) "feedback-plus-prompts"--in addition to receiving the same message as the feedback condition at the end of each transit, these shapers also received prompts throughout each transit whenever their use of reinforcement dropped below a predetermined low level (this level reflected a

combination of both their cumulative and their more immediate use of reinforcement). The message read: "Your recent use of reinforcement is low. Remember the 70-80% rule". This message appeared for a few seconds at the bottom of the computer screen. Presentation of the prompts was temporarily stopped during the preprogrammed probe moves in order that shapers' use of reinforcement during these moves could be assessed in the absence of the prompts.

Design

A 2 x 3 factorial design was utilized with two levels of deteriorating probes, and three levels of feedback. In addition, two control groups were tested without probes; one group receiving feedback-alone and the other group receiving feedback-plus-prompts. These control conditions assessed the effects of feedback-alone and feedback-plus-prompts in the absence of the probe variable and served as an attempt to replicate the lack of differential effects of the two conditions found in the study by Acker et al. (1986). Such a nonsignificant difference could, in turn, serve as a baseline enabling any differential performance observed between these conditions in the present study to be attributed to the

effects of the probes themselves, or to an interaction of the probes and the feedback condition.

Subjects were randomly assigned, 25 each to the eight cells of the design.

Procedure

Subjects were seated in front of a computer terminal upon entering the experimental room. The author, present during all testing, made an announcement at the onset of the session advising subjects to disregard anything they had previously heard about the program they were about to engage in. This measure was taken in an attempt to minimize subjects adopting strategies based on information obtained from students who had already participated in the experiment (subjects were also asked to not discuss their experiences with other students). Before turning on the computers subjects read an instruction sheet which briefly explained the task and provided them with the following rule: "a good rule of thumb to follow when shaping Sidney is to try to reinforce approximately 70-80 % of all moves; that is, don't let too many moves go unreinforced! Be generous to Sidney and be sure that you reinforce him 70-80 % of the time" (see Appendix B for complete instruction

sheet). After reading the instruction sheet, subjects turned on their computers and began the shaping program. The duration of the experiment for any one shaper was one and a half hours.

Results and Discussion

The first issue addressed in the present study was whether subjects' (shapers') use of reinforcement for the probe moves was lower than their use of reinforcement for other, non-probe moves. In other words, did the shapers display a lower probability of reinforcing the probe moves? This question was answered by two separate analyses. First, a repeated measures analysis of variance was performed within each condition comparing the average percent of moves reinforced over the first transit with the average percent of moves reinforced over the six probe moves (the first probe move was removed for all analyses because it represented merely a repetition of the previous move--the actual deterioration began on the second move). Performance over the first transit was used in this comparison rather than performance over all transits because the first transit provides a sample of shapers' reinforcing behavior without intrusion of possible new effects caused by experiencing the probe (the probes began shortly after the onset of the second transit). Table 1 presents the means and F values. In each condition shapers demonstrated a lower frequency of reinforcement

TABLE 1

Comparison of Mean Percent of Moves Reinforced Over the First Transit With Mean Percent of Moves Reinforced Over the Probe Moves

Condition	Subsection of Moves		F
	First Transit	Probe Moves	(1,24)
No Feedback			
Progressive Deterioration	59%	19%	60.29*
Uniform Deterioration	60%	20%	102.00*
Feedback-Alone			
Progressive Deterioration	50%	19%	61.35*
Uniform Deterioration	54%	39%	10.14*
Feedback-Plus-Prompts			
Progressive Deterioration	63%	27%	39.11*
Uniform Deterioration	65%	44%	13.00*

*$p < .004$.

for the probe moves. All comparisons were significant, $p < .004$.

Second, for the feedback-alone and feedback-plus-prompts conditions the average percent of probe moves reinforced was compared to the average percent of moves reinforced over the six moves in the exact same location as the probe in the program received by the control groups (those moves positioned 6-11 in the second transit). This analysis controlled for possible position effects in that all shapers in this comparison would have received the feedback message at the end of the first transit and would be at the exact same point in the shaping program. Table 2 presents the means and F values. All four probe groups reinforced significantly fewer probe moves as compared to those not receiving probes (the control groups), $p < .001$.

These data support the first hypothesis stated in the introduction of this paper, namely, shapers in all conditions reinforced less of the probe moves relative to their overall use of reinforcement. Even the feedback groups, who used a higher overall amount of reinforcement as compared to the no feedback groups, demonstrated that their "generosity" had limits. More specifically, faced with either a uniform or progressive deterioration in the animal's behavior, subjects

TABLE 2

Comparison of the Mean Percent of Moves Reinforced Over the Probe With the Mean Percent of Moves Reinforced Over the Non-Probe Analogous Moves in the Control Groups

Condition	Subsection of Moves		F (1,48)
	Probe Moves (Experimental groups)	Analogous Moves (Control groups)	
Feedback-Alone			
Progressive Deterioration	19%	73%	96.99*
Uniform Deterioration	39%	73%	31.33*
Feedback-Plus-Prompts			
Progressive Deterioration	27%	70%	43.06*
Uniform Deterioration	44%	70%	12.64*

*$p < .001$

did not lower their criteria for reinforcement to serve the principle of good shaping.

The second hypothesis that the probability of reinforcing the probe moves would vary with the severity of deterioration experienced was also supported. Table 3 presents the percent of probe moves reinforced for both levels of deterioration at each level of feedback. Analysis of variance comparing the average use of reinforcement for each deterioration level (pooled across feedback conditions) revealed a significant difference, with shapers in the uniform deterioration condition reinforcing more than shapers in the progressive deterioration condition, F (1,148) = 10.3, p < .003.

The third and fourth hypotheses concerning differential use of reinforcement based on type of feedback received, were both tested via planned, unorthogonal pairwise comparisons. Differences in percent of probe moves reinforced between feedback conditions were tested at each deterioration level separately. Of these six comparisons two significant differences were found, both at the uniform deterioration level. The no feedback group reinforced less than both the feedback-alone and the feedback-plus-prompts groups (Tukey's test, p < .05).

TABLE 3

Mean Percent of Probe Moves Reinforced for Each Level of Deterioration Across Each Level of Feedback

Level of Deterioration	Feedback Condition		
	No-Feedback	Feedback-Alone	Feedback-Plus-Prompts
Uniform Deterioration	20%	39%	44%
Progressive Deterioration	19%	19%	27%

Thus, the third hypothesis that the no feedback groups at both levels of deterioration would reinforce fewer of the probe moves than both feedback groups was only partially supported. Within the progressive deterioration condition no difference was found between the feedback groups and the no feedback group, with all groups reinforcing very few of the probe moves. The feedback provided was apparently not sufficient for maintaining a higher use of reinforcement throughout a series of steadily deteriorating moves. Within the uniform deterioration condition however, results suggest that feedback had a small but reliable effect on shapers' reinforcing behavior. Those shapers receiving the feedback (the feedback-alone and the feedback-plus-prompts conditions) reinforced more of the probe moves than the no feedback condition.

The fourth hypothesis which concerned finding a difference in the amount of reinforcement used during the probes between the feedback-alone condition and the feedback-plus-prompts condition, depending on the level of deterioration, was not supported. No difference was found between these conditions at either level of deterioration. The prompts, as an adjunct to feedback, do not appear to instruct the shaper into a more generous use of reinforcement, compared to feedback-

alone, even under the most severe conditions of deteriorating performance by the shapee.

Despite the statistically significant effect of feedback during the uniform deterioration, the amount of reinforcement delivered by shapers in the feedback conditions was still low (an average of 41% of the probe moves were reinforced). Because these moves do represent a deterioration, a drop in the amount of reinforcement used is to be expected, however the low frequency displayed (as compared to a more ideal 70-80% use) still suggests that shapers have a low probability of lowering their criteria for reinforcement. Consequently, all that can be concluded from these analyses is that when faced with persistent shapee behavior after an initial deterioration (i.e., the uniform deterioration), shapers are more likely to reinforce (i.e., show a slightly higher probability of lowering their criteria) when given feedback. On the other hand, shapers faced with the more severe, progressive deterioration in shapee performance do not appropriately lower their criteria for reinforcement, regardless of the presence of feedback and/or prompts.

In addition to the four hypotheses tested, the present study served as a systematic replication for some of the results noted by Acker et al. (1986). Specifically,

their study revealed a significant difference in overall use of reinforcement between the no feedback condition and both the feedback-alone and the feedback-plus-prompts conditions, however no difference was found in a comparison of the feedback-alone and feedback-plus-prompts conditions. In the present study, the three groups who received the uniform deterioration demonstrated parallel results. Table 4 presents the overall average percent of moves reinforced for these groups. Inspection of these means (58%, 68%, and 70%) revealed a striking similarity to those means presented by Acker et al. (58%, 70%, and 71% for the no feedback, feedback-alone, and feedback-plus-prompts conditions respectively). The no feedback condition showed a lower frequency of reinforcement than either the feedback-alone or the feedback-plus-prompts conditions ($p < .01$), but no significant difference was found between the feedback-alone and the feedback-plus-prompts conditions. The latter finding was further replicated by a statistical comparison of the two control groups representing the feedback-alone condition and the feedback-plus-prompts condition in which no difference was found. In addition to analyses of overall use of reinforcement, the test of the fourth hypothesis in which use of reinforcement just during the probe moves

was assessed, revealed, once again, no difference between the feedback-alone and the feedback-plus-prompts conditions. Taken together these results strongly suggest that the prompts used in this study failed to function (a more detailed discussion of this can be found in the general discussion section of this paper). Accordingly, the value of the prompts must be questioned. With the measures employed thus far, the prompts appear to have no supplemental affect on shaper reinforcing behavior. Within this context it is interesting to note the difference in overall use of reinforcement between the feedback-alone and the feedback-plus-prompts groups in the progressive deterioration condition. Table 4 presents the average percent of moves reinforced for these conditions. Comparison of all means in Table 4 suggests that experiencing the uniform deterioration has not affected the behavior of shapers (these means are almost identical to those reported by Acker et al. [1986] with groups not receiving any probes), however experiencing the progressive deterioration seems to have resulted in a lowered overall use of reinforcement for the no feedback and the feedback-alone conditions. Interestingly the feedback-plus-prompts group appears unaffected. Thus, for the first time, there seems to be

TABLE 4

Mean Percent of Moves Reinforced Over All Transits for Each Experimental Group

Level of Deterioration	Feedback Condition		
	No Feedback	Feedback-Alone	Feedback-Plus-Prompts
Uniform Deterioration	58%	68%	70%
Progressive Deterioration	53%	63%	70%

a possible difference between the feedback-alone and the feedback-plus-prompts conditions; the feedback-plus-prompts condition used more reinforcement after the progressive deterioration than the feedback-alone condition. A post hoc comparison of these means revealed a nonsignificant difference at the .06 level (Tukey's test). In light of this suggestive, not quite significant effect, and due to the post hoc nature of this comparison, conclusions that prompts, per se, may help shapers to not "give up" in the face of a short, severe deterioration in the shapee's behavior, and to continue being relatively generous in their overall use of reinforcement can only be speculative at this time.

General Discussion

The present study demonstrates that shapers engaged in a computerized shaping program use a low frequency of positive reinforcement, and that feedback can be helpful in increasing this frequency. An additional purpose of this study was to further investigate the finding of Acker et al. (1986) of a nonsignificant difference in overall use of reinforcement between the feedback-alone and the feedback-plus-prompts conditions. Acker et al. had anticipated that the prompts might serve to increase shapers' use of reinforcement as compared to the amount used by shapers receiving feedback-alone. This latter group reinforced an average of 70% of the animal's moves which represents the lower limit of the 70-80% rule of thumb to which shapers were asked to adhere. The failure of the prompts to increase this average above 70%, and furthermore the fact that the feedback-alone group remained at this lower limit, probably represents a combination of shapers' low probability of using reinforcement and the absence of contingencies to support a frequency of reinforcement greater than the minimum 70% required by the 70-80% rule. The following

analysis of existing contingencies reveals that the feedback serves to both positively and negatively reinforce the shaper's 70% reinforcement frequency, but that no additional consequences are provided for reinforcing more than 70%.

Shapers in the feedback conditions received a message at the end of each transit which displayed their frequency of reinforcement for that transit. This message presumably served to positively reinforce shapers when they reinforced between 70 and 80% by confirming their compliance with the specified rule. Further, all shapers receiving feedback would be negatively reinforced for achieving the minimum frequency of reinforcement (70%), in that maintaining this minimum would serve to avoid receiving the message during feedback: "remember the 70-80% rule". Since this message would indicate that they had failed to achieve the goal frequency it is assumed to have been an aversive stimulus. In the feedback-plus-prompts condition, achieving the minimum frequency of reinforcement avoided delivery of the prompts too (again, the prompts could be assumed to be aversive stimuli). Thus, once shapers achieved a frequency of reinforcement of 70% they were positively and negatively reinforced. Moreover, no differential reinforcement was

provided for reinforcing at a higher frequency. The same amount and kind of reinforcement was delivered whether shapers reinforced 70% or 80% of the animal's moves. Without differential contingencies to support a higher frequency, it is not surprising that feedback shapers and feedback-plus-prompts shapers maintained the minimum frequency of 70%.

Since the focus of this study has been on shapers' low frequency of using reinforcement, investigation of the contingencies potentially controlling this behavior seems worthwhile. In order to understand this complex phenomenon the discriminative stimuli for the behavior and the consequences that maintain it should be identified. In this experiment the written instructions given to shapers prior to beginning the program probably served as discriminative stimuli, and the feedback provided during the program may have served as both discriminative, and as reinforcing or punishing stimuli. However, the most immediate and thus most powerful source of both kinds of stimuli are the actual moves that the shapee makes (i.e., the shapee's behavior). Thus, the following conjecture will attempt to explain the low frequency of reinforcement observed in the experimental groups which received the 70-80% rule but no feedback on their performance (i.e., the group that

displayed the lowest frequency of reinforcement) by focusing on the shapee's behavior as the maintaining stimuli for shaper behavior.

In the initial stages of the program the behavior of the shapee is highly variable. The animal has a wide range of potential moves, and, prior to any training, has no disposition to move in any one particular direction. Thus, the shapee is providing a wide variety of discriminative stimuli. Because shapers have never had experience with the computerized animal's moves, discriminating between those moves which should signal reinforcement and those moves which should signal nonreinforcement is a difficult task. Thus, the stimulus control exerted by the shapee's moves on the reinforcing behavior of the shaper is often weak and highly variable. Furthermore, when the shaper reinforces a particular move, the immediate consequence of that response, provided by the shapee, will be one of three possibilities: 1) a repetition of the same or a similar move, 2) a move which represents an improvement, or 3) a move which represents a deterioration (the probability of each of these outcomes is relatively equal at the onset of the shaping program). In other words, the consequent stimulus for the shaper's reinforcing behavior will as often be negative as

positive, or even neutral. This is hardly an ideal situation for developing and maintaining a high frequency of reinforcement delivery. Under contingencies which include weak discriminative stimuli and variable and sometimes seemingly inappropriate consequences, it is not surprising that the shapers' behavior is not maintained at a high frequency. In theory, as the shaping intervention progresses, and the consequences provided by the shaper begin to exert some control over the shapee's behavior, the shapee's behavior begins to provide more appropriate consequences for the shaper's behavior. That is, a reinforcement response on the part of the shaper is more likely to result in a repetition of the same move or even an improvement, events which are presumed to be reinforcing to the shaper. Unfortunately, this progression will only occur if the shaper has been shaping correctly from the onset, in other words, reinforcing the appropriate shapee moves while maintaining a high frequency of reinforcement right from the start of the program. The situation represents a "Catch 22" because the shaper will not use a high frequency of reinforcement unless he or she is provided with reinforcing consequences for doing so, and these reinforcing consequences will not be provided (by the shapee) unless the shaper first

provides a high frequency of reinforcement. Although the feedback message provided by the program is not as effective a reinforcer or a discriminative stimulus as the shapee's moves are, it serves to provide some of the needed contingencies to maintain shaper behavior.

As mentioned in the introduction, the generality of findings derived from a computer simulation of animal behavior must be addressed before broader conclusions from the results of this study can be made. Does the behavior of a person engaged in shaping a computerized animal approximate the behavior of a person engaging in the shaping of a real animal, or more importantly for practical purposes, a human? This question requires an empirical answer and would be best addressed through systematic replication of the present study in which, keeping all other variables constant, the target behavior to be shaped was the behavior of a human shapee. After investigating the broader issue of whether shapers demonstrate a low frequency of reinforcing human behavior, the likelihood of shapers lowering their criteria for reinforcement in response to <u>deteriorations</u> in human behavior could be addressed. For example, a human subject (shapee) who is actually a confederate, could engage in preplanned deteriorations in performance, thus allowing investigation of the

likelihood of shapers lowering their criteria for reinforcement with human shapees. Several such systematic replications are needed before extensions to human subjects and applied settings can be made.

Despite the absence of considering the generality of findings to human shapees, some of the results of the present study, viewed in the context of existing research with human subjects, allow for some practical suggestions aimed at workers in applied behavioral psychology. First, due to the nature of applied behavioral problems requiring the use of shaping, the initial stages of such intervention will often present the same dilemma to shapers as was presented to shapers in the computer simulation used in this study. For example, the behavior of the shapee would likely be highly variable at the onset of intervention, and therefore would not provide effective contingencies for developing and maintaining appropriate shaper behavior. One way to minimize this problem might be to <u>train</u> shapers (as opposed to just instructing them) in the skills of shaping before presenting them with the applied task. Considering the nature of these skills, an effective technique for such training would be shaping itself; in other words, supervisors could make use of shaping to develop the shaping behavior of

shapers. Training would begin at the shaper's existing level of competence and would involve reinforcing successive approximations to correct shaping behavior. The target behavior would be the appropriate application of a high frequency of reinforcement. Of course, as with any shaping program, once the target behavior was reliably emitted, reinforcement would still be required to maintain it.

Considering the evidence provided by the present study that shapers are not likely to temporarily lower their criteria for reinforcement when faced with deteriorating shapee performance, part of the shaping program for training shaping skills outlined above should include training shapers to appropriately lower their criteria. Such training would include recognition of the appropriate circumstances for lowering criteria and learning to maintain a high frequency of reinforcement throughout the deterioration. Again, a follow-up to such training should include establishing consequences to maintain the behavior. The need for supporting consequences is particularly salient during severe deteriorations in shapee behavior because of the powerful stimulus control such deteriorating behavior exerts over the withholding of reinforcement. Shapers are apparently, as suggested in the current study, more

likely to withhold reinforcement when faced with a response which represents a distinct deterioration because reinforcing that response would, theoretically, serve to increase the probability of it being repeated (an event which is assumed to be contradictory to the shaper's intent). Thus, the maintenance of appropriate reinforcing behavior during severe deteriorations would be primarily dependent on external contingencies. Regardless of severity, occasional deteriorations in shapee performance are highly probable in most shaping procedures, and since the consequences of the shaper failing to use any reinforcement during such periods can be extremely detrimental (shapee behavior may decay even further, or in extreme cases, shapee responding may extinguish altogether [Acker, 1980]), training shapers to lower their criteria for reinforcement, and providing supporting consequences for doing so would seem to be worthwhile tasks.

If the direct training of shaper behavior through techniques such as shaping proves impossible or impractical, an alternative procedure would be to make use of detailed instructions rich with a variety of examples of appropriate shaper behavior. Computer simulations are particularly suitable for this kind of instruction. Through computer managed tutorials,

potential shapers could be taught the skills appropriate to their task via step by step examples. With the addition of such a tutorial, the computer program used in the present study could make a useful training package for applied workers. After being presented with explanations and examples of the various shaping skills, subjects would be given the opportunity to exercise these skills on the behavior of a computerized animal with the aid of corrective feedback. Future research might investigate the usefulness of such a training package perhaps by way of a traditional control-group design in which the experimental group would receive training with the computer program before attempting to shape the behavior of an animal or human, and the control group would receive only basic instructions on how to shape before attempting the shaping task. After investigating whether shapers demonstrate a low frequency of reinforcement following a computer training tutorial, the likelihood of shapers' lowering their criteria for reinforcement when faced with deteriorating shapee performance could be assessed as in the present study.

A final suggestion for applied workers is that, with or without prior training, contingencies must be established for the maintenance of appropriate trainer

intervention behavior. Although these contingencies may be provided by changes in the behavior of the trainee, supervisors should not depend on this to sustain proper trainer behavior. Changes in trainee behavior may actually support inappropriate trainer behavior, or may work to extinguish trainer responding altogether (Acker, 1980). To increase the probability of effective intervention, external contingencies for trainer behavior must often be imposed. Without effective contingencies, appropriate trainer behavior, like many other behaviors, will not be maintained.

In conclusion, from a supervisor's perspective it would be time consuming and perhaps bothersome to develop and institute practical training programs and suitable contingencies for trainer behavior in addition to developing the original intervention program for the trainee, however, this extra effort and attention could undoubtably lead to more appropriate trainer behavior, which in turn would lead to more efficient and more successful behavioral interventions.

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Appendix A

Algorithm for Determining Each of the Computerized Animal's Moves

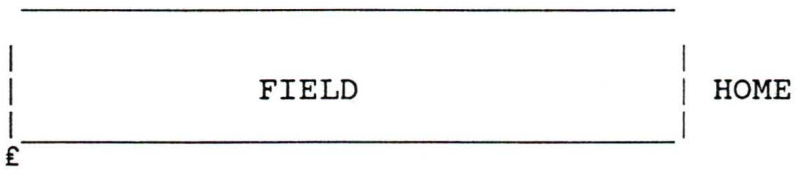
"The direction of a particular move is a function of a mathematical formula whose elements include (a) the directions of Sidney's most recently reinforced moves (his "reinforcement history"); (b) the range of directions within which a move may take place (centered around the direction of Sidney's last move); and (c) a random process which selects one direction within the allowable range, in multiples of 10 degrees. The size of the allowable range, and thus the degree to which a move may differ from a previous move, is inversely related to the proportion of reinforcement of preceding moves. Thus, as the student provides repeated reinforcement for a particular direction or set of directions, the probability that Sidney will continue to move in the same general direction is increased, due both to the narrowing of the range and to the contribution of this reinforced direction within the "reinforcement history." The withholding of reinforcement decreases the likelihood that a move will

be repeated (its direction is not entered into the "reinforcement history") and increases the range of possible directions, thus promoting the possibility of a large deviation in direction" (Acker and Goldwater, 1985, p. 2).

APPENDIX B

Instruction Sheet

In the exercise you are about to do, you will teach SIDNEY SLUG to cross a large field so that he can get HOME (you'll see this field again when you start the SHAPING PROGRAM).



Sidney's home is at the right or Eastern side of the field. Sidney starts his journey on the left or Western side and will cross the entire field in his journey.

> The trick to Sidney getting home SUCCESSFULLY is that: HE MUST CROSS THE RIGHT BOUNDARY WHILE CONSISTENTLY MAKING DUE-EAST MOVES
>
> not like this
>
> or like this
>
> but like this
>
> Whenever Sidney enters home while moving in any directions other than Due-East he is simply kicked right back out so that he can try again!

Unfortunately, Sidney has no particular inclination to make moves ONLY in a Due-East Direction. That's where YOU come in! You will have to teach (shape) Sidney to make Due-East Moves by reinforcing him appropriately. Now, in order for you to eventually get Sidney to make ONLY Due-East Moves, you will have to be SELECTIVE with your reinforcement, reinforcing Moves which are more like Due-East and withholding reinforcement from Moves which are less like Due-East. This is called Selective or Differential Reinforcement. You will use it to obtain gradual improvement in Sidney's choice of

direction to Move.

(Oh, by-the-way, whenever Sidney moves outside of the top or bottom of the field, we will bring him back on the opposite side so that he can continue his journey.)

O.K., you're ready to begin. If you have any questions, ask the instructor now. If not, turn on the machine and begin a short introduction (the switch is on your left on the rear of the computer). Then continue working until the instructor informs you that your time is up. DO YOUR VERY BEST AT SHAPING BECAUSE YOUR BONUS POINTS DEPEND ON YOUR GIVING IT AN HONEST TRY (SOMETIMES SIDNEY CAN BE VERY DIFFICULT TO SHAPE BUT SO LONG AS OUR COMPUTER RECORDS SHOW THAT YOU WERE REALLY TRYING, YOU'LL BE GIVEN YOUR BONUS POINTS).

NOTE: A GOOD RULE OF THUMB TO FOLLOW WHEN SHAPING SIDNEY IS TO TRY TO REINFORCE APPROXIMATELY 70-80% OF ALL MOVES; that is, don't let too many moves go UNreinforced! BE GENEROUS TO SIDNEY AND BE SURE THAT YOU REINFORCE HIM 70-80% OF THE TIME.

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January 14, 1988
Date