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Autoshaping Infant Vocalizations

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AUTOSHAPING INFANT VOCALIZATIONS

by

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Alexander M. Myers

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURES

Page

Figure

ABSTRACT

Autoshaping Infant Vocalizations

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A series of five experiments was conducted to determine whether operant or respondent factors controlled the emission of a particular vocalization ("Q") by human infants 16 to 18 months old. Experiment 1 consisted of a pilot investigation of the effects of an autoshaping procedure on three infants' vocal behavior. All three subjects demonstrated increased emission of the target sound during the CR period. Experiments 2 through 4 attempted to replicate the findings of Experiment 1 under controlled conditions, and failed to do so. Experiment 5a presented infant subjects with a discrete-trial operant procedure (having the identical temporal parameters as the autoshaping procedure used in Experiments 1 through 4), during which subjects received rewards only after emitting the target sound. All three experimentally naive subjects in this condition emitted the target sounds, and each met an acquisition criterion of 15 successive trials with at least one target response (CR) per trial. Subjects in Experiment 5b were exposed to the

autoshaping procedure employed in Experiments 1 through 4; in addition, they were rewarded verbally for emitting the target sound at any time during the session. One of these three subjects increased her rate of target sound emission, but never met the acquisition criterion. The results suggest that vocalizations of subjects in this age range are susceptible to response-reinforcer (operant) manipulations and not to stimulus-stimulus (Pavlovian) associations. This conclusion differs from the findings of previous investigations that used younger infant subjects, suggesting that subject age may be important when conditioning vocalizations. Further research is also recommended to determine the utility of employing autoshaping procedures with humans.

(145 pages)

INTRODUCTION AND REVIEW OF THE LITERATURE

Background

For the past two and a half decades, linguists have argued about the exact nature of language; how to define it, how it is acquired and maintained, how or if it can be taught, and even how it should be examined. Modern psycholinguists (e.g., Chomsky, 1965; Lenneberg, 1967) have stressed that: a) language is unique to man; b) syntax is "built into" the nervous system; and c) language is acquired in the absence of learning. Alternatively, behavior analysts (e.g., Guess, Sailor, Rutherford, & Baer, 1968; MacCorquodale, 1969, 1970; Skinner, 1957) have emphasized the importance of: a) operant conditioning techniques in the acquisition and maintenance of language; b) the necessity of examining and discussing language in terms of its function; and c) viewing language as a learned phenomenon.

While the arguments raised by their respective proponents have not been, and may never be, settled, these two groups have succeeded in motivating researchers to examine language empirically. Psycholinguists, for instance, have provided a great deal of information about normal language development (e.g., Brown, 1973; Brown & Hanlon, 1970; Klima & Bellugi-Klima, 1966; Lenneberg, 1967) and about language development among certain handicapped populations (e.g., deaf or hard-of-hearing children: Quigley, Wilbur & Montanelli, 1974). Behavior analysts have also contributed greatly. Reinforcement techniques have been shown

to be effective when used to improve the language skills of language-deficient individuals (e.g., Guess, et.al, 1968; Sailor, 1971), and certain basic research projects using behavioral techniques hold promise for further understanding of the controlling stimuli of language (e.g., Bloom, 1974, 1975; Bloom & Esposito, 1975; Rheingold, Gewirtz, & Ross, 1959; Todd & Palmer, 1968). Other researchers (e.g., Gardner & Gardner, 1969, 1975; Patterson, 1978; Premack, 1970, 1976; Rumbaugh, 1977; Terrace, 1979) working with communication in non-human organisms have also contributed greatly to this area and are continuing to report important data concerning the conditions under which language-like behaviors are acquired.

Researchers in psychology attempt to uncover the necessary and sufficient conditions under which particular behaviors occur, after first defining the particular behavior operationally or functionally. Unfortunately, it has been difficult to define language and to identify the necessary and sufficient conditions under which it occurs. For psycholinguists, the only requirement is man. Language comes naturally (i.e., without training and regardless of environment) to man and man only, as long as man meets certain critical boundary conditions: e.g., normal brain and nervous system function, normal hearing, intact vocal apparatus. Language for these psycholinguists consists of spoken or written symbols presented in particular grammatical forms; it is the symbolic representation of information that is passed between persons. Skinnerian behavior analysts, on the other hand, prefer to talk of language as "verbal behavior" and believe that it operates under the same conditions as any other kind of behavior. Skinner himself

(1957) stated that verbal behavior is simply operant behavior that has its reinforcers delivered by other organisms. The necessary and sufficient condition for the development, acquisition, and maintenance of verbal behavior, therefore, is the emission of a response by one organism that is reinforced by another organism.

Neither of these conceptualizations of language is particularly useful. The psycholinguists' definition does not account for non-human communication, nor does it easily handle the communication of deaf persons. Neither can it explain the successful language training efforts mentioned earlier (e.g., Guess, et al., 1968; Sailor, 1971). The Skinnerians' definition, on the other hand, has been criticized for not readily explaining the complexity of human syntactic performance, and its cumbersome generality--for example, this definition would seem to accept the reinforced barking of a sea lion in a circus as verbal behavior since the barking of the animal is reinforced by a human trainer. Verbal behavior becomes such an enormous class of responses that the construct serves little purpose.

Amidst all this confusion, how then does the psychological researcher examine language? The answer seems straight-forward. The researcher does not examine any one behavior called "language"; rather, more readily definable behaviors that are generally accepted as part of language are studied and potentially manipulated in an effort to uncover the necessary and sufficient conditions under which they occur. Examples of such behaviors are vocal behavior, sign language, syntactic usage, use of plural forms, etc.

The focus of the present work is infant vocalization. It is not the intent of the proposed research to examine language specifically; rather, it is more generally intended that, by learning more about the controlling variables of infant vocalization, some generalizations about language and its acquisition may be made. This follows from the simple reasoning that vocalization is a part of, and often a precursor to, language.

Conditioning Vocalizations

Most of the research designed to examine the conditionability of infant vocalizations has been conducted within the operant framework. In one of the earliest investigations Rheingold, et al. (1959), employing three month old infants, found that infant vocalizations increased when an experimenter reinforced each vocalization by smiling and touching the infant while saying "tsk, tsk, tsk,". Three two-day conditions were alternated; a baseline condition in which the experimenter leaned over the subject with an expressionless face, a conditioning period in which the experimenter rewarded the infant for vocalizing in the manner previously described, and an extinction period which was a reinstatement of the conditions in the baseline. During the conditioning procedure vocalization increased above that obtained during the baseline condition, and subsequently decreased to near baseline levels during the extinction period. In their discussion the authors mentioned factors other than conditioning that might have confounded the results; they worried that the conditioning procedure did not adequately separate the reinforcing function of the social reward from a possible

eliciting or "releasing" function. In other words, the effects of the study might have been due to the arousing stimulation of the social reward, rather than the fact that the reward contingently followed the response.

Weisberg (1963) tested this explanation with three month old infants. He exposed groups of infants to either a) a no treatment control procedure (no adult in the experimental setting) (Group I); b) a no treatment control procedure and then a procedure in which the experimenter was present but unresponsive to the subject (Group II); c) a no treatment procedure, the unresponsive adult procedure and then a noncontingent social stimulation procedure (Group III); d) a no treatment procedure, the unresponsive adult procedure and then a noncontingent nonsocial procedure (Group IV); e) a no treatment procedure, the unresponsive adult procedure and then a contingent social stimulation procedure followed by an extinction procedure (Group V); or f) a no treatment procedure, the unresponsive adult procedure and then a contingent nonsocial stimulation procedure followed by the extinction procedure (Group VI). The investigation lasted eight days. Weisberg summarized his results by saying:

> "...after habituating to an unfamiliar setting devoid of humans, the S's rate of vocalizing did not reliably increase when an unresponding adult was introduced and made part of this environment, i.e., the immobile adult was evidently not a social releaser or S^D for vocal behavior. Taking the vocalizing rate in the presence of the unresponsive adult as the operant level, it was found that the behavior could be operantly conditioned by social consequences... Extinction operations subsequently reduced the rate but not to baseline performance. Conditions other than social reinforcement (e.g., presenting the reinforcing stimulus noncontingent upon vocalizing and giving an auditory stimulus in the presence of an unresponding adult both independently of and contingent upon vocalizing) did not seem to control infant vocal behavior." (Weisberg, 1963, p. 387-388)

These findings confirmed that the results obtained in the Rheingold et al. (1959) study were, in fact, due to operant conditioning, and not to some eliciting or "releasing" effect. Further support for this conclusion came from Todd and Palmer (1968) who showed that a tape recording of an adult's voice was effective as a reinforcer when presented after an infant's vocalizations, especially when an adult was present in the room. In addition, Schwartz, Rosenberg, and Brackbill (1970) demonstrated that any of the three variables used by Rheingold et al. and by Weisberg were effective reinforcers of infant vocalizations. That is, infant vocalization rate increased when followed by the experimenter's smile, touch, and/or sound.

Bloom (1975, 1979) has suggested that these particular studies, as well as others that purport to demonstrate the effectiveness of social reinforcement on conditioning infant vocalizations (e.g., Haugan & McIntire, 1972; Wahler, 1967) contain a major methodological flaw. She pointed out that operant studies generally require changes from baseline levels of responding before a conditioning claim can be made. The typical infant vocalization study includes a baseline phase in which the adult experimenter leans over and looks at the infant with an unresponsive blank stare. During the subsequent conditioning period, the same adult delivers social stimulation of some type after each vocalization. Bloom (1979) argued that the methodological problem of these studies concerned the baseline. Supporting evidence for this argument is provided by Brazelton, Tronick, Adamson, Als, and Wise (1975), Carpenter (1974), Carpenter, Teece, Stechler, and Friedman (1970), and by Bloom herself (1977). Carpenter (1974) and Carpenter et al. noted

suppressed social behavior in infants when the infants were presented with the unresponsive face of their mothers. Similarly, Brazelton et al. (1974) reported suppression of social behaviors in a sighted infant who was exposed to the unresponsive facial features of his blind mother. Bloom (1977) demonstrated that the baseline procedure (unresponsive adult) used in the studies examining operant conditioning of infant vocalizations suppressed infant vocalizations. In this study, the vocalizations of infants (2.8 to 4.4 months old) were recorded on four separate occasions. During the first and third sessions, the experimenter was either absent (Group A-S) or present but unresponsive (Group B-S). During the remaining two sessions, subjects in both groups received social stimulation in a random fashion from the experimenter. Bloom (1977) summarized her results as follows:

> "Infants in the A-S group vocalized at the same rate during the two periods in which the adult was absent and at similar rates during the two stimulation periods. For infants in the B-S group, baseline procedures suppressed vocal rates and did not provide a neutral or operant level of responding with which the effects of social conditioning could be compared." (Bloom, 1977, p. 128)

Bloom (1979) went on to point out that none of the studies examining operant infant vocal conditioning successfully controlled for possible vocal elicitation effects. This oversight was probably due to the results of three studies, two of which (Ginsburg, 1960; Lane, 1960) showed that chirping behavior of birds increased when contingent food was delivered, but not when the food was delivered noncontingently, and the third which was the previously described Weisberg investigation. Recall that his study attempted to assess the eliciting properties of the social reinforcer in conditioning vocalizations by comparing a group of subjects

who received response-contingent rewards with a group of subjects who received the social rewards independently of their vocal behavior. The results showed that noncontingent social rewards did not increase subject vocalizations. Bloom (1979), however, pointed to a number of methodological problems with Weisberg (1963) which prevents it from adequately addressing the issue of elicitation versus reinforcement. Briefly, the two groups were not matched for reinforcement density, the baseline rates for all subjects were very low, and the conditioned rates were lower than the baseline rates of most subjects in other studies (Bloom & Campbell, Note 1, showed that low vocalization rates were important when conditioning infants.) Only one of five infants showed both a substantial increase in responding over baseline levels and a decrease in responding during the extinction period. Bloom's argument is further supported by the results of an additional study (i.e., Bloom & Esposito, 1975). This study demonstrated that negatively contingent social rewards, a procedure in which social rewards were removed when vocalizations occurred, were as effective in conditioning vocalizations as positive contingent social rewards and positive noncontingent social rewards. The investigation proceeded as follows:

In the first of two experiments, one group of eight infants (ages 2.7 to 3.4 months) received response (vocalization)-contingent social rewards while a second group of eight infants received similar rewards on a random basis. The delivery of social rewards to the second group was randomized by yoking the sequence to that of subjects in Group 1. In other words, subjects in Group 2 received rewards at the same time as their counterparts in Group 1; the difference between the groups lay

in the fact that the reinforcement delivery for Group 1 followed vocalizations; the reinforcement delivery in Group 2 was presented regardless of the behavior of the subjects. In this way, the density of reinforcement was identical for the two groups. Both groups' vocalizations increased during the reward procedure, and decreased during extinction. In the second experiment 12 infants were given continuous social stimulation during one period (i.e., the experimenter was instructed to "try and get the infant to vocalize"), omission training during another period (i.e., social stimulation was withheld for 5-seconds after a vocalization), and no social stimulation during a final period. Vocalization rates were similar during the continuous stimulation and omission periods in spite of the response-decreasing contingency of the omission period, but decreased during the no stimulation period. These findings indicated that infant vocalizations were insensitive to operant contingencies, leading Bloom to conclude that: "Infants vocalize during operant social conditioning studies because adult social responsiveness elicits infant vocal responsiveness" (Bloom, 1979, p. 65).

Bloom's (1979) argument concerning the elicitation of infant vocalizations follows logically from her research but, as yet, there have been very few formal investigations that test her assumptions. In an earlier study Bloom (1975) demonstrated that the role of the adult in the vocal conditioning experiment was as a "releaser" of infant vocalizations. In this experiment, an adult presented social stimulation (e.g., smiling, touching the infant's abdomen, and saying "hi baby") to the infant (age ranged from 2.6 to 3.3 months) for two seconds at the

beginning of each of four consecutive two-minute periods. The results showed that the adult stimulation produced an immediate increase in infant vocalizations; this higher rate of vocalizations persisted for about 1.5 minutes of each two-minute period, and then decreased suddenly. While this study suggested that there may be some validity to Bloom's argument, it did not demonstrate clearly that infant vocalizations could be systematically elicited. In fact, it may be the case that social stimulation causes an increase in a large class of behaviors, much as in the case of a 'novel stimulus' effect. Brimer (1970), for example, demonstrated that the presentation of a novel stimulus increased the rate of responding when baseline levels of responding were relatively low.

Further, Bloom used the term "releaser", which historically has been used to describe a stimulus which results in an organisms's emission of instinctual responses (cf., Lorenz, 1966). This does not imply conditioning, but rather a "releasing" of behavior that exists somewhere inside the organism. As in Pavlovian conditioning, responses are said to be elicited by a stimulus but, unlike Pavlovian conditioning, no unconditioned stimulus is required for the establishment of the elicited response. Bloom does not clearly differentiate between these two processes and it is necessary to do so. The Bloom (1975) experiment just described was an attempt to assess the vocal "releasing" properties of adult social stimulation. The social stimulation was provided without planned pairing with any unconditioned stimulus or reward. Because the infants subsequently vocalized, they were said to have had their vocal behavior "released". A potential problem with the study, of course, is the possibility of unplanned

stimuli (e.g., smiles, facial expressions, and so on) that might have been present in the experimental environment during the "releasing" procedure. Such unplanned stimuli are important to consider. Instinctual behavior is not thought to be conditionable; that is, it is not learned. Any behavior that is conditionable cannot be thought of as "instinctual" (cf., Lorenz, 1966).

What is required, therefore, is a clear demonstration of conditioning the elicitation of infant vocalizations. One way to provide such a demonstration is to employ a typical elicitation procedure and one such procedure is autoshaping.

Autoshaping

Autoshaping is a procedure first reported by Brown and Jenkins (1968). They found that pigeons which are food-deprived and magazine trained, but otherwise experimentally naive, would peck an illuminated key when the illuminated key was presented once every 60 seconds, on the average, and when the key was illuminated for 8 seconds and followed by the delivery of grain. This pecking occurred even though the grain presentation was independent of the response. The authors called this procedure autoshaping because the pigeon "shaped itself" to peck the key.

The autoshaping procedure itself consists of presenting a number of repeated trials to the organism. Each trial begins with the termination of a previous unconditioned stimulus (UCS), perhaps food, and the initiation of an intertrial interval (ITI) of fixed or variable duration. Following the termination of this ITI, a key (previously dark) is illuminated for a fixed period of time. Generally, the UCS is presented upon the offset of the key light. The UCS is also usually presented for a fixed period of time. Key-pecking responses are recorded, but never

affect UCS delivery. The key light can be considered a conditioned stimulus (CS) that elicits responses. A more complete account of the autoshaping procedure and a description of the critical temporal relationships among the different procedural components are provided by Hearst and Jenkins (1974), and Schwartz and Gamzu (1977).

The results of autoshaping were initially startling because the pigeon's keypecking behavior was thought to be wholly under operant control, yet the autoshaping procedure was Pavlovian (cf., Schwartz & Gamzu, 1977). Operant or instrumental conditioning involves an arbitrary response (often made in the presence of a discriminative stimulus) and a contingent reinforcing stimulus. Pavlovian or classical conditioning, on the other hand, involves an informative relationship between a conditioned stimulus (initially neutral in most cases) and an unconditioned stimulus (cf., Schwartz & Gamzu, 1977). The autoshaping procedure, which presents a stimulus-stimulus relationship (lighted key=CS→grain=UCS), is typical of Pavlovian procedures. Nowhere in the autoshaping procedure is there a specified response-reinforcer relation (keypeck→grain) that is typical of operant procedures.

Since Brown and Jenkins' initial experiment, autoshaping has been widely documented. The procedure has produced conditioned responding in a number of species; e.g., rats (Stiers & Silberberg, 1974; Peterson, Ackil, Frommer, & Hearst, 1972), dogs (Smith & Smith, 1971), fish (Squier, 1969), monkeys (Gamzu & Schwam, 1974; Sidman & Fletcher, 1968) quail (Gardner, 1969), and humans (Seigel, 1977; Wilcove & Miller, 1974). A number of unconditioned stimuli (UCSs) have been used effectively; e.g., food (Brown & Jenkins, 1968), water (Jenkins & Moore, 1973), copulation (Farris, 1967), heat (Wasserman, 1973), brain stimulation (Peterson,

et al., 1972), and even mirror presentation (in Siamese fighting fish; Thompson & Sturm, 1965). Finally, a number of responses have been autoshaped using the procedure. Schwartz and Gamzu (1977) have stated that "the directedness of the response... may be the only way of distinguishing autoshaping phenomena from more familiar instances of Pavlovian conditioning" (Schwartz & Gamzu, 1977, p. 61). In a classic example of this, Jenkins and Moore (1973) autoshaped pigeons using food or water as the UCS. When food was used as the UCS, the pigeons' autoshaped pecks resembled unconditioned behaviors to food (i.e., food-getting movements); when water was used as the UCS, the pigeons' autoshaped pecks resembled unconditioned behaviors to water (i.e., drinking-like movements). Similarly, fish make consummatory-like key responses (Squier, 1969) and dogs and rats have been observed to lick and chew at response manipulanda (Smith, reported in Schwartz & Gamzu, 1977; Peterson et al., 1972).

There have been some exceptions to this 'directedness' phenomenon; most notably, Sidman and Fletcher (1968) and Gamzu and Schwam (1974) found that monkeys (rhesus and squirrel, respectively) displayed different topographies when pressing a key with their fingers and when picking up the food pellet. Of interest is the report, however, by Gamzu and Schwam (1974) that some of their monkeys eventually made nose-pressing responses to the key.

Hearst and Jenkins (1974) have emphasized this directedness of the response in their discussion of "sign tracking". They defined sign tracking as "behavior that is directed toward or away from a stimulus as a result of the relation between that stimulus and the reinforcer

or the stimulus and the absence of the reinforcer" (Hearst & Jenkins, 1974, p. 4). Given this definition, autoshaping is an instance of a more general phenomenon (sign tracking) that is of substantial importance in discrimination learning.

Siegel (1977) provided an example of sign tracking in humans. In this investigation, a number of "normal" and moderately retarded males served as subjects in an attempt to control misdirected urination. The non-retarded males were only used in a preliminary study to assess preferences for stationary or free-floating "targets" placed in the commode. The free-floating target was selected for use with the ten remaining subjects. Misdirected urinations were recorded for all subjects for one week. During days 8 through 49, a target was placed in the commode, free-floating on the water. A substantial decrease from about 30 percent of urinations misdirected to near zero levels was obtained in the number of daily misdirected urinations for the four males who had a history of urination problems. During days 50 through 56 the target was removed; the number of misdirected urinations per day rose for the subjects, although not to pre-treatment levels. The increase in misdirections was again eliminated upon the replacement of the target. The author referred to this result as "autoshaped target directed behavior", although he failed to identify the precise stimulus-stimulus relationship. In any case, the subjects appeared to shape themselves in the absence of any response contingency, giving rise to the author's conclusion that this constituted an example of autoshaping.

One further example of autoshaping in humans has been reported

(Wilcove & Miller, 1974). These investigators conducted a series of experiments using college students as subjects. Their basic procedure consisted of placing uninstructed subjects in a room containing a translucent panel, a lever, and a penny-dispensing slot. The first five-minutes and last ten-minutes of each session consisted of a baseline condition, during which the panel was transilluminated for five-seconds on a variable-interval 20-second schedule. The period between the two baseline conditions (lasting 12-16 minutes) involved CS-UCS presentations, during which each CS presentation (the five-second transillumination of the panel) terminated with a penny dispensed in a slot (UCS). Under this procedure, subjects autoshaped; that is, they depressed the lever during the CS period prior to the UCS delivery. In a separate experiment, subjects who were exposed to the same procedure, except that the CS and UCS were presented randomly, failed to autoshape. Two differences emerged between this study and experiments conducted with animal subjects. First, humans responded during the baseline conditions as well as during the CS-UCS conditions. This baseline responding was not CS-controlled as it generally is during a CS-UCS condition. Second, the authors stated that the subjects who autoshaped under this procedure claimed, in post-session interviews, that they were being rewarded for their responses. In any event, the subjects responded in the presence of the CS during the autoshaping procedure, which is indicative of classical conditioning.

The important aspect of the directedness in auto-shaping (or sign tracking) is the nature of the autoshaped response. These responses tend to be species-specific and topographically similar to unconditioned responses that are elicited by unconditioned stimuli. Food, for example, is paired with open-beaked pecking in birds, licking and gnawing in rats and dogs. In Thompson and Sturm's (1965) study, the presentation of a mirror resulted in aggressive behavior in their Siamese fighting fish; this behavior is highly species-specific. Vocal communication also appears to be species specific. In man, this type of behavior is paired with many unconditioned stimuli, e.g., food, water, sex, social stimulation, etc. Taking the evidence provided by Bloom and her associates (Bloom, 1975, 1979; Bloom & Esposito, 1975) indicating that infant vocalizations can be "elicited" or "released", depending on the particular paradigm used in these studies, along with the universality and potential directedness of human vocalization, it would appear logical to attempt to autoshape vocalization in infants. Such an investigation would extend the generality of the autoshaping phenomenon and, perhaps even more importantly, would suggest that at least some components of vocalization are under Pavlovian control. This would not only add to our understanding of the necessary and sufficient conditions for vocalization in infants, but could possibly also provide a convenient technique for improving the deficient vocal skills of children in certain handicapped populations, e.g., the deaf, the mentally retarded, etc. The speech of mentally handicapped children, for instance, might be acquired or improved when Pavlovian procedures are employed, perhaps even when operant techniques have proved less than adequate.

STATEMENT OF THE PROBLEM

Bloom (1979) has raised an interesting issue: Is the acquisition of vocalizations in infants controlled by operant response-reinforcer contingencies, by Pavlovian stimulus-stimulus pairings, or by instinctual "releasing" mechanisms? As mentioned previously, the majority of research examining infant vocalization conditioning has pointed towards operant control, but more recent work (e.g., Bloom, 1977; Bloom & Esposito, 1975) has suggested that these "operant" studies were confounded by elicitation effects, either through Pavlovian procedures or "releasing" mechanisms.

The problem, therefore, is first to provide a test of the hypothesis that infant vocalizations are elicited and, second, to compare the effects of operant and Pavlovian conditioning procedures on infant vocalizations.

The first of these goals is met in Experiments 1 through 4, in which infants 16 to 18 months old are exposed to an autoshaping procedure under one of a number of experimental conditions. It is predicted that if Bloom's (1979) hypothesis concerning the elicitation of vocalizations is correct, subjects of this age would emit vocal sounds of the type presented by the experimenter during the temporal periods immediately preceding (and immediately after the experimenter's emission of the sound) and/or immediately following non-contingent food delivery. If Bloom's hypothesis is incorrect (at least for this age group), and vocalizations are not elicited, subjects should emit few or no vocalizations of the type voiced by the experimenter.

The second goal, that of comparing the effects of operant and Pavlovian procedures, is reached in the final experiment, Experiment 5. Here, subjects of the same age range as in the previous experiments are exposed to either: a) a discrete trials operant procedure with identical temporal parameters as in the previous experiments, but with food delivery only contingent upon a subject's response immediately after the experimenter's emission of the sound; or b) an autoshaping procedure identical to that used in the first four experiments except that infant vocalizations of the type emitted by the experimenter are always contingently rewarded with verbal praise. It is predicted that: a) if infant vocalizations are elicited (either through Pavlovian conditioning or by "releasing" stimuli), infant subjects would emit the appropriate vocalization in Experiments 1, 2, 3, 4, and/or 5b, but not in Experiment 5a (operant only); b) if infants vocalize because of response-contingent reinforcement, only those subjects in Experiemnt 5 (a and b) would produce the target sound; and c) if some combination of operant (contingent reinforcement) and Pavlovian (stimulus-stimulus elicitation) control is required, only those infants in Experiment 5b would emit the target sound.

EXPERIMENT 1: PILOT STUDY

Experiment 1 was conducted as a pilot study to determine if an autoshaping procedure would elicit infant vocalizations. In short, it was a test to determine whether the research idea was viable prior to conducting a parametric investigation.

Method

Subjects

Three infants served. At the start of the investigation, S1 (male) was 21 months of age, S2 (female) was 14 months of age, and S3 (female) was 16 months of age. Subjects were experimentally naive, and all vocalized. The male had a more extensive vocabulary than the females (especially S2) although no formal records of their language repertoires were made. Verbal consent was obtained from the parents of the three infants following an explanation of the nature of the investigation. (Appendix A constitutes the letter of explanation that was used in the experiments. The verbal explanations given to the parents of S1, S2, and S3 were similar to the written explanation presented in this letter.)

Setting and Apparatus

Subjects were located in either a crib or a playpen for the sessions. Each subject's sessions were conducted separately. S1's sessions were conducted either at the investigator's home (Sessions 1, 2, 3, 4, 10, 11) or in his own home (Sessions 5, 6, 7, 8, 9). S2's sessions were all conducted in her own home with one of her parents usually present.

S3's sessions were also conducted in her own home, but neither of her parents was ever present during the sessions. A tape recorder was used by the investigator to time intervals. Vocal responses of the subjects were recorded on data sheets as they occurred. (Appendix B constitutes a sample data sheet.) Toys belonging to the subjects were always present in the experimental setting. A variety of food items (e.g., ice cream, sherbet, Hostess Cup Cake, banana, etc.) was used as the unconditioned stimuli (UCS).

Procedure 1: Autoshaping

Sessions proceeded in the following manner. The investigator arranged a playpen or crib, placed the subject and some toys inside, and showed the subject whatever materials the investigator was working with that day (i.e., tape recorder, data sheet, food items). Prior to the start of the first trial, subjects were given a bite of one of the food items. Allowing 5 seconds for the consumption of the item, the investigator started the tape recorder, and Trial 1 began. Figure 1 shows the temporal parameters of the autoshaping trials used in this investigation. These trials consisted of an intertrial interval (ITI) of fixed duration, a to be conditioned stimulus (CS), and an unconditioned stimulus (UCS). For all three subjects, the CS consisted of the sound "Q" (vocally emitted by the investigator). The CS was presented immediately after the ITI. This particular sound was selected because it appeared infrequently (if at all) during initial interaction periods between

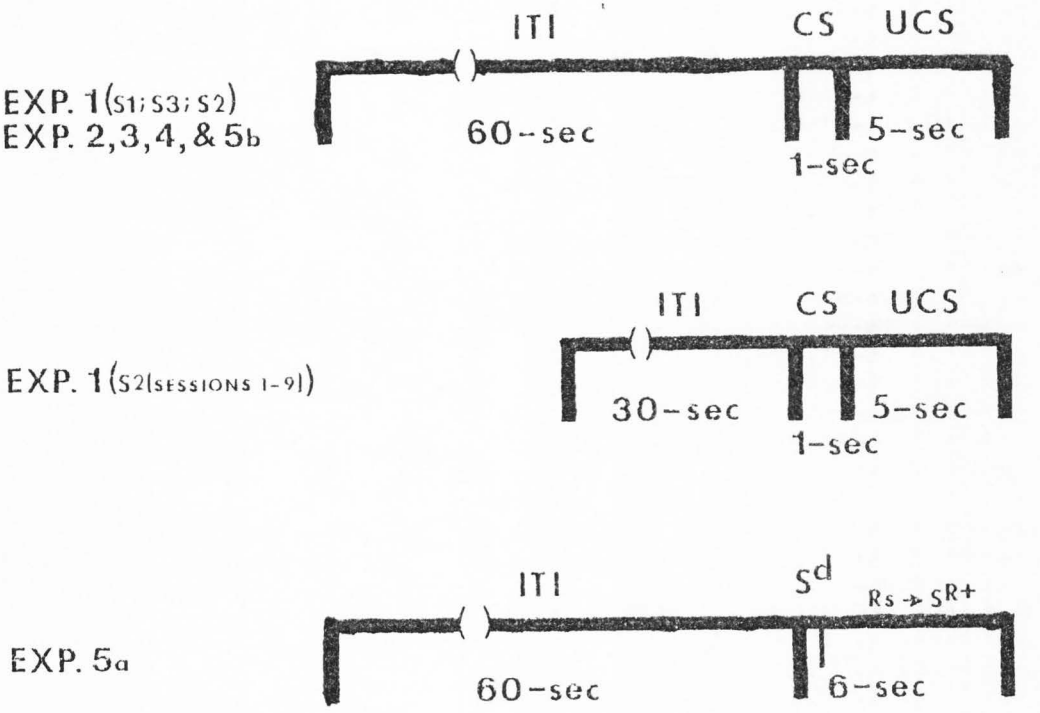

Figure 1. Temporal parameters of the procedures employed in the present investigation.

the subjects and the investigator.[1] Subjects were given about 1 second following this sound presentation to allow for a response to be emitted by the subjects before the UCS was presented. The sound was occasionally repeated (S1 and S2) or the subject's name spoken prior to the sound presentation (S3) if the subjects were looking away from the investigator or not attending (e.g., playing with a noisy toy) when the sound first occurred. The UCS was generally placed in the subjects' mouths when it was presented, although if the subjects grabbed the object or the spoon, the investigator allowed them to consume the item on their own in order to avoid struggling with the subjects. Subjects were allowed 5 seconds to consume the item, during which time the investigator praised the infants (e.g., "good boy/girl!") This praise was delivered regardless of whether the subjects ate the food item. If the item was uneaten at the end of this 5-second period, it was removed. Upon the termination of the 5-second UCS period, the next trial began.

The ITI for S1 and S3 was 60 seconds throughout the experiment. The ITI for S2 was 30 seconds for nine sessions and 60 seconds for the last (10th) session. S2's involvement was terminated after 10 sessions due to her permanent departure from the area. Her ITI was changed

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[1]S1, the son of a fellow graduate student and known to the investigator since birth, was never heard to say the phoneme "Q" prior to the study except on one occasion when the investigator asked the subject if he could say "Q", whereupon the subject responded with a close approximation of that phoneme. S2 and S3 were not heard to say "Q" prior to the study, and their parents stated that they did not remember either infant making that particular sound. The investigator asked each of the subjects "Can you say 'Q'?" prior to the start of the first session (except S1--he was asked about 24 hours prior to the first session). Both S1 and S3 responded with sounds that approximated "Q", while S2 made a sound that was similar to the sound "aah".

on the last day (Session 10) to determine if she would meet criterion under this temporal procedure prior to her termination as a subject. S1 had already reached criterion (see Results) with a 60-second ITI.

An attempt was made in each session to have the subjects play by themselves during each ITI. There were occasions, however, when the investigator interacted with the infants in order to maintain the infants' interest and attention. Investigator vocalizations were kept to a minimum during the ITI and were never the result of the subjects' emission of the sound "Q".

Procedure 1 ended for S2 when she terminated as a subject. Procedure 1 ended for S1 and S3 when they met a criterion of 15 successive trials with a conditioned response (CR). A CR was recorded when the subjects emitted the sound "Q" or a close approximation containing a main property of the sound "Q" (e.g., kū, ū, fū, koo) during the CS period described above or within 5 seconds of the UCS. This rule was adopted because of the high frequency of the response occurring in the first 5 seconds of the ITI and because of the possibility that the UCS was causing an incompatible response (mouth open) during the CS period. Due to external distractions and occasional nonattending on the part of the subjects (especially in the case of S2), some trials were recorded but not included in the results or in criterion requirements. The definition used to score a disruption trial involved the presence of an external (i.e., outside the experimental setting) stimulus such as the phone ringing, a parent entering or leaving the room, and so on, and either an orienting response away from the experimenter (e..g., toward the parent with back to experimenter) or a response that

was incompatible with the CR (e.g., looking at the experimenter and crying or shouting "Ma-Ma") resulting in the failure of the subject to accept the UCS. Disruption, by definition, was recorded only as it occurred during the CS and UCS periods. External disruptions which occurred during the ITI were recorded, but such trials were never labeled as disruption trials unless the disruption persisted into the CS and UCS period.

Sessions were conducted at about the same time of day for each subject. S1's sessions were conducted over a period of 5 weeks. S2's and S3's sessions were conducted over a 2½ week period.

Procedure 2: CS Only

After meeting criterion requirements, S1 and S3 were exposed to a second procedure. As in Procedure 1, each trial consisted of a 60-second ITI and a vocal CS ("Q"), but, in the present procedure, the UCS was eliminated. Instead of presenting a food item during the 5-second UCS period, the investigator just looked at the data sheet and stopwatch. This procedure was continued for five sessions for S1; he met a criterion at this point of five successive trials without a CR simultaneously with his completion of the five-session minimum for this condition. No five-session minimum requirement was imposed on S3; she met a criterion of 15 successive trials without a CR during the first session under this procedure.

Procedure 3: Autoshaping

Upon completion of Procedure 2, both S1 and S3 were re-exposed to the conditions of Procedure 1. In other words, the food item was again

presented during the 5-second UCS period. The subjects remained in this condition until they met the 15-trial criterion described above in Procedure 1.

Results

A summary of the raw data collected in Experiment 1 is presented in Table 1, and Figure 2 presents the percent of trials with at least one CR ("Q" or acceptable approximation) for each of the subjects during each session. Included in this figure are the CRs recorded during the CS period of each trial and CRs recorded in the first five seconds of the ITI period. Both Table 1 and Figure 2 show that the subjects in Procedure 1 eventually emitted many CRs. S1 increased his number of CRs substantially after Session 2 and met the auto-shaping acquisition criterion (15 trials in succession with a CR) during Session 6. S2 required more sessions (and many more trials) before she approached criterion. This may have been due to her age (14 months) or to the shorter ITI (30 seconds as opposed to 60-second seconds for S1). In any case, this subject neared criterion on Session 10, which was the last session that could be conducted with her, and it was the only session conducted that employed a 60-second ITI. While S2 did not meet the criterion, she emitted 11 CRs in succession and at least one CR in 92 percent of the final session's trials (see Figure 2). S3 increased her number of CRs substantially after the third session, and met the autoshaping criterion during Session 6.

Table 1

Number of Target Responses in Each Component of the Autoshaping Trial: Experiment 1

Trials	# of Target Responses ("Q") (CR)		
	ITI	CS	ITI (1st 5-seconds)
SUBJECT: S1		Procedure 1	
1-30	1	2	0
31-60	0	0	0
61-83	3	5	8
84-110	3	5	2
111-141	7	9	3
142-181$_{c1}$	10	23	5
		Procedure 2	
182-211	6	6	2
212-241	5	2	0
242-266	2	1	0
267-291	3	1	0
292-321$_{c2}$	1	0	0
		Procedure 3	
322-342	1	1	1
343-359$_{c1}$	1	15	0
SUBJECT: S2		Procedure 1	
1-44	4	4	0
45-84	7	7	0
85-112	5	8	0
113-142	5	7	0
143-179	2	6	0
180-208	6	7	3
209-245	5	1	3
246-275	7	8	4
276-306	3	7	0
*307-326	4	7	9

c1 = Autoshaping criterion met (15 successive trials with at least 1 CR)

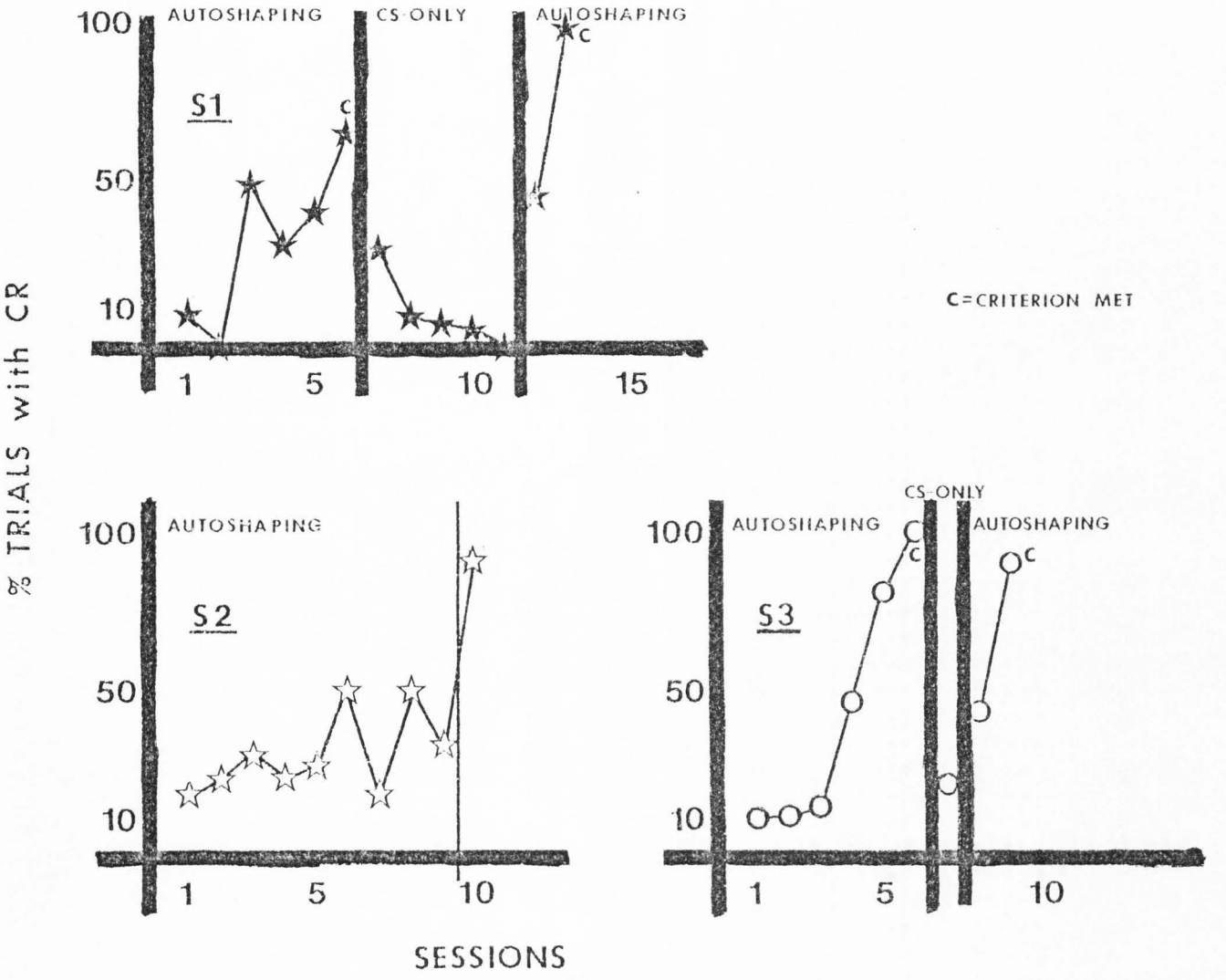
c2 = CS-only criterion met (5 day minimum plus 15 successive trials with no CR)

* = ITI changed from 30-seconds to 60-seconds

Table 1 (cont.)

Trials	# of Target Responses ("Q") (CR) ITI	CS	ITI (1st 5-seconds)
SUBJECT: S3			
		Procedure 1	
1-28	3	2	2
29-47	0	0	2
48-61	6	2	0
62-91	7	8	6
92-115	4	9	12
$116\text{-}132_{c1}$	2	10	6
		Procedure 2	
$133\text{-}153_{c2}$	1	4	0
		Procedure 3	
154-180	9	5	11
$181\text{-}198_{c1}$	3	13	6

c1 = Autoshaping criterion met (15 successive trials with at least one CR)
c2 = CS-only criterion met (5 day minimum plus 15 successive trials with no CR)


100
50
10
AUTOSHAPING
CS-ONLY
AUTOSHAPING
S1
C
C
1
5
10
15
% TRIALS with CR
C=CRITERION MET
100
50
10
AUTOSHAPING
S2
1
5
10
CS-ONLY
100
50
10
AUTOSHAPING
C
AUTOSHAPING
S3
C
C
1
5
10
SESSIONS

In Procedure 2 where the CS was presented in the absence of the UCS, a rapid decrease in emissions of the CR occurred for S1 and S3. Percent of trials with at least one CR (see Figure 2), for instance, decreased for S1 from 28 percent during the first session (Session 7) of this procedure to 0 percent by the end of the fifth session (Session 11) of this procedure. In addition, the total number of CRs emitted by this subject decreased to zero by this last session (Session 11). It was also of interest that this subject began responding "No" occasionally when the CR was presented during this procedure. These "No's" were stated emphatically and often with a shake of the head and a frown. During Session 11, the subject emitted seven of these "No's" and even responded with a "Yuk" on one occasion. S3 exhibited even faster elimination of the CR; she met a criterion of 15 trials in succession without a CR after Trial 21 of the first session (Session 7) of this procedure.

In Procedure 3, S1 and S3 were re-exposed to the autoshaping condition of Procedure 1. Both S1 and S3 met the autoshaping criterion (15 successive trials with at least one CR) during the second session (Session 13 and Session 9, respectively) of this procedure. Unlike his performance in Procedure 2, S1 never emitted the sounds "No" or "Yuk" during Procedure 3.

In addition to presenting the CR data just described, Table 1 shows the trials per session for each subject, the number of ITIs with a target vocalization per session, the number of UCS periods with a

target vocalization per session. For S1, the average session length was 30.17 trials in Procedure 1, 28.0 trials in Procedure 2, and 19.0 trials in Procedure 3. Only seven trials were labeled "disruption" in Procedure 1, two in Procedure 2 and five in Procedure 3. S1 never emitted a target vocalization during the UCS period but emitted averages of 4.0, 3.4, and 1.0 target vocalizations in the ITI per session during Procedures 1, 2, and 3, respectively. For S2, on the other hand, the average session length during Procedure 1 was 32.6 trials. Sixty-six trials (20.25 percent) were labeled "disruption". Like S1, S2 never emitted a target vocalization during the UCS period. She did emit an average of 4.8 target vocalizations in the ITI per session. S3's average session length was 22.0 trials during Procedure 1, 21.0 trials during Procedure 2, and 22.5 trials during Procedure 3. Eleven trials during Procedure 1 and one trial during Procedure 3 were labeled "disruption". Like the others, S3 never emitted vocalizations during the UCS periods; she did, however, emit an average of 3.7, 1.0, and 6.0 ITI vocalizations during the three procedures, respectively.

Discussion

The data collected in Experiment 1 suggested that a particular target sound ("Q") could be produced by subjects who were exposed to a standard autoshaping procedure. A 21-month-old male infant reached a 15-trial criterion of acquisition in six sessions after a total of 181 trials. This same subject, when exposed to a reversal condition when

the CS was presented with no UCS, decreased his CR emissions to zero after five more sessions. When subsequently re-exposed to the first autoshaping procedure, he again increased his CR emission reaching the 15-trial criterion of acquisition in two more sessions.

A 14-month-old female infant, who left town before criterion was met, approached criterion during Session 10 after a total of 326 trials. However, 306 of those trials were presented with a 30-second ITI, while the 20 trials of Session 10 were presented with an ITI of 60 seconds.

A 16-month-old female infant met the autoshaping criterion during the sixth session, after 132 trials. Like S1, S3 quickly ceased emitting CRs when the UCS was eliminated, and quickly met the autoshaping criterion a second time when the first procedure (UCS present) was reinstated.

The results of this pilot experiment indicated the importance of this procedure and warranted its further investigation. An obvious shortcoming of the present experiment was the lack of several control groups that typically assist in isolating the autoshaping effect. Experiment 2, therefore, was designed to replicate the findings of Experiment 1 in a group design with a number of additional variables controlled.

EXPERIMENT 2

In Experiment 1, infant subjects emitted vocal sounds of a particular type ("Q") when exposed to an autoshaping procedure. A shortcoming of Experiment 1, however, was that it tested three subjects in the absence of baseline or operant level recordings of vocalizations, and there was an absence of certain obvious control conditions. Several uncontrolled variables could have confounded the results. First, the subjects matured somewhat over the course of the testing time, and their increased use of the sound "Q" may have occurred simply because of the subjects' increased developmental ages. Second, the subjects may have "warmed up" to the investigator after a period of time and merely increased their rate of vocalizations as a result of their familiarity with the experimenter. Third, the investigator (AMM) served as the experimenter in Experiment 1 in the absence of an independent observer.

Experiment 2 was conducted in an attempt to replicate Experiment 1 while controlling for these possible confounding variables. Two groups of five subjects each were employed. Both groups were exposed to identical Baseline recording conditions. One group (No Treatment/Control) was maintained on this Baseline condition following the one week Baseline period, while the other group (Autoshaping) was exposed to the autoshaping procedure used in Experiment 1. The control group was used to control for the first two confounding variables, namely maturation and familiarity. The third variable, independent experimenters, was controlled by using naive female experimenters who recorded subject vocalizations concurrently with independent, naive observers.

Method

Subjects

From the local area, 35 infants (13 boys, 22 girls) were selected as the subject population for Experiments 2 through 5. The subjects were obtained through advertisements placed in the Utah Statesman (the Utah State University newspaper), flyers posted in the entrances to the married student housing areas on the Utah State University campus, and through phone calls to former students of the local (Cache Valley) Childbirth Education Association. Subjects were selected so that they were between the ages of 16 and 18 months at the start of their involvement in the investigation. Parents were fully informed as to the nature and content of the investigation and signed informed consent forms prior to the start of their infant's participation (Appendix A). Upon request, parents received a brief summary of the results of the investigation following its completion (Appendix C). Subject confidentiality was protected by coding the subjects by numbers. During the course of the investigation, the experimenters and observers knew the names of only those subjects with whom they were working. Parents requesting the brief Summary of Results (Appendix C) received only coded results.

Of the subject population, 14 infants (6 boys, 8 girls) were randomly selected, with the restriction that they were between 16 and 18 months at the start of the involvement, to serve in the present

experiment. Seven subjects were randomly assigned to each of two groups. Two subjects in each group were then selected at random to serve as alternates, in the event of subject attrition. As there was no attrition in the investigation, these alternate subjects were never actually employed.

Setting and Apparatus

Sessions were conducted in the subjects' homes, with the subjects located in a crib (Subjects A1, A5), a playpen (Subjects A2, A4, C3), or a small room (Subjects A3, C1, C2, C4, C5). The setting included some of the subjects' own toys. One parent remained in the room if he/she desired. Occasionally, if the parent seemed to be distracting the infant, the parent was requested to leave the setting until the infant "got used to the situation". Similarly, some infants (C1, C2, C4) refused to cooperate unless the parent was in the room; with these subjects, the parents were requested to remain in the room, and be as unobtrusive as possible. All parents complied with these requests. Two of the subjects in the No Treatment/Control (C) group were fraternal twins; this presented a problem as one of the twins refused to cooperate with the experimenter unless her sister was present in the room. After a week of unsuccessful attempts at conducting sessions, the two twins were permitted to remain together and their sessions occurred successively; that is, one subject's vocal behavior was recorded, and then the other subject's vocal behavior was recorded.

The apparatus consisted of three tape recorders (used one at a time), three dual earplug sets (each one consisting of two earplugs to permit the experimenter and the observer to listen simultaneously to

the recorder), data notebooks (Appendix B), pencils for recording data, a grab bag of assorted toys, and preselected food items for use as the UCS. Each subject's parents selected two preferred food items for use in the experiment. It was found that these items occasionally had to be altered when the infant refused to eat them. For Subjects C3 and A4, the apparatus also included a playpen, owned by the investigator.

Experimenters

Three female undergraduate students at Utah State University were selected to serve as experimenters. Each experimenter was responsible for conducting sessions with her randomly assigned subjects, and the experimenters were the only individuals to interact directly with those assigned subjects throughout the experiment. Experimenter 1 was assigned Subjects A1, A2, A5, and C3; Experimenter 2 was assigned Subjects A3, A4, and C5; and Experimenter 3 was assigned Subjects C1, C2, and C4. The experimenters were selected on the basis of their interest in working with infants, their rapport with infants, their willingness to work up to three hours per day, five days per week, and their ability to master their duties as experimenters (delivering CSs and UCSs appropriately, recording data, interacting with subjects), all defined by the investigator's judgment. The experimenters received academic credit for their participation (three credit hours per quarter for three quarters).

Observers

Four undergraduate students (two males, two females) were selected to serve as observers. The main purpose of the observers was to record

four important events: the recording of vocalizations, the recording of target sounds ("Q"), the recording of trials classified as "disruption" trials, and the recording of deviations from the stated procedures. Each observer was randomly assigned subjects to observe, except when there were time conflicts (e.g., courses) in which case the observer was assigned to another subject. For each subject, one assigned observer and one assigned experimenter recorded data on trials concurrently. The difference between the observer's role and the experimenter's role was that the observer never interacted with the subject more than was absolutely necessary, while the experimenter conducted all experimental interactions (i.e., delivering CSs and UCSs and interacting with the infant when necessary). The observers were as unobtrusive as possible while in the presence of the subject. The observers received academic credit for their participation (usually three credit hours per quarter).

Investigator

The investigator maintained data files and records, scheduled subject sessions, experimenter schedules, and observer schedules, attended as many sessions as possible, ensured that the procedure was followed correctly at all times, selected and trained the experimenters and observers, selected the subjects, made all random assignments, conducted and scheduled the introductory session, interacted with parents, and completed the data analysis and the present report. He occasionally served as an observer when a regularly scheduled observer was absent for a session, and no other observer was available to take his/her place.

Behavioral Definitions

Conditioned response (CR). As in Experiment 1, a conditioned response (CR) consisted of a target vocalization ("Q"), or an acceptable approximation that was emitted by the subject either during the CS period or during the first five seconds of the ITI period. Responses of this type that were made at other times were recorded but were not considered CRs. An "acceptable approximation" of the vocalization was any vocal sound that contained a major property of the sound "Q". Any "ū" sound was acceptable; as was any "kū" sound, or "ka-ū" sound. The sound "oo" was acceptable when emitted alone or preceded by a "k" sound (i.e., "k-oo"), but not if preceded by any other sound (e.g., "boo" was not acceptable). In each case, however, observer agreement was necessary before the sound was classified as a CR. During the Baseline condition, identical responses were recorded as "target vocalizations" rather than "conditioned responses", since the CS and UCS were absent during this condition.

Disruption. This was defined as in Experiment 1: those trials which were disrupted were recorded but not considered in the data analysis. Observer agreement was required before a trial was labeled a "disruption" trial.

Vocalizations. The number of vocalizations per session was also recorded. A vocalization was defined as a discrete, voiced sound occurring within a respiration. Hiccoughs, sneezes, coughs, fussing sounds, and cries were recorded but were not included in the definition of vocalizations. The exception to this was when the subject uttered a sound which did qualify as a vocalization concurrently with

a cry. For instance, when the infant cried across, say, three respirations, and uttered the sounds "Ma-Ma" during the second respiration, but while still crying, the "Ma-Ma" was recorded as two vocalizations. The crying was not.

Experimenter/Observer Training

The experimenters and the observers trained together under the supervision of the investigator. The investigator, observers, and experimenters reviewed the nature and procedures of the investigation; discussed, reviewed and presented examples of the definitions concerning vocalizations, the CR, and "disruption"; practiced using the tape recorders and delivering CSs and UCSs (experimenters only); and practiced recording data. The experimenters and the observers were "blind" with respect to experimental design; that is, they were chosen to be unknowledgeable in terms of formal expectations, and the investigator took care not to divulge any information that might lead the experimental personnel to expect any particular outcomes of the various experimental conditions. The investigator demonstrated how interobserver agreement was calculated, and specified the procedure that was followed when disagreements arose between observer and experimenter. Specifically, disagreements always resulted in refusing to record a response as a CR, in the case of a CR disagreement, or retaining a trial in the event of a "disruption" disagreement. Experimenters and observers were never aware of disagreements until after the fact (i.e., after the day's sessions).

Following this initial rehearsal, the experimenters and the observers conducted training sessions, under the supervision of the investigator, using a tape recording of a session of a subject employed in Experiment 1 (S1), and a tape recording of the investigator. The purpose of this training phase was to obtain good recording and agreement skills among all the experimental personnel. After several practice runs through these tapes, during which the investigator discussed any difficult sounds or disagreements, the experimental personnel recorded the vocalizations as if the sounds were coming from a subject in an actual session, employing the apparatus (i.e., tape recorder, earplugs, data sheets) they were to use in such a session. When observer agreement exceeded 90 percent on each tape for all observers and experimenters, this training phase was terminated.

The final training phase consisted of the experimenters and observers conducting practice sessions with the investigator's infant (aged 23 months). During this phase, as in the previous phase, the personnel and the investigator recorded vocalizations, target sounds and CRs, and disruptions, employing the experimental apparatus. Simultaneously, the experimenters were trained to interact with the subject. The investigator demonstrated several trials of CS and UCS presentation and discussed the do's and don'ts of experimenter-subject interactions. For example, no vocal interaction took place except when appropriate during the CS and UCS, and only necessary nonvocal interactions during the remaining periods of the trial. The experimenters then took turns conducting the sessions, during which the investigator and the remaining experimenters commented on mistakes and examples of appropriate behavior on the part of the practicing experimenter. It was also stressed that the experimenters should present the CS and UCS as enthusiastically as possible. When the investigator was

satisfied that the experimenters were conducting the sessions appropriately, the experimenters were comfortable in their task, and interobserver agreement was 90 percent or better, the training sessions were terminated.

Experimenter attrition was not a problem. All three experimenters served for the duration of the investigation (Experiments 2 through 5). Two observers left the team after the first quarter (after Experiment 2 was completed) and were replaced by one other female observer who received training in the manner previously described.

Agreement Measures

Three measures of interobserver trial-by-trial agreement were calculated for each dependent variable (i.e., trial numbers per session with at least one CR, trial numbers per session labeled as "disruption" trials, number of target sounds ("Q") per session, and number of vocalizations per session). First, Occurrence Agreement was calculated by dividing the number of trial-by-trial agreements on the occurrence of a response by the total number of agreements plus disagreements of that response and by multiplying by 100. Second, Nonoccurrence Agreement was calculated by dividing the number of trial-by-trial agreements on the nonoccurrence of a response by the total number of agreements plus disagreements and by multiplying by 100. Finally, Overall Observer Agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and by multiplying by 100.

If interobserver agreement on any of the three measures fell below 80 percent during the course of the experiment, the observers and the experimenters reviewed the definitions with the investigator and discussed any problems. Practice sessions were conducted if they were considered necessary (only two such sessions occurred over the course of the entire

investigation). Throughout the investigation, the investigator met with the experimenters and the observers and discussed complications or difficulties in procedures and reviewed the definitions and procedures. These meetings ensured that the definitions and procedures did not change over the course of the study and provided an opportunity for the investigator to review the performances of the experimenters and observers. The experimenters and observers used this time to provide feedback to the investigator.

Experimental Procedures and Conditions

Introductory session. Prior to the start of the subject's involvement in the experiment, the investigator and assigned experimenter met with the subject and his/her parent. The purpose of this 30-minute session was twofold; first, it gave the experimenter a chance to get to know the subject, and to play with the subject, so that when the actual experimental sessions began (usually the next day) the subject would not be faced with a complete stranger. Second, it presented an opportunity for the investigator to describe the nature and content of the study to the subject's parent, answer any questions, present the informed consent letter to the parent, and obtain the signed informed consent from the parent. Also during this introductory period, the investigator obtained information necessary for the study; such as, what were two preferred food items to use as UCSs, where the experimental session could occur (e.g., in the child's bedroom, in the living room, etc.), and whether the infant would be put in a playpen, crib, or just in a small room.

Baseline. The Baseline procedure consisted of the experimenter interacting, in a way as similar to the other procedures as possible, with the infant subject without delivering CSs or UCSs. The observer and the experimenter recorded the number of vocalizations per trial per session, the

overall number of subject-emitted target vocalizations ("Q") per trial per session, and the number of trials per session with at least one target vocalization ("Q") during the 11-second period which corresponded to the CR period in the Autoshaping procedure (that is, the one-second CS period, plus the five-second UCS period, plus the first five-seconds of the ITI--next trial--period). Typically, the daily sessions consisted of 30, 66-second trials, which lasted a total of 33 minutes. The Baseline condition was terminated after the subject was exposed to 150 such trials.

Autoshaping (A). The autoshaping procedure consisted of the experimenter presented trials commencing with a 60-second ITI, a one-second CS (with the vocal stimulus "Q" presented once by the experimenter), and a five-second UCS during which the subject was offered a bite of one of the food items. Figure 1 (top panel) shows the temporal parameters of this procedure. As in Experiment 1, the UCS was placed in the subject's mouth unless it was refused. Each subject was allowed five seconds to consume the food during which time the experimenter praised the infant. This praise consisted of the enthusiastic exclamation of either "good boy/girl!" or "big boy/girl!" and was presented at the very beginning of the UCS period, as the experimenter raised her hand with the food offering. It was delivered regardless of whether the infant made a vocal response or ate the food item. If the food was uneaten at the end of the five-second UCS period, it was removed. The next trial began upon termination of the five-second UCS. Sessions typically lasted 33 minutes (30 trials). Prior to the initiation of the experiment, it was decided that the autoshaping condition would last a maximum of 500 trials (not including "disruption" trials), or until an autoshaping acquisition criterion of 15 successive trials with at least one CR per trial was met before the 500-trial maximum. Here and throughout the

investigation, the experimenter and the observer recorded the number of trials with at least one CR per session, the number of trials labeled "disruption" per session, the overall number of target vocalizations ("Q") per trial per session, and the number of vocalizations per trial per session.

Those subjects (N = 5; 2 boys, 3 girls) assigned to this Autoshaping condition were exposed to the procedure immediately following the termination of the Baseline.

No Treatment/Control (C). Subjects assigned to the No Treatment/Control condition (N = 5; 2 boys, 3 girls) received an identical procedure to that received during their Baseline exposure. In short, after completing the 150 trials of Baseline, each No Treatment/Control subject received another 500 (maximum) trials of the same procedure. All recordings made by the experimenter and the observer were as they were during the Baseline condition. Prior to the initiation of the experiment, it was decided that these subjects would be yoked to the subjects in the Autoshaping (A) group for purposes of determining amount of exposure to the condition. Therefore, each subject in each group was randomly assigned a number 1 to 5. Then, subjects receiving the number 1 were yoked, subjects with the number 2 were yoked, and so on for all five subjects in each group. The purpose of this yoking procedure was to provide the same amount of exposure to the Autoshaping or the No Treatment/Control for each condition. For example, if Subject 1 of the Autoshaping group (A1) met the autoshaping acquisition criterion (say, after 60 trials) thereby completing the condition, Subject 1 of the No Treatment/Control (C1) group had his/her involvement in the

Control condition terminated at the same point (after 60 trials). If Subject 5 of the Autoshaping group received 500 trials of the condition, then Subject 5 of the No Treatment/Control group also received 500 trials of the Control condition.

General Procedure

Sessions proceeded in the following manner. The experimenter and the observer arrived at the subject's home, entered, and the observer retired immediately to a seat in the room where he/she could observe the setting clearly and still be inconspicuous. The experimenter, meanwhile, set up the equipment in the manner described in Experiment 1. Prior to the start of the first trial, the experimenter gave the subject a bite of one of the food items. The subject was allowed five seconds to consume the item; this seemed sufficiently long, based on Experiment 1 observations, for the subject to finish eating the item. The experimenter then started the tape recorder with the appropriate cassette tape already in it and Trial 1 began. There were three cassette tapes; each one had the Autoshaping procedure tape on one side and the No Treatment/Control tape on the other side. Each tape presented appropriate instructions to the experimental personnel. That is, the ITI, CS, UCS, and first 5-second (ITI) periods were signalled; e.g., "Ready, CS".

An attempt was made to have the subject in each session play by him/herself during each ITI. The experimenter interacted with the infant only nonvocally and only when it was necessary to do so in order to maintain the infant's interest and attention.

The experimenter and the observer listened to the same tape recorder simultaneously, and both recorded the subject's relevant behavior

as previously described. The observer also recorded any deviations from the appropriate procedure. The investigator did this as well when he was present. During the Baseline condition, additional tape recorders were used to record the sessions, not only to capture the subject's vocal behavior but also to detect any errors in the procedure.

Sessions were conducted five days per week at about the same time of day for each subject. An attempt was made when scheduling the subjects to conduct the sessions at the optimal time of day for each child, i.e., when the infant was least likely to be irritable (e.g., after naps, after meals). Sessions were typically 30 trials long (33 minutes), although this varied somewhat depending on the child's disposition, health, etc.

Results

Observer Agreement

Mean percent observer agreement between the experimenter and the observer for the subjects in the Autoshaping group was 80.87 (Occurrence), 98.19 (Nonoccurrence), and 98.21 (Overall) when recording conditioned responses (CRs), and 87.52 (Occurrence), 89.30 (Nonoccurrence), and 90.02 (Overall) when recording vocalizations per trial. Similarly, mean percent observer agreement for the subjects in the No Treatment/Control group was 75.00 (Occurrence; only one subject ever emitted CRs), 99.95 (Non-occurrence), and 99.93 (Overall) for conditioned responses (CRs), and 86.49 (Occurrence), 91.42 (Nonoccurrence), and 90.97 (Overall) for vocalizations. Appendix G presents individual subject data for each of these measures during Experiment 2.

Treatment Effects

A summary of the results for each subject and group in Experiment 2

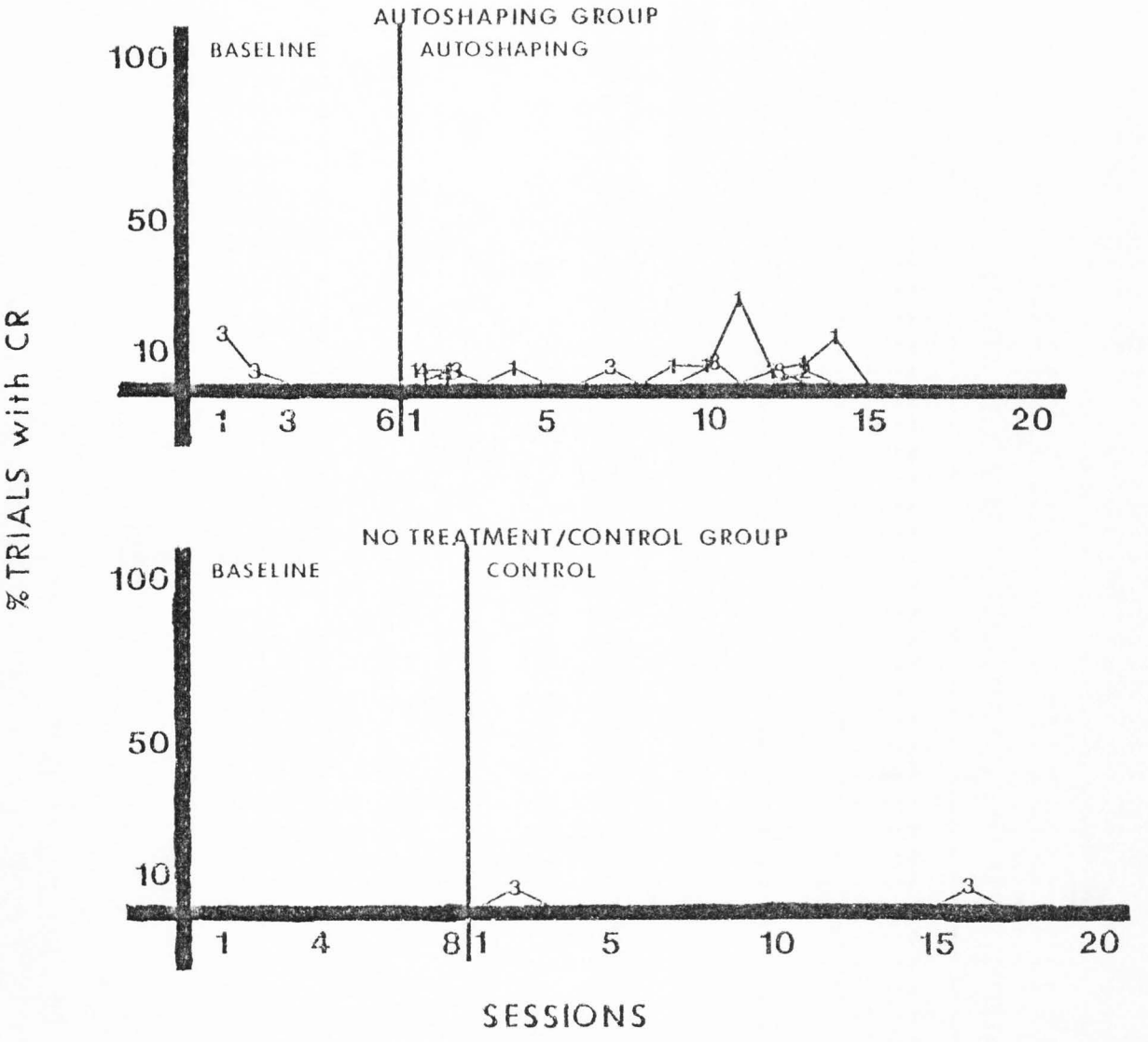
Table 2

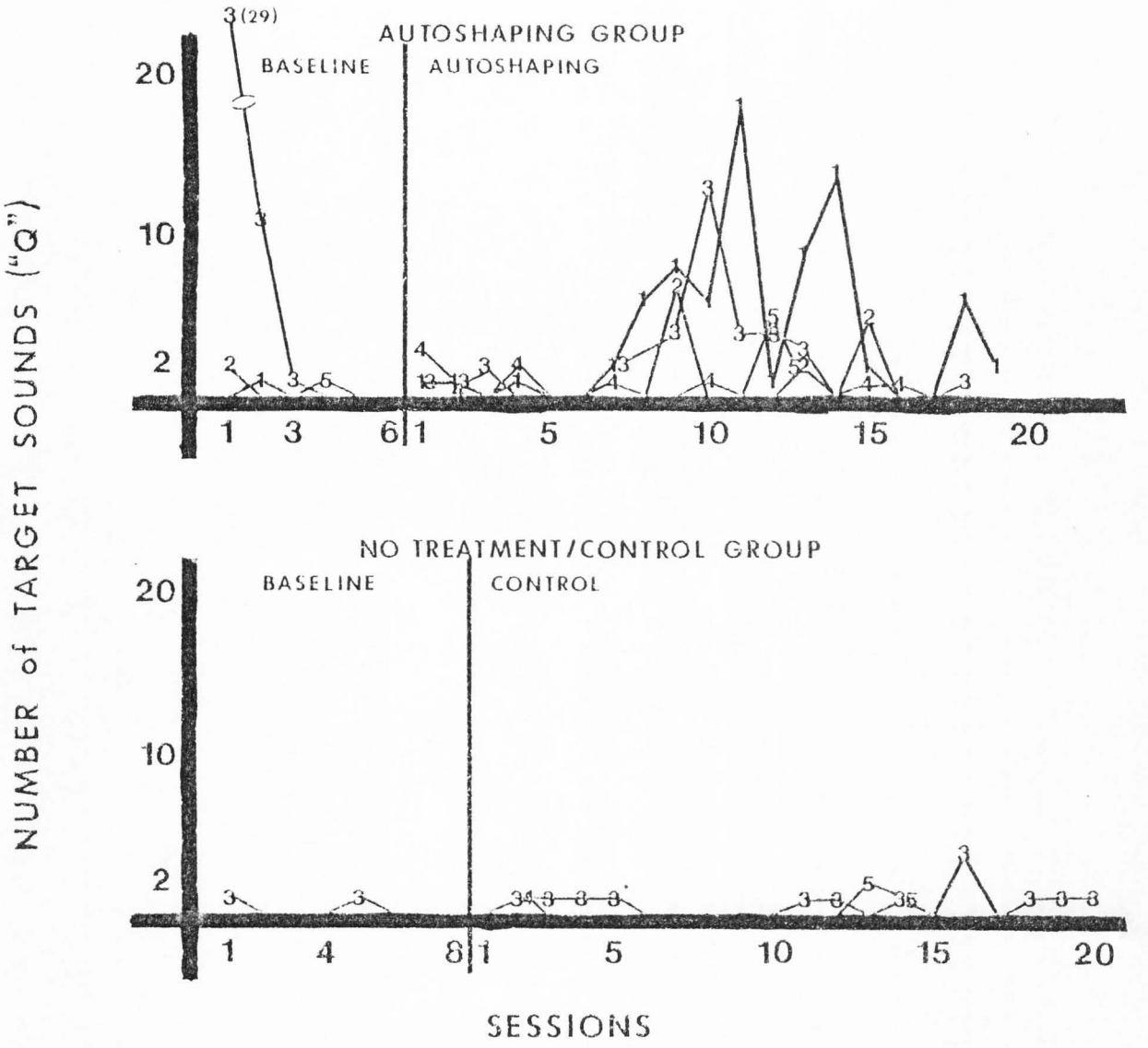
Summary of Results For Each Subject and Group In Experiment 2

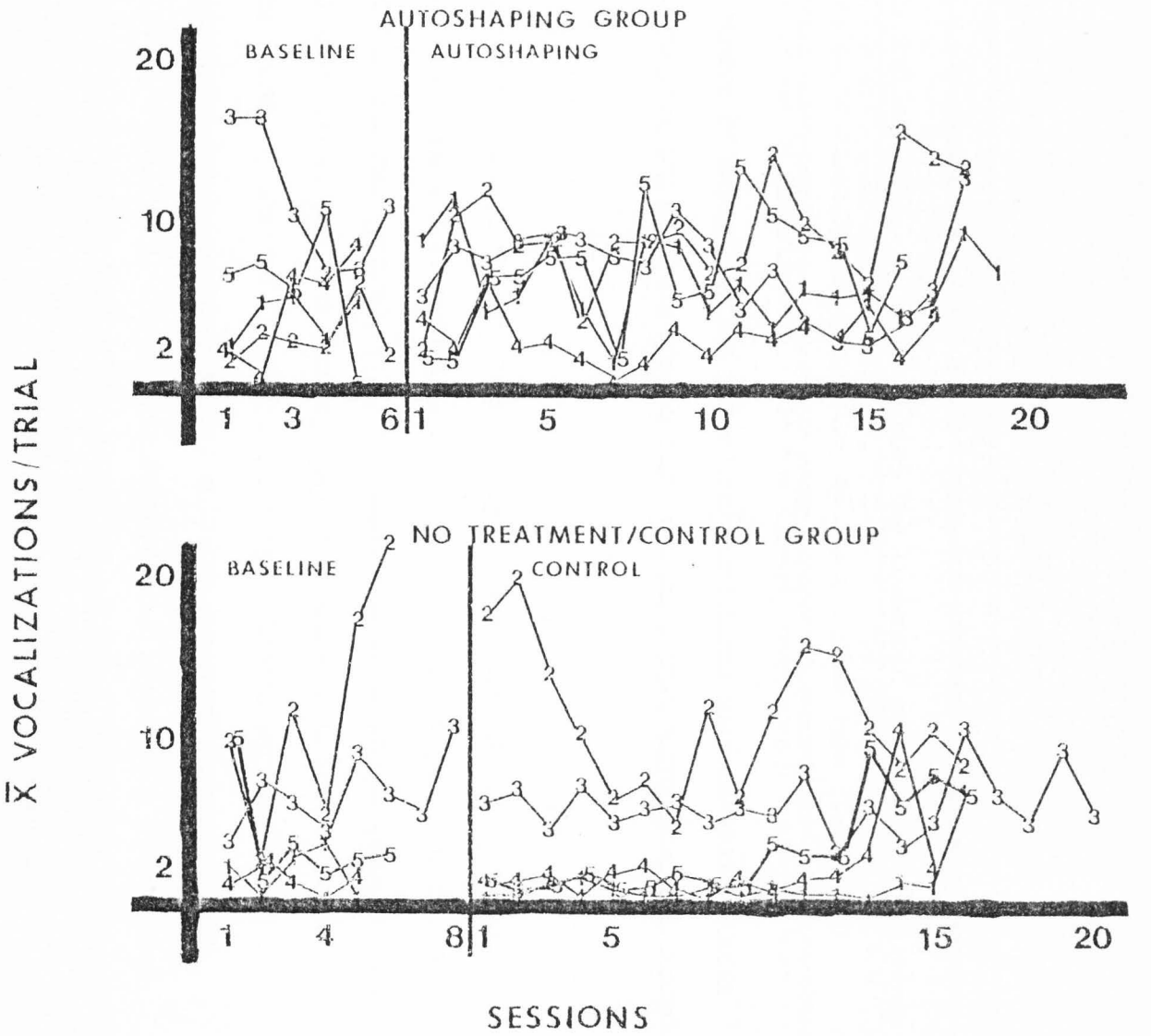
Autoshaping Group Subject	$\bar{X}$ Percent Trials With CR/Session		$\bar{X}$ Total Target Vocal/Session		$\bar{X}$ Vocalizations/ Trial/Session	
	Baseline	Treatment	Baseline	Treatment	Baseline	Treatment
A1	0.0	3.87	0.20	4.05	3.97	6.15
A2	0.0	0.18	0.33	0.78	2.79	9.27
A3	3.19	1.04	6.83	1.94	11.29	6.93
A4	0.0	0.39	0.0	0.59	4.79	2.85
A5	0.0	0.0	0.20	0.44	6.19	6.73
$\bar{X}$	0.64	1.10	1.51	1.56	5.81	6.39
No Treatment/Control Group						
	Baseline	Control	Baseline	Control	Baseline	Control
C1	0.0	0.0	0.0	0.0	1.74	0.97
C2	0.0	0.0	0.0	0.0	11.47	11.13
C3	0.0	0.58	0.25	0.70	6.64	5.95
C4	0.0	0.0	0.0	0.07	1.20	1.96
C5	0.0	0.0	0.0	0.19	3.44	2.96
$\bar{X}$	0.0	0.12	0.05	0.19	4.90	4.59

is presented in Table 2. Appendix D (Autoshaping group) and Appendix E (No Treatment/Control group) contain summaries of the raw data for each session and for each subject in Experiment 2. Appendix F contains a more specific summary of these data; it presents data on the percent of trials with at least one CR, the number of target vocalizations (total), and the mean number of vocalizations per trial for each session for each subject in Experiment 2. Figures 3, 4, and 5 graphically portray the data presented in Appendix F, respectively.

As can be seen from all these sources, the results of Experiment 1 were not replicated in Experiment 2. Whereas in Experiment 1 the subjects produced large percentages of trials with CRs (two of the three subjects reached autoshaping acquisition criterion and the third subject approached this criterion), the subjects in the Autoshaping group of Experiment 2 rarely emitted CRs at all (see Figure 3, top panel). Examining Figure 4, which presents the total number of target sounds ("Q") emitted by the subjects during each session, it can be seen that the subjects in the Autoshaping group emitted more target sounds throughout the trials than did the subjects in the Control group, but almost all of these target sounds occurred during the ITI of the trials. Similarly, it is clear from Figure 5 (which presents the mean number of vocalizations per trial per session for each subject) and Table 2 that the Autoshaping group vocalized more than did the Control group, but the Autoshaping group also vocalized more during the


AUTOSHAPING GROUP
BASELINE
AUTOSHAPING
100
50
10
1
3
6
1
5
10
15
20
NO TREATMENT/CONTROL GROUP
BASELINE
CONTROL
100
50
10
1
4
8
1
5
10
15
20
% TRIALS with CR
SESSIONS


AUTOSHAPING GROUP
BASELINE
AUTOSHAPING
3(29)
20
10
2
1 3 6 1 5 10 15 20
NO TREATMENT/CONTROL GROUP
BASELINE
CONTROL
20
10
2
1 4 8 1 5 10 15 20
NUMBER of TARGET SOUNDS ("Q")
SESSIONS


AUTOSHAPING GROUP
BASELINE
AUTOSHAPING
20
10
2
1
3
6
1
5
10
15
20
NO TREATMENT/CONTROL GROUP
BASELINE
CONTROL
20
10
2
1
4
8
1
5
15
20
X̄ VOCALIZATIONS/TRIAL
SESSIONS

in Experiment 1 the investigator interacted freely and vocally (although never using the target sound); 5) the investigator knew either the parents or the subjects in Experiment 1, while the experimenters in Experiment 2 never met the family or the subject prior to the first introductory session, which usually occurred one day prior to the start of the experiment; and, 6) the investigator (AMM) was not the experimenter in Experiment 2 as he was in Experiment 1, and independent observers were added to the experimental setting in Experiment 2.

Experiments 3a, 3b, and 4 were designed to determine whether any or all of these procedural changes contributed to the failure to replicate the findings of Experiment 1 in Experiment 2. In Experiment 3a the identical procedure was used as in Experiment 2, except that the Baseline phase was eliminated. Experiment 3b used the identical procedure as used in Experiment 1 (that is, no Baseline, repeated CSs as needed, a variety of preferred food items for the UCS, no instructions on interactions except for no experimenter-emitted target sounds) except that the subject's mother served as the experimenter in an attempt to test the effect of experimenter-subject familiarity. Experiment 4 also used the same procedure as used in Experiment 1, and the investigator served as the experimenter. (NB: An independent observer was included, however).

Baseline period, which suggests that these subjects vocalized more due to non-experimental factors.

In short, it can be said that none of the subjects in Experiment 2 demonstrated autoshaping of any kind of vocalization.

Discussion

No matter what differences there were between the Autoshaping and Control subjects, it is clear that the treatment procedure, Autoshaping, failed to elicit vocal responding of a particular type (i.e., "Q") as it had in Experiment 1. It has already been noted, however, that a number of Experiment 1's procedural conditions were changed in order to control for possible confounding variables that might have influenced the results of Experiment 1. These considerations resulted in the following procedural changes: 1) a baseline phase was added in an effort to control for any "warming up" effect, and to allow the subjects and experimenters to become familiar with each other prior to the start of the treatment procedure; 2) the experimenter no longer repeated the CS when the subject was looking away or appeared not to have heard the sound; 3) whereas in Experiment 1 the subjects were presented a variety of foods, in Experiment 2 only two items were used for each subject. Initially, the parents selected the items; this was changed if and when it appeared that the subjects were not going to eat those items; at that time, the investigator picked two food items with the cooperation of the parents of the subject; 4) experimenter interactions with the subject were kept to a minimum, and were never vocal;

EXPERIMENT 3

The findings of Experiment 2 failed to replicate those of Experiment 1, in which two of three subjects reached an autoshaping criterion and the third almost met the criterion. Instead, an autoshaping procedure similar to that used in Experiment 1, but with some procedural changes, had little or no effect on subjects' emission of the target sound.

Experiment 3a was conducted to determine whether the failure to replicate in Experiment 2 was due to the added Baseline condition of Experiment 2, and Experiment 3b was conducted to see if the results of Experiment 1 could be replicated if specific instances of the original conditions were reinstated in the autoshaping procedure.

In Experiment 1, no Baseline condition was presented. Bloom (1979) suggested that, in studies looking at the conditionability of vocal behavior in very young infants, the operant baseline procedure may actually serve to suppress the behavior that is later "conditioned". In other words, this procedure provides an abnormal social and linguistic setting that may in and of itself affect behavior. For instance, in the present setting, the experimenter and observer served as very unusual adult figures in the experimental setting. During Baseline, any infant vocal behavior was ignored (and therefore possibly on extinction), and, because the observer did not interact at all and the experimenter interacted only when absolutely necessary, the social relationship between the infant and the experimental personnel may have been neutral or even aversive. Finally, the infant was expected to play by him/herself during

the baseline sessions. It was possible that the infants, over the course of the baseline condition learned to ignore the experimenter.

To test the possibility that the Baseline condition in Experiment 2 resulted in the failure to autoshape particular vocalizations in the autoshaping group subjects, Experiment 3a exposed naive subjects to the autoshaping procedure used in Experiment 2 without prior Baseline exposure. If this Baseline condition was responsible in Experiment 2 for the failure of subjects to autoshape, then the subjects exposed to Experiment 3a should produce target vocalizations just as in Experiment 1.

To test the possibility that some other factor or factors were critical to the autoshaping result, Experiment 3b was conducted. In this experiment, naive subjects were exposed to the autoshaping procedure used in Experiment 1, except that mothers served as experimenters to provide maximum experimenter-subject familiarity. Summarizing the differences between this procedure and that used in Experiment 2, here there was familiarity between experimenter and subject; experimenter-subject interactions were permitted to occur freely, with the restriction that the experimenter could not emit the target sound except when delivering the CS; a variety of preferred food items was used as the UCS; the CS presentation was more salient in that the experimenter repeated the CS sound or mentioned the subject's name prior to CS presentation if the subject appeared to be off-task; and no baseline was conducted. If any, or all, of these conditions were critical for autoshaping vocalizations in infants this age, the results of Experiment 3b should replicate the findings of Experiment 1.

Method

Subjects

From the remaining 21 subjects in the subject pool, six infants (3 boys, 3 girls) were chosen for the present experiment. Three subjects (1 boy, 2 girls) were randomly selected and assigned to Experiment 3a. The remaining three subjects (2 boys, 1 girl), assigned to Experiment 3b, were selected on the basis of their mothers stating an interest, during the initial subject solicitation process, in participating or assisting in the investigation. This latter selection procedure was adopted to ensure maximum cooperation from mothers who were to serve as experimenters. All subjects were between the ages of 16 and 18 months at the start of the study. Informed consent, subject confidentiality, and result reporting procedures were identical to those used in Experiment 2.

Setting and Apparatus

Setting and apparatus were identical to Experiment 2. All six subjects in Experiment 3 (a and b) were located in a small room in their home for the duration of the sessions. (Cribs and playpens were not employed).

Experimenters

For Experiment 3a, the experimenters were the same as in Experiment 2. Experiment 1 was randomly assigned Subject B2; Experiment 2, Subject B1; and Experimenter 3, Subject B3.

For Experiment 3b, the subjects' mothers served as the experimenter. As before, only the experimenters were allowed to interact directly with the subjects.

Observers

The observers were the same as in Experiment 2, except that one female observer withdrew from the study, (leaving three--two males, one female). Two of the observers (both male) were selected by the investigator on the basis of their rapport with parents to serve as the observers for the Experiment 3b sessions. All duties were the same as in Experiment 2.

Investigator

The investigator was the same (AMM) as in Experiment 1 and 2.

Behavioral Definitions

All behavioral definitions were identical to those in Experiment 2.

Experimenter/Observer Training

The experimenters and observers in Experiment 3a required no further training. The two observers employed in Experiment 3b were instructed on how to interact with the mother/experimenter--that is, to be pleasant and helpful and to offer suggestions or instructions to the parents (before or after the sessions, never during), but to be as unobtrusive as possible during the sessions and to record as before. The mother/experimenters were instructed briefly on their responsibilities during the introductory session and again just prior to the first autoshaping session. The investigator and the observer were always present during the first autoshaping session, and, if the mother/experimenter became flustered, upset, or made a mistake, the investigator offered reassurance. These investigator-experimenter interactions only occurred when

the investigator felt they were absolutely necessary; most such interactions occurred after the session in the form of feedback or advice. After the first session, the investigator and the observer only interacted during the session if the mother/experimenter asked a question directly, and it was explained to her prior to the start of the infant's involvement that the observer and investigator had to remain quiet.

Agreement Measures

All agreement measures were identical to those in Experiment 2.

Experimental Procedures and Conditions

Introductory session. The introductory session was the same as in Experiment 2, with the exception that, for the mother/experimenters of Experiment 3b, the experimenter duties and procedures were specified to the parent.

No Baseline/Autoshaping (B). This was identical to the autoshaping (A) procedure employed in Experiment 2. This condition was terminated after 300 "non-disruption" trials.

Mother/Experimenter/Autoshaping (M). This procedure was the same as the No Baseline/Autoshaping (B) procedure, except that the subject's mother served as the experimenter; experimenter-subject interactions were allowed to occur freely, provided the experimenter never emitted the target sound except during the CS presentation, a variety of foods was used as the UCSs, and the CS presentation was made more salient by repeating the CS or saying the subject's name prior to the CS presentation when the subject was off-task. Ths mother/experimenter was not required to record data. This condition was terminated after 300 trials, not including "disruption" trials.

General Procedure

The general procedure was the same as it was in Experiment 2, with the exceptions that, in the case of Experiment 3b, a) the mother/experimenters were already at the subject's home, and b) the above mentioned changes in procedure were implemented (e.g., experimenter-subject interactions, variety of food items, and so on).

Results

Observer Agreement

Mean percent observer agreement between the observer and the experimenter for the subjects in Experiment 3a (No Baseline/Autoshaping) was 87.5 (Occurrence), 99.67 (Nonoccurrence), and 99.68 (Overall) when recording conditioned responses (CRs). When recording vocalizations per trial, mean percent agreement for the same subjects was 78.79 (Occurrence), 71.77 (Nonoccurrence), and 81.97 (Overall). Appendix J presents individual subject data for each of these three measures during Experiment 3a.

Treatment Effects

A summary of the results for each subject and group in Experiment 3 is presented in Table 3. Appendix H contains a summary of the raw data for each session and each subject in Experiment 3. Appendix I contains a more specific summary of this data; it presents

Table 3

Summary of Results For Each Subject and Group In Experiment 3

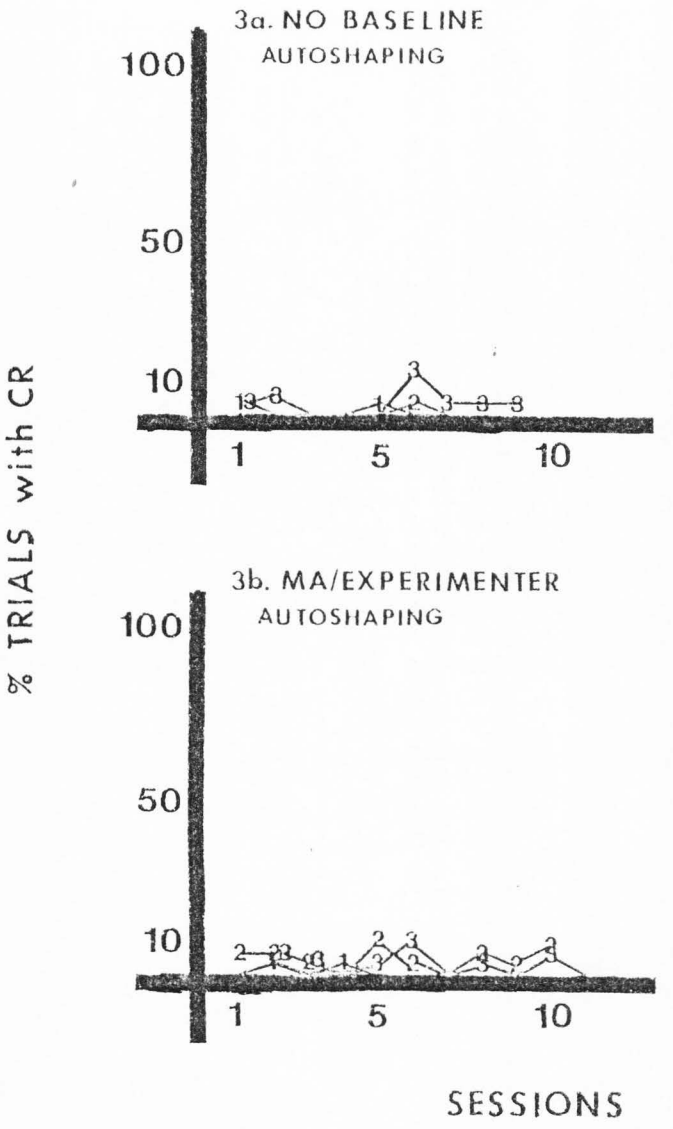
Subject	$\bar{X}$ Percent Trials With CR/Session	$\bar{X}$ Target Vocal/ Session	$\bar{X}$ Vocalizations/ Trial/Session
No Baseline/Autoshaping (3a)			
B1	0.69	0.56	5.28
B2	0.30	0.36	5.25
B3	3.52	2.33	7.66
Mother as E/No Baseline/Autoshaping (3b)			
M1	0.67	1.20	5.61
M2	4.91	17.00	5.68
M3	3.08	1.27	15.31

data on the percent of trials with at least one CR, the total number of target vocalizations, and the mean number of vocalizations per trial for each session for each subject in Experiment 3. Figures 6, 7, and 8 graphically portray the data presented in Appendix I, respectively.

None of the six subjects in Experiment 3 autoshaped. As in Experiment 2, subjects rarely emitted CRs (see Figure 6 and Table 3). There was some variation among subjects with respect to total number of target sounds emitted per session, as is evidenced in Figure 7 and Table 3. This was attributable mainly to subject M2, who averaged 17.00 target vocalizations per session (range = 2 to 46), and somewhat to subject B3, who averaged 2.33 target vocalizations per session (range = 0 to 9). The subjects performed similarly with respect to mean number of vocalizations per trial across sessions, with the exception of subject M3, who consistently vocalized two to three times as much as the other five subjects (see Figure 8 and Table 3).

Discussion

The results of Experiment 3 suggest that several factors were not critical in producing the autoshaping effect in Experiment 1. First, no conditioning occurred when the autoshaping procedure was not preceded by a baseline condition (Experiment 3a). Second, subjects did not autoshape in Experiment 3b when a) the salience of the CS was increased, b) the familiarity of the experimenter was maximized by having the subject's mother serve as the experimenter, c) a variety of food items was used, and d) experimenter-subject interactions were permitted.


3a. NO BASELINE
AUTOSHAPING
100
50
10
1
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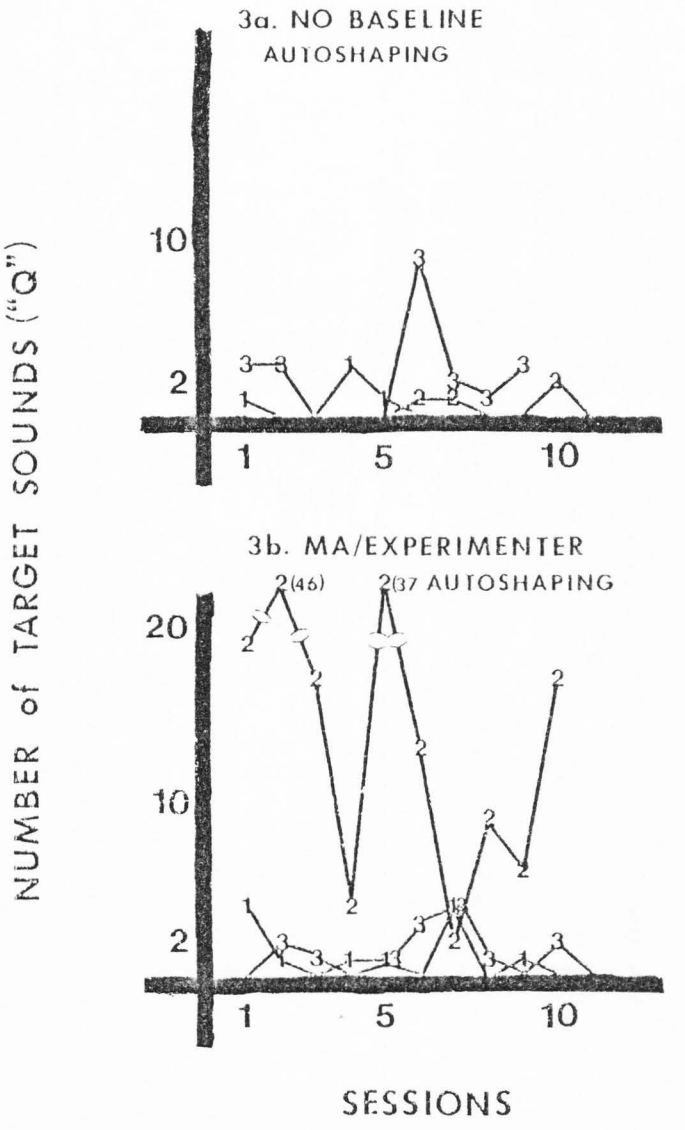
10
3b. MA/EXPERIMENTER
AUTOSHAPING
100
50
10
1
5
10
% TRIALS with CR
SESSIONS


3a. NO BASELINE
AUTOSHAPING
10
2
1
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10
3b. MA/EXPERIMENTER
AUTOSHAPING
20
10
2
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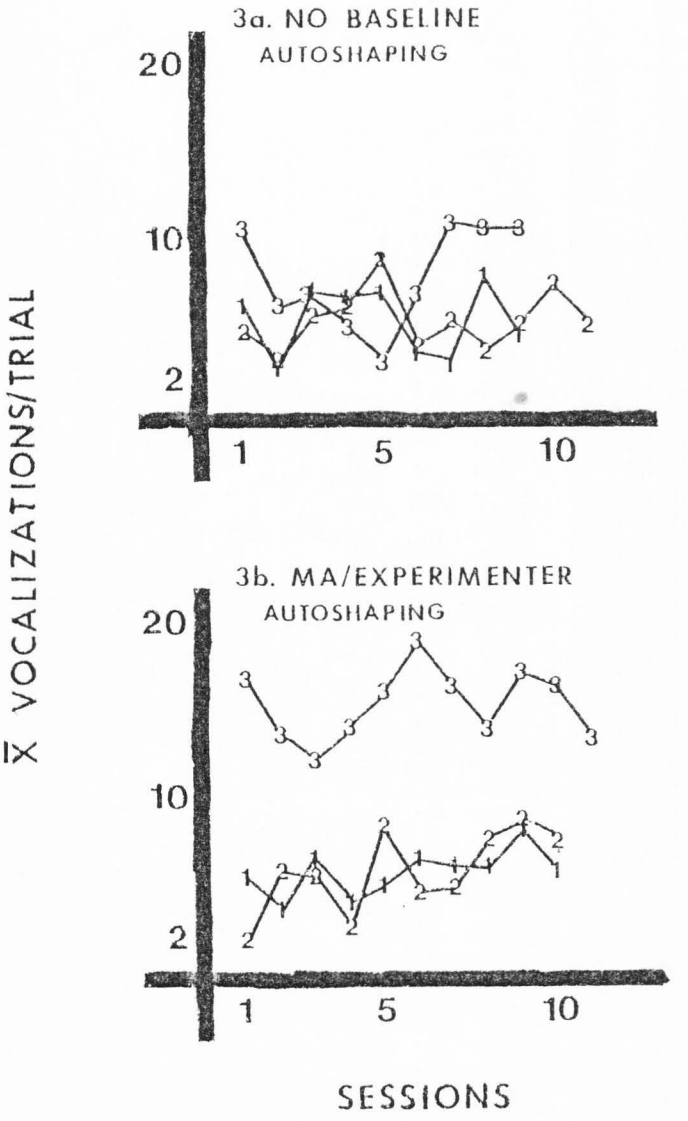
5
10
NUMBER of TARGET SOUNDS ("Q")
SESSIONS


3a. NO BASELINE
AUTOSHAPING
20
10
2
1
5
10
3b. MA/EXPERIMENTER
AUTOSHAPING
20
10
2
1
5
10
X̄ VOCALIZATIONS/TRIAL
SESSIONS

Experiment 4 was designed to determine whether one remaining factor was responsible for the autoshaping effect in Experiment 1. This final factor was the presence of the investigator (AMM) in the experimental setting as the experimenter. This experiment was conducted to determine whether the investigator was performing differently in Experiment 1 than the female experimenters in Experiments 2 and 3.

EXPERIMENT 4

Experiment 2 was an attempt to replicate Experiment 1 in a controlled manner using a group design. The results of that experiment showed that the subjects exposed to the Experiment 2 procedure did not produce the target sound as had subjects exposed to the procedure in Experiment 1. Experiment 3 reinstated the altered conditions of Experiment 1 to determine whether some or all of these conditions were critical to obtain the autoshaping effect. The results of these experiments (3a and 3b) also failed to replicate the findings of Experiment 1.

Experiment 4 was conducted to reinstate one final condition that existed in Experiment 1 but not in Experiments 2 or 3; namely, the investigator's role as experimenter. It was possible that the investigator, either due to his greater knowledge and expertise in the field or to his greater expectations of the results, performed differently as an experimenter than had the experimenters in Experiments 2 and 3.

Method

Subjects

From the remaining 15 subjects in the subject pool, three infants 16 to 18 months of age (1 boy, 2 girls) were selected at random. Informed consent, subject confidentiality and result reporting procedures were identical to those used in Experiments 2 and 3.

Setting and Apparatus

Setting and apparatus were identical to those in Experiment 3.

Experimenter and Investigator

The experimenter was the investigator (AMM). As before, only the experimenter interacted with the subjects during a session.

Observers

Experimenter 1 of the previous experiments and one of the male observers served as the observers for this experiment. Both were instructed to note any differences in procedure or style of the investigator as an experimenter and the procedure or style of the experimenters in the previous experiments. All other duties were the same as in Experiment 2 and 3.

Behavioral Definitions

All behavioral definitions were identical to those described in Experiment 2.

Experimenter/Observer Training

The observers received no additional training. The investigator practiced recording and delivering CSs and UCSs using the training procedure described in Experiment 2 prior to conducting any sessions, in order to minimize procedural errors.

Agreement Measures

All agreement measures were identical to those described in Experiment 2.

Experimental Procedures and Conditions

Introductory session. The introductory sessions were the same as in Experiments 2 and 3.

Myers/Autoshaping (MY). This procedure was identical to the procedure used in Experiment 1 (ITI = 60 seconds), except that the subjects were located in small rooms during sessions, and an independent observer was present in the setting. The experiment was terminated for each subject after 300 "non-disruption" trials.

General Procedure

The general procedure was the same as it was in the previous experiments.

Results

Observer Agreement

Mean observer agreement between the experimenter and observer for the subjects in Experiment 4 was 94.44 (Occurrence), 99.81 (Nonoccurrence), and 99.81 (Overall) when recording conditioned responses (CRs). When recording vocalizations per trial, mean percent agreement for these subjects was 79.32 (Occurrence), 88.39 (Nonoccurrence), and 84.93 (Overall). Appendix M presents individual subject data for each of these three measures during Experiment 4.

Treatment Effects

A summary of the results for each subject in Experiment 4 is presented in Table 4. Appendix K contains a summary of the raw data

Table 4

Summary of Results For Each Subject In Experiment 4

Subject	$\bar{X}$ Percent Trials With CR/Session	$\bar{X}$ Target Vocal/Session	$\bar{X}$ Vocalization/ Trial/Session
Myers = E/Auto			
My1	0.62	0.88	2.88
My2	2.28	2.50	2.42
My3	1.61	4.11	2.40

for each session and each subject in Experiment 4. Appendix L contains a more specific summary of these data; it presents data on the percent of trials with at least one CR, the total number of target vocalizations, and the mean number of vocalizations per trial for each session for each subject in Experiment 4. Figures 9, 10, and 11 graphically portray the data presented in Appendix L.

Once again, none of the subjects autoshaped. While there was some variability among the three subjects with respect to total number of target vocalizations per session (e.g., Figure 10 and Table 4), the subjects rarely emitted target sounds during the CR period (e.g., Figure 9 and Table 4). The three subjects vocalized an average of 2.57 times per trial, with little variation among subject means (range of means for each subject was 2.40 to 2.88 vocalizations per trial per session; see Figure 11 and Table 4.

Discussion

Either the autoshaping effect observed in Experiment 1 was not due to the investigator's performance as experimenter, or the investigator's behavior as an experimenter changed between the termination of Experiment 1 and the start of Experiment 4. The increased emission of target vocalizations during the CR period by the subjects in Experiment 1 was probably not due to the autoshaping procedure. Experiments 2, 3, and 4 constituted four attempts to replicate the findings of Experiment 1, and each failed to do so. Some unknown variable may have confounded

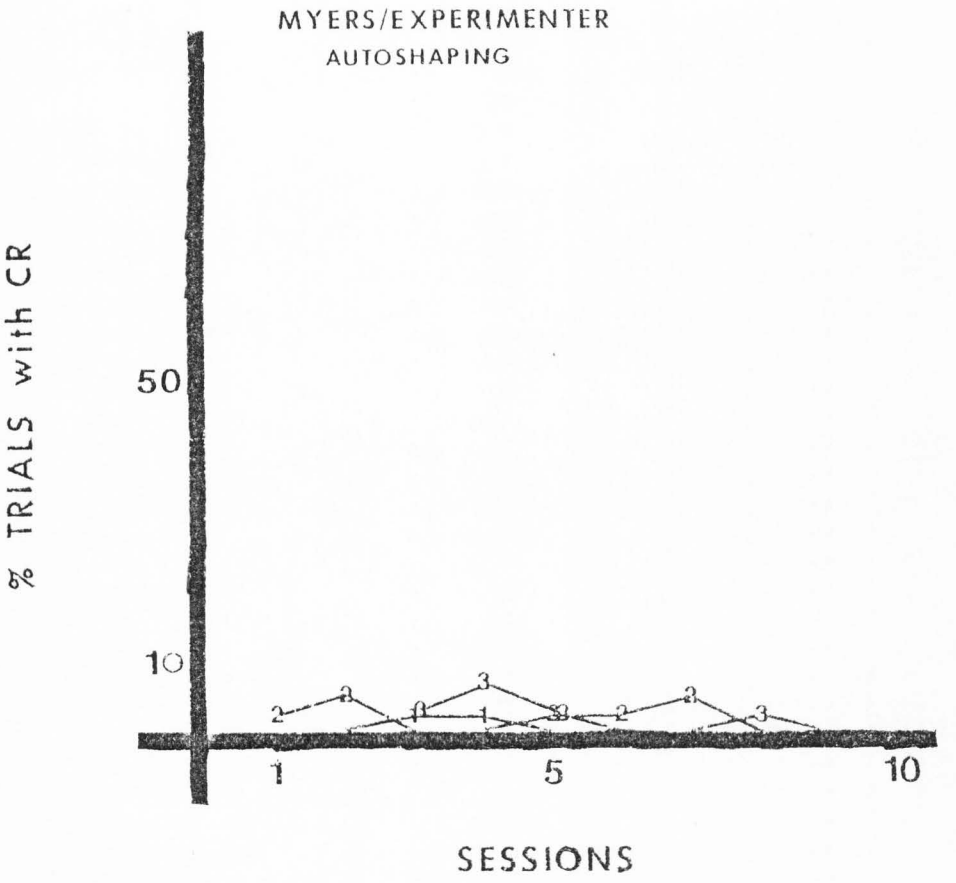


Figure 9. Percent of trials with at least one CR (Conditioned Response) per session for each subject in Experiment 4.

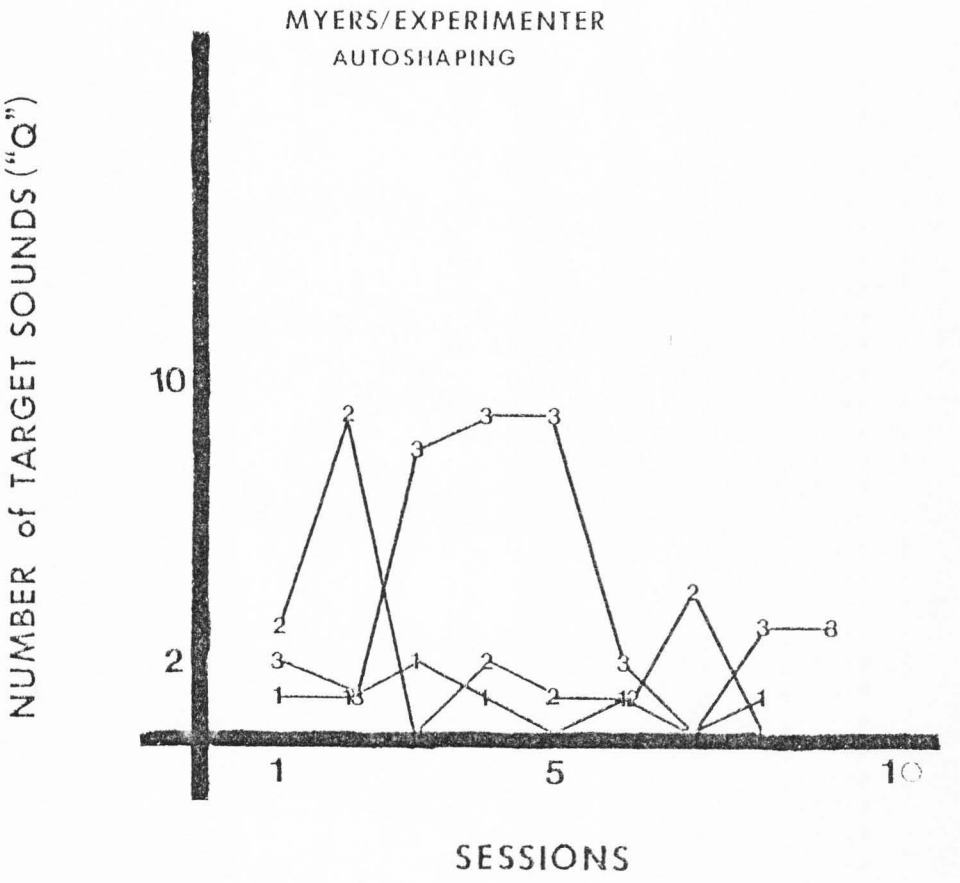


Figure 10. Total number of target sounds ("Q") per session for each subject in Experiment 4.

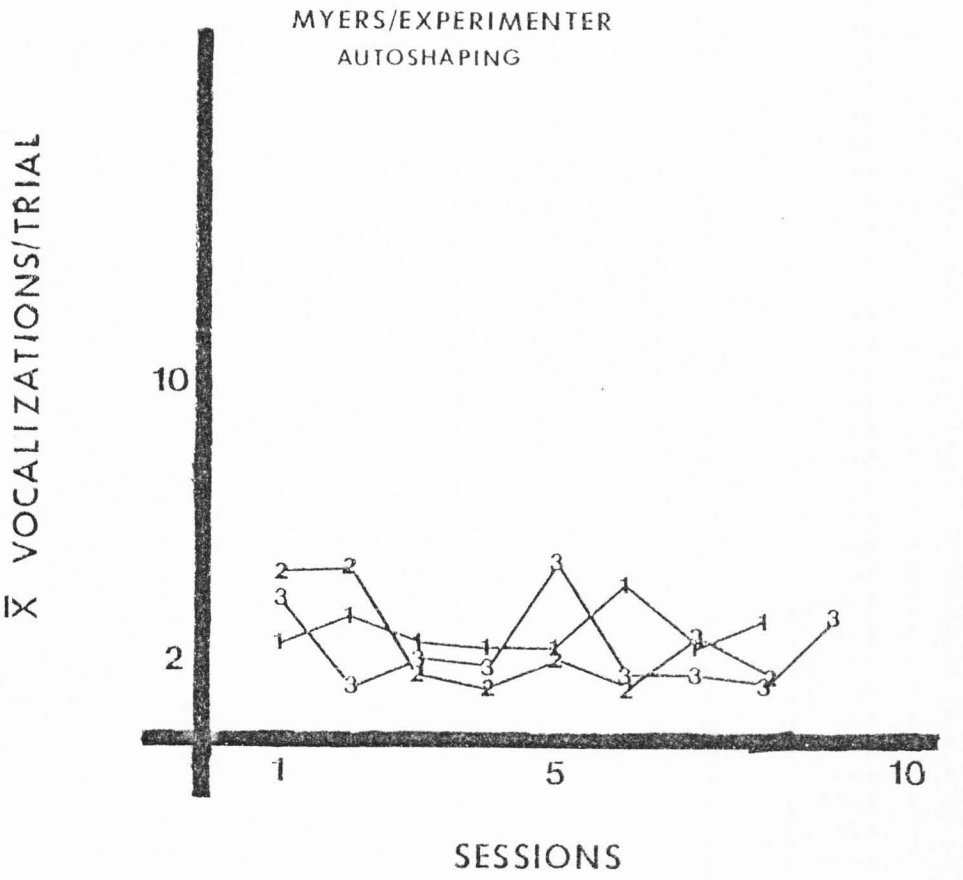


Figure 11. Mean ($\bar{X}$) number of vocalizations per trial per session for each subject in Experiment 4.

the procedure of Experiment 1 and resulted in the "autoshaping" effect. An operant contingency was probably inadvertently superimposed onto the supposedly response-independent autoshaping procedure. This could have taken many forms; e.g., altered facial expressions of the experimenter when the subject emitted the target sound, more enthusiasm on the part of the experimenter when presenting the verbal praise during the UCS period or when interacting with the subject during the other periods of the procedure, and faster delivery of the UCS, to name several.

Experiment 5 was designed to test the operant control of the subject's emission of the target sound under similar circumstances. The experiments to this point suggested that vocalizations by infants of this age range (16 to 18 months) were not under Pavlovian stimulus-stimulus control when the previously stated temporal relations were employed. Experiment 5a employed a discrete trial operant procedure with temporal parameters identical to those used during the autoshaping procedure in the previous experiments. In this procedure, food was presented only when the subjects emitted the target response during a particular period of time following the experimenter's emission of that sound. Experiment 5b employed the autoshaping procedure used in the previous experiments, but the experimenters also verbally rewarded the subject's emission of the target vocalization no matter when it occurred in the trial. All other procedures in the autoshaping condition were the same as in the previous experiments.

EXPERIMENT 5

Experiments 2 through 4 showed that infant vocalizations of a particular type could not be elicited from 16-18 month old infants using an autoshaping procedure of the type employed. Experiment 5 was designed to examine the effects of operant procedures on infant vocalizations. Experiment 5a presented subjects with a discrete trial operant procedure in such a manner that the temporal parameters were the same as in the previous autoshaping procedure. Experiment 5b employed the original autoshaping procedure, but superimposed an operant contingency on target vocalizing; namely, target vocalizations ("Q") were verbally rewarded with the experimenter's emphatic statement "Good boy/girl!". If verbal praise is sufficient to establish particular vocalizations in infants this age (16-18 months), subjects in Experiment 5b should evidence higher rates of target vocalizing than subjects in the previous three experiments (Experiments 2, 3, and 4). If these vocalizations can be operantly conditioned, subjects in Experiment 5a should have high probabilities of responding with a target vocalization after the experimenter presents the target sound.

Method

Subjects

From the remaining 12 subjects in the subject pool, six infants 16 to 18 months of age (1 boy, 5 girls) were selected at random. Three of these subjects (3 girls) were then randomly assigned to Experiment 5a while

the remaining three subjects (1 boy, 2 girls) were assigned to Experiment 5b. Informed consent, subject confidentiality, and result reporting procedures were identical to those used in Experiments 2 through 4.

Setting and Apparatus

Setting and apparatus were identical to those used in Experiments 3 and 4.

Experimenters

The experimenters were the same as in Experiments 2 and 3a. Experimenter 1 was assigned Subject OR1; Experimenter 2 was assigned Subjects OR3, O1, and O3; and Experimenter 3 was assigned Subjects OR2 and O2. All subject assignments were random.

Observers

Three observers were employed in the present experiment. Two of these observers were the male undergraduate observers who served in Experiments 2 and 3. The third observer was a newly selected female undergraduate who received training prior to her involvement in the study. She received academic credit for her participation. All duties were as described previously.

Investigator

As usual, the investigator was A. M. Myers.

Behavioral Definitions

All behavioral definitions were identical to those in the previous experiments (Experiments 2, 3, and 4). It should be noted that for

a Conditioned Response (CR) to be recorded during Experiment 5a, a target response had to have been emitted by the subject during the 11-second period following the experimenter's presentation of the target sound ("Q"). This 11-second period corresponded to the CS, UCS, and first five seconds of the ITI periods in the autoshaping procedure (Experiment 5b, as well as Experiments 1, 2, 3, and 4).

Experimenter/Observer Training

The experimenters and the two experienced observers were instructed briefly on the changes in procedure for the present experiment. As no significant changes were made in their experimental roles, only a short rehearsal was necessary to ensure that they could implement the procedure and record accurately prior to actual implementation of the conditions with the subjects. The naive observer was trained in a manner similar to that described in Experiment 2. In addition, she attended two 'practice' sessions with experienced experimenters and observers at the end of Experiment 3. These practice sessions took place while the experienced experimenter and observer were conducting a session with one of the subjects employed in Experiment 3a. Her observer agreement with the experienced observer was 84.0 percent and 92.5 percent for the two sessions, during which she sat as unobtrusively as possible in the experimental setting.

Agreement Measures

All agreement measures were identical to those in Experiments 2, 3, and 4.

Experimental Procedures and Conditions

Introductory session. The introductory session was the same as in Experiments 2, 3a, and 4.

Discrete-trial operant (O) (5a). The discrete-trial operant procedure is diagrammed in Figure 1, bottom panel. Each trial in Experiment 5a commenced with a 60-second inter-trial-interval (ITI). At the end of this ITI, the experimenter presented the target sound ("Q") to the subject. As in Experiments 3b and 4, this sound was repeated or the subject's name was mentioned prior to the presentation if the subject was looking away or distracted. Following this presentation of the target sound, there was a six-second reinforcement-availability period. If the subject emitted the target sound (CR) during this 6-second period she received verbal praise ("Good boy/girl!" or "Big boy/girl!") and was offered food. If this food was not accepted within two seconds of its presentation, it was removed; however, this was never a problem. For recording purposes, the experimenter and observer were also notified (by means of the tape recorder) at the end of the first five seconds of the next trial's ITI.

The acquisition criterion used in Experiments 1 and 2 was employed. This criterion of 15 successive trials with a CR, (that is, a reinforced response during the 6-second post-target sound period) terminated the subject's involvement. If the criterion was not met, the subject would be exposed to a total of 300 "non-disruption" trials. The experimental personnel recorded behavior as they had in all the previous experiments.

Operant and Respondent (OR) (5b). This procedure was identical to that used in Experiment 4 with the exception that the experimenter verbally praised the subject every time the subject emitted a target sound. Subjects were exposed to 300 trials.

General Procedure

The general procedure was the same as it was in the previous experiments (i.e., Experiments 2, 3, and 4).

Results

Observer Agreement

Mean observer agreement between the experimenter and observer for the subjects in Experiment 5a (Operant discrete-trial) was 98.14 (Occurrence), 98.79 (Nonoccurrence), and 99.29 (Overall) when recording conditioned responses and 82.47 (Occurrence), 92.64 (Nonoccurrence), and 83.75 (Overall) when recording vocalizations per trial. Similarly, mean percent observer agreement for the subjects in Experiment 5b (Operant and Respondent) was 96.38 (Occurrence), 99.18 (Nonoccurrence), and 99.51 (Overall) when recording conditioned responses (CRs), and 80.88 (Occurrence), 73.40 (Nonoccurrence), and 81.95 (Overall) when recording vocalizations per trial. Appendix P presents individual subject data for each of these measures during Experiment 5 (a and b).

Treatment Effects

A summary of the results for each subject and group in Experiment 5 is presented in Table 5. Appendix N contains a summary of the raw

Table 5

Summary of Results For Each Subject and Group in Experiment 5

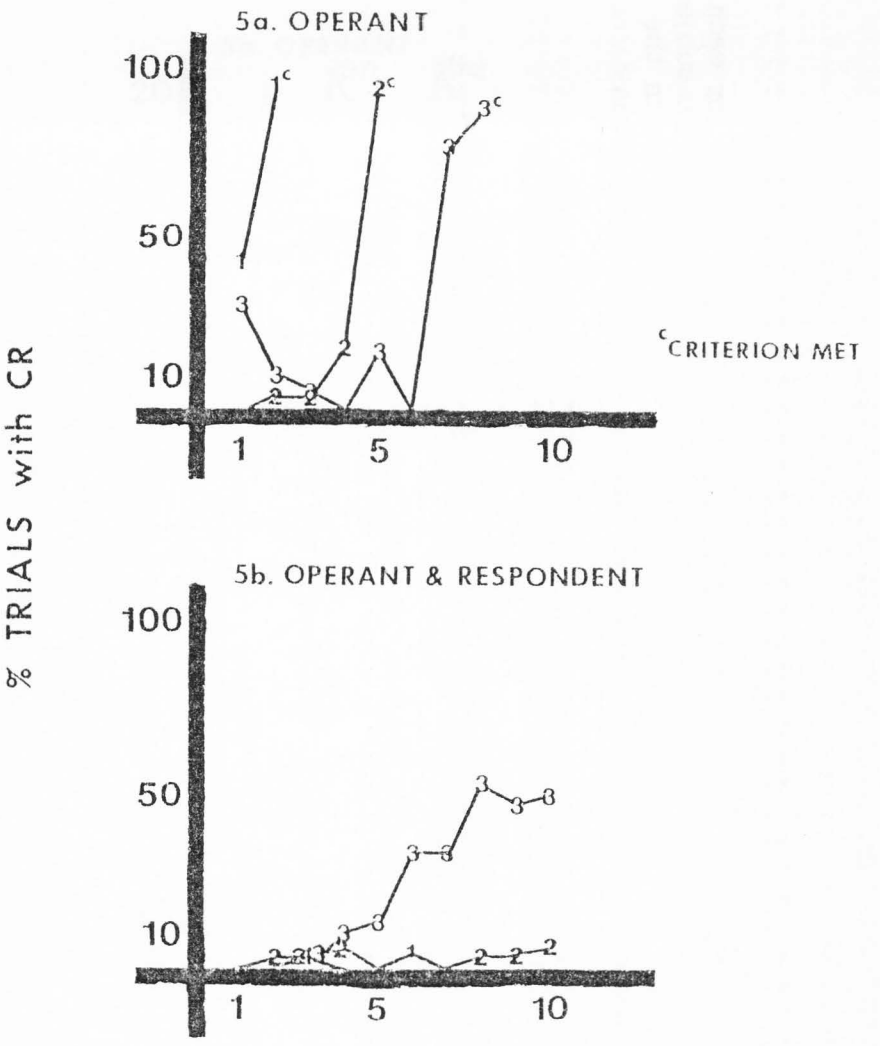
Subject	$\bar{X}$ Percent Trials With CR/Session	$\bar{X}$ Target Vocal/ Session	$\bar{X}$ Vocalizations/ Trial/Session
5a Operant			
O1	69.16[c]	16.50	9.58
O2	23.72[c]	9.20	6.23
O3	28.29[c]	8.88	9.06
5b Operant & Respondent			
OR1	0.87	1.12	6.69
OR2	2.34	3.20	5.52
OR3	24.33	11.00	12.26

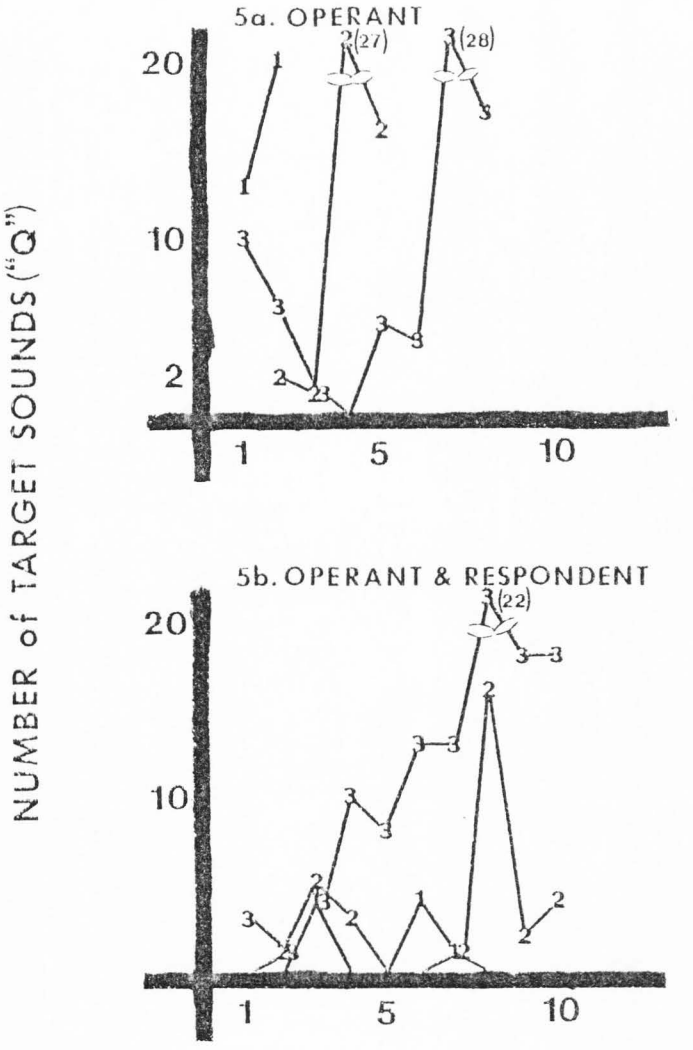
c: criterion met; O1 - Session 2, Trial 50
O2 - Session 5, Trial 139
O3 - Session 8, Trial 192

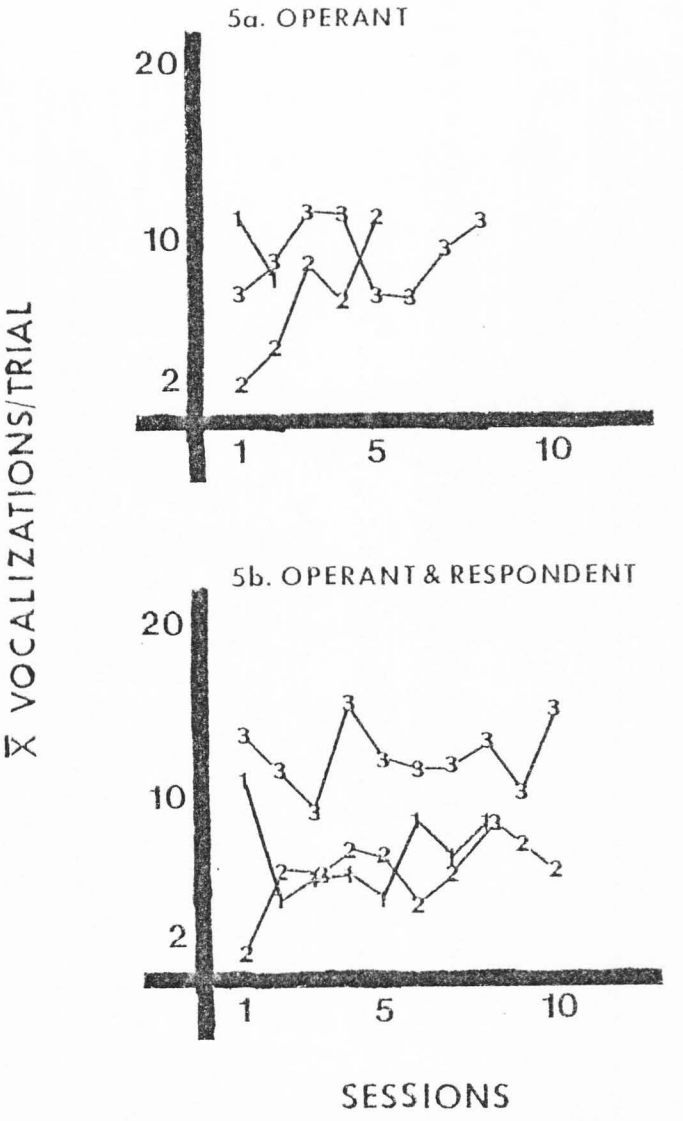
data for each session and each subject in Experiment 5. Appendix O contains a more specific summary of these data; it presents data on the percent of trials with at least one CR, the total number of target vocalizations, and the mean number of vocalizations per trial for each session and subject in Experiment 5. Figures 12, 13, and 14 (respectively) graphically portray the data presented in Appendix O.

Discrete-trial operant (O). As can be seen in Table 5 and Figure 12, all three subjects exposed to the discrete-trial operant procedure met the acquisition criterion. Subject 01 almost met the criterion of 15 successive trials with at least one CR during the first session, and actually met this criterion during the second session (by Trial 50). Subject 02 emitted few target responses during the first three sessions, but met the criterion during the fifth session (by Trial 199). Subject 03 emitted CRs during 9 of the 30 trials of Session 1, but she decreased similar emissions until Session 7, during which she vocalized CRs during 76.67 percent of the session's trials. She finally met criterion the next day (Session 8), after a total of 192 trials.

Figure 13 demonstrates that the subjects' emissions of total target vocalizations per session closely match the percent trials with a CR per session data (Figure 12), as would be expected. In other words, on those days that the subject demonstrated a high percentage of trials with CRs, the subject also tended to make a lot of target vocalizations. Finally, Figure 14 presents the mean number of vocalizations per trial for each session. These data were rather unremarkable; the infants were all


5a. OPERANT
100
50
10
1
5
10
% TRIALS with CR
CRITERION MET
5b. OPERANT & RESPONDENT
100
50
10
1
5
10
SESSIONS


5a. OPERANT
5b. OPERANT & RESPONDENT
NUMBER of TARGET SOUNDS ("Q")
20
10
2
1
5
10
SESSIONS


5a. OPERANT
20
10
2
1
5
10
5b. OPERANT & RESPONDENT
20
10
2
1
5
10
X̄ VOCALIZATIONS/TRIAL
SESSIONS

rather consistent in their rates of vocalization, all vocalizing at about the same rate.

Operant and Respondent (OR). Under this procedure, two of the subjects (OR1, OR2) rarely emitted CRs, while the remaining subject (OR3) gradually increased her emission of CRs after the third session, until she was responding with CRs on about 50 percent of trials by Session 8 (see Figure 12). For the last three sessions (8, 9, 10) she performed consistently at this 50 percent level, but never approached the criterion of 15 successive trials with at least one CR. During these last three sessions, the subject occasionally responded to the experimenter's target sound with "No". All three subjects concluded the experiment after 300 trials. Subjects OR2 and OR3 emitted quite a few target vocalizations throughout the trials on certain days (Figure 13). During Session 8, for instance, OR2 emitted 16 target vocalizations--only one of which was during the CR period. As might be expected, Subject OR3 emitted quite a few target vocalizations during her last three sessions (22, 18, and 18, respectively). The data for mean number of vocalizations per trial were again rather unremarkable (Figure 14 and Table 5). All subjects were consistent in their rates of vocalization, with Subjects OR1 and OR2 vocalizing at about the same rate, while Subject OR3 vocalized about twice as often.

Discussion

Experiment 5a demonstrated that a particular vocalization in 16 to 18 month old infants can be operantly conditioned. Experiment 5b also provided partial support for this finding. One of the three subjects

exposed to the autoshaping plus verbal reward procedure emitted CRs in about 50 percent of the trials during her last three sessions. It can be recalled that the autoshaping procedure in and of itself never resulted in subjects emitting many CRs during Experiments 2 through 4. The fact that she, and the other two subjects in that procedure, never met the acquisition criterion may have been due to the relatively poor status of the experimenters as social rewarders. That is, the verbal rewards presented by the experimenters to the subjects after target vocalizations simply did not function as reinforcers. This was supported anecdotally by reports from the experimental personnel; the experimenter and observer for Subject OR3 reported that the experimenter and the subject "had a good time", whereas the other experimenters, particularly in the case of Subject OR1, reported poor rapport with the subjects. In fact, one experimenter reported, and the observer agreed, that the subject was "a really weird little monster". This suggests that when adequate positive reinforcers (e.g., food, verbal praise from a valued adult) were involved, the particular vocalization could be established. When weak rewards (e.g., verbal praise from poorly valued adults) were employed, the particular vocalization was not established. This suggestion parallels the conclusions of Bloom & Campbell (Note 1). These authors found that vocal rates were indicative of social responsiveness, to the extent that the authors could predict that if an infant vocalized frequently, they would be socially responsive to an adult. Similarly, if an infant vocalized infrequently, she/he looked away from the experimenter's face, smiled less often, and was unaffected by social stimulation. It is interesting to note that in Experiment 5b of the

present investigation, the one subject who did respond in about 50 percent of the trials under the autoshaping procedure with verbal praise contingent upon vocalizations was the subject who exhibited the highest rate of vocalizations per trial (Table 5 and Figure 14). The results of Experiment 5b, therefore, may have been due to responsiveness of the subjects to social praise. Since Subject OR3 exhibited a higher rate of vocalizing generally, she was more responsive to social rewards.

An additional explanation for this finding could be the manner in which the verbal praise was used. On some occasions, after a subject-emitted target vocalization, the praise was delivered contingently. On other occasions, and perhaps more often, the praise was delivered non-contingently as a part of the autoshaping UCS component. The praise, therefore, might not have functioned as a contingent consequence of any particular behvaior.

GENERAL DISCUSSION

In Experiment 1, three infant subjects increased a particular vocalization when exposed to an autoshaping procedure. This finding validated Bloom's (1979) argument that infant vocalizations can be classically conditioned. Experiment 2 attempted to replicate the findings of Experiment 1 using a control group design. A baseline period was added to allow familiarization between the subject and the experimental personnel and to control for possible initial differences between subjects. No autoshaping was observed in any of the subjects during this experiment. In order to determine whether some of the procedural changes that occurred between Experiments 1 and 2 were the reason for the failure to replicate, Experiments 3 and 4 were conducted. No autoshaping occurred in either of these experiments. This led the investigator to conclude that the results in Experiment 1 must have been due to some confounding, inadvertent, procedural variable. Most probably, some unprogrammed operant contingency was implicit in Experiment 1; e.g., variations in facial expression, variations in delivery of CS and UCS, variations in interactions, and so on.

Another confounding variable might have been the experimental setting. In Experiment 1, all three subjects were placed in a crib or playpen for the duration of the sessions. In all other experiments, some subjects were placed in a crib, playpen, or small room. This change in setting was not systematically manipulated to determine its effect on behavior, but it seems unlikely that it was critical. First, some subjects in Experiment 2 were exposed to the experimental conditions in the playpen or crib. Their behavior was not noticably different from subjects

in the same condition who were positioned in a small room. Second, some subjects in Experiment 5 (all three subjects in Experiment 5a and one in Experiment 5b) increased their emissions of the target sound, or CR, while placed in a small room and not in a playpen or crib.

It was therefore concluded that the establishment of the particular vocalization in these infants was not produced by Pavlovian stimulus-stimulus (autoshaping) relations.

Experiment 5a tested the hypothesis that the establishment of a vocalization could occur by operant conditioning. Therefore, a discrete-trial operant procedure of the same temporal parameters as in the auto-shaping procedure was employed, with the effect of producing a consider-able increase in target sounds. In fact, all three subjects under this procedure met the acquisition criterion of 15 successive trials with at least one CR. Experiment 5b exposed another three subjects to the same autoshaping procedure as in the previous experiments, with the exception that any target sound emitted by the subject during any part of the trial was verbally rewarded with praise. One subject emitted CRs in about 50 percent of the trials per session for the last three sessions. The other subjects emitted few CRs at all. This was possibly due to the fact that the verbal praise was an ineffective reward--that is, the experimenters were not valued as social rewarders. Also, the continued delivery of the praise non-contingently during UCS presention could have made praise non-predictive of reinforcement. The two subjects who did not emit many CRs had 1) experimental personnel who reported weak or bad rapport with the subjects, and 2) exhibited lower overall vocalization rates (an index of social responsiveness; cf. Bloom & Campbell, Note 1) than the third subject who did emit some CRs. Taken together, the results

of the entire investigation suggest that infant vocalizations are controlled by operant contingencies, and not by respondent stimulus-stimulus relations.

These results were somewhat surprising given the results presented by Bloom and her associates (e.g., Bloom, 1975, 1977; Bloom & Esposito, 1975; Bloom & Campbell, Note 1). Recall that Bloom and Esposito (1975) demonstrated that social stimulation, omission training, and operant reinforcement techniques resulted in similar increases in vocalization rates. This implied that those subjects receiving operant training increased their vocalizations simply because of the delivery of social stimulation. The fact that the delivery was contingent upon a response made no difference. The present investigation, however, found that social stimulation presented with food failed to produce an increase in target vocalizations unless it was presented contingent upon the response. Clearly, these two studies are contradictory.

One possible explanation for the difference in the findings of this study and those of Bloom and her associates (Bloom, 1975, 1977; Bloom & Esposito, 1975; Bloom & Campbell, Note 1) concerns the age of the infants employed as subjects in the studies. Bloom generally used infants three to four months of age, while the present investigation looked at conditionability of infants 16 to 18 months old. It is conceivable that infants who were much younger than those employed in the present study would have behaved differently. Horowitz (1973), for instance, distinguished between the first year of an infant's life and later years of language development. The first year of an infant's life is spent "not in producing speech but in listening to language and developing a discriminative repertoire of receptive langauge skills" (p. 11).

Further she suggested that "the grosser variables of contingencies and certain aspects of caretaker reinforcement may be less powerful during this period than some other variables in the acquisition of the discrimination of language from the receptive side" (p. 11). If this hypothesis is correct, some differences in performance would be expected between a group of subjects three to four months old and a group of subjects 16 to 18 months old. This conclusion would appear to be congruent with the findings of other researchers working in the field of infant classical conditioning. Fitzgerald and Brackbill (1976), for example, concluded that "nonconditionability is...most probably an indirect function of CA (Chronological Age) insofar as neurological maturity is correlated with age" (p. 371).

A second possible explanation for the discrepancy between the present findings and those of Bloom and her associates might lie in the nature of the autoshaping phenomenon. As described previously, autoshaping is Pavlovian in that it consists of a stimulus-stimulus association, with no response contingencies. Pavlovian or classical conditioning has been clearly demonstrated in infants; in the Fitzgerald and Brackbill (1976) review of this area, in fact, a number of studies are noted that successfully conditioned a somatic CR using an auditory CS (e.g., Abrahamson, Brackbill, Carpenter & Fitzgerald, 1970; Connolly & Stratton, 1969; Kantrow, 1937; Kaye, 1965; Lintz, Fitzgerald, & Brackbill, 1967; Lipsitt & Kaye, 1964; Naito & Lipsitt, 1969). In general, it can be said that classical conditioning in infants is a function of CS-CR specificity. That is, the CS and the CR are specifically related to each other. Conditioning is more easily accomplished with simple procedures than with complex procedures. The autoshaping procedure used in the present investigation met these two conditions.

The CS and CR were specifically related (Experimenter-sound (CS) and subject-sound (CR)), and the procedure used was quite simple (60-second ITI, one-second CS, five-second UCS). The fact that conditioning failed to occur is puzzling, although no clear example of autoshaping has been presented with humans as subjects. The two studies described briefly in the Introduction were the only reports available in the literature, and these presented unusual findings. First, the Wilcove and Miller (1974) study reported that the subjects who "autoshaped" stated that their responses were being reinforced, and the authors showed that these subjects responded fairly frequently during the ITI and baseline conditions. This latter finding is atypical of the findings of studies examining the autoshaping phenomenon in non-humans (cf., Schwartz & Gamzu, 1977). The other study (Seigel, 1977) reported that subjects "autoshaped" when they came to urinate toward a floating target in a commode, but the author was unable to identify the actual stimulus-stimulus relationship. In short, Wilcove and Miller's (1974) conclusion that "human autoshaping processes are different from rat or pigeon autoshaping processes" (p. 868) may be correct. Further research is required to determine the accuracy of their conclusions, and to determine whether this was a critical reason for the failure to autoshape vocalizations in the present investigation.

Whatever the reason for the failure of the autoshaping procedure to condition vocalizations in the present study, it is clear that such vocalizations could be operantly conditioned. Bloom's (1979) contention that infant vocalizations are elicited (and only elicited) seems unfounded, at least in the 16- to 18-month-old age group. Skinner's (1957) claim that verbal behavior (including speech) is controlled by operant

contingencies received strong support from the present study. Although nothing can be said at this point about normal development of verbal behavior, it can be stated that speech production in infants 16 to 18 months old can be controlled by response-reinforcement relations. In the present case, unconditioned reinforcement (food) appeared to be more powerful at controlling vocalizations than did conditioned reinforcement (praise), although this may have been due to the use of non-valued adults as the experimenters.

The present investigation was designed as a functional analysis of the problem of the controlling factors of infant vocalizations. The results would be substantially stronger if parts of the study were replicated using either a matched subjects group design or a multiple baseline, reversal, single subject design.

Finally, this study may appear to be tainted by that agonizing problem that occasionally plagues science; namely, irreproducible data. The findings of Experiments 2, 3, 4 and 5, however, seem quite strong. Four attempts were made at eliciting particular vocalizations, and all four attempts failed. In one case, autoshaping and operant procedures were combined with mixed results. One attempt was made to operantly condition a particular vocalization, and this attempt proved quite successful. This outcome suggests that operant contingencies are responsible for the establishment of infant vocalizations. Further research may be required before a satisfactory explanation can be offered for why the subjects in Experiment 1 conditioned when subjects in Experiments 2 through 4 did not, but the results of Experiments 2 through 5 stand by themselves.

It is recommended that further research examine the role of subject chronological age on vocal conditioning and the effects of autoshaping procedures on humans in general. In this way, the discrepancies between the findings of this study and those of Bloom and her colleagues (e.g., Bloom, 1975, 1977; Bloom & Esposito, 1975; Bloom & Campbell, Note 1) may be eliminated. Bloom (1979) is supported by this investigator in her call for better control procedures when investigating the conditionability of vocalizations in infants. Specifically, researchers should include in their research designs one or more "elicitation" control groups receiving non-contingent social stimulation and omission training.

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APPENDICES

Appendix A

Informed Consent Letter

, 1980

Dear

I am a doctoral candidate in the Psychology Department at Utah State University. In October, I will be beginning my dissertation research which is aimed at examining ways to increase infant vocalizations. I am seeking your cooperation and permission for your infant's participation in this project. The project itself has been approved by both the College of Education and the Human Subjects Committee at Utah State University.

The study will be conducted in your home for about 30 minutes a day, five days per week. Your child would serve as a subject for a total of about seven weeks: four successive weeks, then a break until after Christmas, and then the final three weeks in succession. Each day during your child's involvement, two students will come to your home to conduct the daily session. One student will interact with your child presenting certain vocal sounds and/or small bites of food items to your child occasionally. The other student will record the sounds your child makes and will check the experimenter's performance to ensure that no mistakes are made in the procedure. Both students will use a tape recorder to signal when the sounds and/or food items should be presented. As often as possible, I will also attend the sessions. My presence will serve to ensure that both the experimenter and the observer are following the correct procedure and to allow me to answer any questions you may have. The experimenter and the observer probably will not know what results to expect from your child in the different conditions (this ensures that the results we obtain are reliable and not due to biases among the investigators), so it would probably be better to direct your questions and comments to me. I can usually be reached at work (750-3533) or at home (753-5798).

As you can see from the above description, your child would be in your home and under adult supervision at all times. I would like to point out that the data we would gather in studying your child would be held in strict confidence. All infants will be given code numbers for identification to preserve the anonymity of their data. Only I will know the identity of each infant when the data are reported.

When the study is completed, I will, at your request, send you a short description of the overall results and would be happy to answer any questions that you might have about the study.

We consider that the procedures involve no psychological risk. On the contrary, we expect the outcomes of the research to affect your child's behavioral development positively. However, if, at any time, you should wish to withdraw your child from the study, you may, of course, do so.

Informed Consent Letter
Page 2

, 1980

You may grant permission for your child's participation on the enclosed form. Thanks again for your patience in reading this letter. If you have any questions about this project, feel free to contact me in person or at the number below.

Cordially,

Alexander M. Myers
Doctoral Candidate
Utah State University
750-3533

J. Grayson Osborne, Ph.D.
Dissertation Chairman
Professor of Psychology
Utah State University

stb

Enclosure

Informed Consent Form

I, the undersigned, grant permission for my child, _____ _____, to participate in the research project entitled, "Autoshaping Infant Vocalizations," headed by Mr. Alexander Myers. I understand the nature and content of the project.

_____ _____

(Parent's Signature) (Date)

Appendix B

Myers Dissertation Autoshaping Infant Vocalizations

ITI = _____-sec CS = "____" SR+ = _____ Date_____

SESSION # = _____ Condition = _____ E = _____ Observer_____

TRIAL DATA

	ITI		CS	UCS	SR+	NA	NOTES
1.	5"						
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							

Appendix B (cont.

Myers Dissertation Autoshaping Infant Vocalizations

Subject: _____ Condition: _____ Session#: ____ Date: ____

SR+ = _____ E = _____ 0 = _____ Time since eat: ____

Trial#	5"	ITI	CS	UCS	1st 5"ITI	SR+(Y/N)	D	Notes
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								

Appendix C

Summary of Investigation for Parents

Date

Name
Address
City

Dear :

I am writing to describe the results of my dissertation project as you requested. First, I would like to thank you for your cooperation in the study. I know we were a great inconvenience to you--all the parents we worked with were cooperative, and you all went out of your way to accommodate us. Even when we fell behind schedule or made special requests, you rarely complained. In short, I have nothing but respect and admiration for the parents in the study--I'm not sure I could have put up with it myself!

The purpose of the entire research project was to determine the controlling factors behind infant vocalizations of a particular type (we selected the sound "Q" because children of the ages 16 to 18 months are capable of making the sound, but seldom do so). Some researchers have claimed that infants vocalize because they are rewarded for it. That is, their parents praise them for making correct sounds, some sounds are followed by food, and so on.

Other researchers have suggested that infants learn to vocalize simply through associations--by hearing their parents talk, for instance.

To test these two theories, we exposed groups of infants 16 to 18 months old to either a condition in which they were rewarded for making particular sounds, a condition in which the infants heard the experimenter make sounds which were associated with rewards (independent of the infant's behavior), or a control condition in which infants played and vocalized normally without associations or rewards.

The results of the entire study showed that the infants emitted the target sound "Q" most often when they were rewarded for doing so, and that simple associations alone were not sufficient to develop the sound. Thus, we were able to provide some important answers concerning the controlling variables behind vocalizations in infants of this age.

If you should have any further questions about the research, please feel free to contact me. I can be reached at 750-2388 or 750-1459. If you want to read the complete report of the research project, you should be able to obtain a copy in the USU Merrill Library late this summer--in the Dissertation section.

Again, thank you so much for your cooperation.

Sincerely,

Alexander M. Myers

J. Grayson Osborne, Ph.D.
Professor

Appendix D

Summary of Raw Data: Experiment 2 - Autoshaping Group

Subject	Condition	Session	Trials	# of Target Responses (Q)*				# of Vocalizations (including Q)/session	% of UCSs (food items) delivered	# of "Disruption" trials
				ITI	CR					
					CS	ITI(1st 5-sec)	UCS			
A1	B	1	1-27	0	0	0	0	58	NA	0
		2	28-57	1	0	0	0	147	-	0
		3	58-87	0	0	0	0	161	-	0
		4	88-117	0	0	0	0	75	-	0
		5	118-150	0	0	0	0	163	-	0
	A	1	1-30	0	0	0	1	266	83.3	0
		2	31-60	0	1	0	0	344	73.3	0
		3	61-80	0	0	0	0	82	55.0	0
		4	81-105	0	0	0	1	133	36.0	0
		5	106-132	0	0	0	0	239	29.6	0
		6	133-146	0	0	0	0	61	57.1	0
		7	147-176	2	0	0	0	38	86.7	0
		8	177-201	6	0	0	0	218	100.0	0
		9	202-231	6	1	0	1	246	100.0	0
		10	232-261	6	2	0	0	131	100.0	0
		11	262-276	14	1	3	0	90	100.0	0
		12	277-306	0	0	0	1	99	80.0	0
		13	307-336	6	1	0	2	173	96.7	0
		14	337-366	10	0	3	1	162	90.0	0
		15	367-396	1	1	0	0	174	93.3	0
		16	397-426	0	0	0	1	123	100.0	0
		17	427-456	0	0	0	0	145	100.0	0
		18	457-486	6	0	0	0	276	93.3	0
		19	487-500	2	0	0	0	97	78.6	0
A2	B	1	1-22	2	0	0	0	27	NA	0
		2	23-52	0	0	0	0	93	-	0
		3	53-82	0	0	0	0	78	-	0
		4	83-112	0	0	0	0	64	-	0
		5	113-142	0	0	0	0	182	-	0
		6	143-150	0	0	0	0	13	-	0
	A	1	1-12	0	0	0	0	25	91.7	0
		2	13-42	0	0	0	0	309	90.0	0
		3	43-72	0	0	0	0	356	93.3	0
		4	73-102	0	0	0	0	249	100.0	0
		5	103-132	0	0	0	0	259	93.3	0

*includes agreements only

Appendix D (cont.)

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
						CR*				
				ITI	CS	ITI 5-sec	UCS			
A2cont.	A	6	133-162	0	0	0	0	115	96.7	0
		7	163-192	0	0	0	0	266	96.7	1
		8	193-221	0	0	0	0	256	93.1	0
		9	222-251	7	0	0	0	285	93.3	0
		10	252-281	0	0	0	0	202	100.0	0
		11	282-311	0	0	0	0	215	96.7	0
		12	312-341	0	0	0	0	423	93.3	0
		13	342-371	2	0	0	0	296	100.0	0
		14	372-401	0	0	0	0	243	76.7	0
		15	402-434	5	0	0	0	198	90.9	0
		16	435-454	0	0	0	0	311	100.0	0
		17	455-480	0	0	0	0	362	100.0	0
		18	481-500	0	0	0	0	265	95.0	0
A3	B	1	1-19	26	3	0	0	309	NA	0
		2	20-49	10	1	0	0	488	-	0
		3	50-79	1	0	0	0	318	-	0
		4	80-109	0	0	0	0	200	-	0
		5	110-139	0	0	0	0	208	-	0
		6	140-150	0	0	0	0	121	-	0
	A	1	1-13	1	0	0	0	76	100.0	0
		2	14-43	0	1	0	0	248	60.0	0
		3	44-73	0	0	0	0	223	40.0	0
		4	74-103	0	0	0	0	260	96.7	0
		5	104-133	0	0	0	0	270	90.0	0
		6	134-163	0	0	0	0	266	66.7	0
		7	164-183	1	1	0	0	156	95.0	0
		8	184-218	0	0	0	0	252	85.7	0
		9	219-248	4	0	0	0	317	70.0	0
		10	249-276	9	2	0	2	230	71.4	0
		11	277-306	4	0	0	0	141	93.3	0
		12	307-336	3	0	1	0	270	96.7	0
		13	337-366	3	0	0	0	114	76.7	0
		14	367-380	0	0	0	0	37	100.0	0
		15	381-410	0	0	0	0	73	100.0	0
		16	411-440	0	0	0	0	121	90.0	0
		17	441-470	0	0	0	0	174	90.0	0
		18	471-500	1	0	0	0	387	76.7	0

Appendix D (cont.)

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
					CR					
				ITI	CS	ITI-5 sec	UCS			
A4	B	1	1-37	0	0	0	0	77	NA	0
		2	38-67	0	0	0	0	12	-	0
		3	68-97	0	0	0	0	198	-	1
		4	98-127	0	0	0	0	189	-	0
		5	128-150	0	0	0	0	197	-	0
	A	1	1-30	2	1	0	0	117	90.0	2
		2	31-60	0	0	1	0	63	86.7	0
		3	61-90	0	0	0	0	188	73.3	1
		4	91-120	2	0	0	0	69	76.7	0
		5	121-150	0	0	0	0	74	90.0	0
		6	151-180	0	0	0	0	45	96.7	0
		7	181-210	1	0	0	0	8	100.0	1
		8	211-240	0	0	0	0	40	86.7	0
		9	241-270	0	0	0	0	102	100.0	0
		10	271-300	1	0	0	0	44	100.0	1
		11	301-330	0	0	0	0	103	96.7	1
		12	331-360	0	0	0	0	85	100.0	0
		13	361-390	0	0	0	0	116	90.0	0
		14	391-410	0	0	0	0	55	95.0	0
		15	411-440	1	0	0	0	149	73.3	0
		16	441-470	1	0	0	0	46	100.0	0
		17	471-500	0	0	0	0	127	96.7	0
A5	B	1	1-30	0	0	0	0	200	NA	0
		2	31-60	0	0	0	0	226	-	0
		3	61-90	0	0	0	0	176	-	0
		4	91-120	1	0	0	0	324	-	0
		5	121-150	0	0	0	0	3	-	0
	A	1	1-30	0	0	0	0	57	100.0	0
		2	31-60	0	0	0	0	53	93.3	0
		3	61-90	0	0	0	0	181	96.7	0
		4	91-120	0	0	0	0	188	96.7	0
		5	121-150	0	0	0	0	237	100.0	0
		6	151-180	0	0	0	0	237	96.7	0
		7	181-210	0	0	0	0	44	96.7	0
		8	211-240	0	0	0	0	367	96.7	0
		9	241-270	0	0	0	0	154	93.3	0

*includes agreements only.

Appendix D (cont.)

Subject	Condition	Session	Trials	# of Target Responses (Q)*				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
					CR					
				ITI	CS	ITI-5 sec	UCS			
A5cont.	A	10	271-300	0	0	0	0	173	93.3	0
		11	301-330	0	0	0	0	398	100.0	0
		12	331-360	5	0	0	0	313	100.0	0
		13	361-390	2	0	0	0	275	100.0	0
		14	391-420	0	0	0	0	260	100.0	0
		15	421-460	0	0	0	0	94	87.5	0
		16	461-500	0	0	0	0	296	100.0	0

* includes agreements only.

Appendix E

Summary of Raw Data: Experiment 2: No Treatment/Control Group

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
				ITI	$\overline{CS}$	ITI-5 sec	UCS			
C1	B	1	1-16	0	0	0	0	32	NA	0
		2	17-46	0	0	0	0	4	-	0
		3	47-76	0	0	0	0	84	-	0
		4	77-106	0	0	0	0	107	-	0
		5	107-150	0	0	0	0	8	-	0
	C	1	1-10	0	0	0	0	1	NA	0
		2	11-40	0	0	0	0	1	-	0
		3	41-70	0	0	0	0	35	-	0
		4	71-100	0	0	0	0	42	-	0
		5	101-135	0	0	0	0	23	-	0
		6	136-170	0	0	0	0	10	-	0
		7	171-205	0	0	0	0	11	-	0
		8	206-240	0	0	0	0	32	-	0
		9	241-275	0	0	0	0	5	-	0
		10	276-310	0	0	0	0	29	-	0
		11	311-345	0	0	0	0	12	-	0
		12	346-380	0	0	0	0	14	-	0
		13	381-415	0	0	0	0	5	-	0
		14	416-450	0	0	0	0	42	-	0
		15	451-490	0	0	0	0	33	-	0
		16	491-500	0	0	0	0	68	-	0
C2	B	1	1-18	0	0	0	0	178	NA	0
		2	19-40	0	0	0	0	55	-	0
		3	41-66	0	0	0	0	305	-	0
		4	67-96	0	0	0	0	157	-	1
		5	97-126	0	0	0	0	523	-	0
		6	127-150	0	0	0	0	529	-	0
	C	1	1-30	0	0	0	0	535	NA	0
		2	31-60	0	0	0	0	602	-	0
		3	61-90	0	0	0	0	421	-	0
		4	91-120	0	0	0	0	306	-	0
		5	121-150	0	0	0	0	189	-	0
		6	151-180	0	0	0	0	223	-	0
		7	181-210	0	0	0	0	132	-	0
		8	211-240	0	0	0	0	361	-	0
		9	241-270	0	0	0	0	187	-	0

* includes agreements only.

Appendix E (cont.)

Subject	Condition	Session	Trials	# of Target Responses (0)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
				ITI	CS	ITI-5 sec	UCS			
C2cont.	C	10	271-300	0	0	0	0	349	NA	0
		11	301-330	0	0	0	0	471	-	0
		12	331-365	0	0	0	0	535	-	0
		13	366-400	0	0	0	0	367	-	0
		14	401-435	0	0	0	0	279	-	0
		15	436-470	0	0	0	0	359	-	0
		16	471-500	0	0	0	0	248	-	0
C3	B	1	1-19	1	0	0	0	73	NA	0
		2	20-36	0	0	0	0	130	-	0
		3	37-56	0	0	0	0	120	-	0
		4	57-76	0	0	0	0	81	-	0
		5	77-96	1	0	0	0	183	-	0
		6	97-116	0	0	0	0	131	-	0
		7	117-136	0	0	0	0	104	-	0
		8	137-150	0	0	0	0	150	-	0
	C	1	1-6	0	0	0	0	36	NA	0
		2	7-26	0	1	0	0	139	-	0
		3	27-46	1	0	0	0	88	-	0
		4	47-66	1	0	0	0	143	-	0
		5	67-96	1	0	0	0	144	-	0
		6	97-116	0	0	0	0	115	-	0
		7	117-136	0	0	0	0	124	-	0
		8	137-156	0	0	0	0	97	-	0
		9	157-176	0	0	0	0	117	-	0
		10	177-216	0	0	0	0	222	-	0
		11	217-236	1	0	0	0	159	-	0
		12	237-256	1	0	0	0	60	-	0
		13	257-276	0	0	0	0	118	-	0
		14	277-296	1	0	0	0	68	-	0
		15	297-336	0	0	0	0	191	-	0
		16	337-366	2	1	1	0	319	-	0
		17	367-406	0	0	0	0	261	-	0
		18	407-430	1	0	0	0	114	-	0
		19	431-465	1	0	0	0	324	-	0
		20	466-500	1	0	0	0	184	-	0

* includes agreements only.

Appendix E (cont.)

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
				ITI	CS	ITI-5 sec	UCS			
C4	B	1	1-30	0	0	0	0	35	NA	0
		2	31-60	0	0	0	0	68	-	0
		3	61-104	0	0	0	0	34	-	0
		4	105-134	0	0	0	0	1	-	0
		5	135-168	0	0	0	0	37	-	0
	C	1	1-6	0	0	0	0	7	NA	0
		2	7-36	1	0	0	0	37	-	0
		3	37-71	0	0	0	0	60	-	0
		4	72-106	0	0	0	0	10	-	0
		5	107-136	0	0	0	0	55	-	0
		6	137-171	0	0	0	0	80	-	0
		7	172-206	0	0	0	0	20	-	0
		8	207-241	0	0	0	0	4	-	0
		9	242-276	0	0	0	0	49	-	0
		10	277-311	0	0	0	0	22	-	0
		11	312-346	0	0	0	0	43	-	0
		12	347-381	0	0	0	0	59	-	0
		13	382-416	0	0	0	0	99	-	0
		14	417-460	0	0	0	0	464	-	0
		15	461-500	0	0	0	0	76	-	0
C5	B	1	1-3	0	0	0	0	30	NA	0
		2	4-33	0	0	0	0	13	-	0
		3	34-63	0	0	0	0	105	-	0
		4	64-93	0	0	0	0	52	-	0
		5	94-123	0	0	0	0	67	-	0
		6	124-150	0	0	0	0	75	-	0
	C	1	1-30	0	0	0	0	34	NA	0
		2	31-60	0	0	0	0	15	-	0
		3	61-90	0	0	0	0	28	-	0
		4	91-120	0	0	0	0	48	-	0
		5	121-150	0	0	0	0	13	-	1
		6	151-180	0	0	0	0	22	-	0
		7	181-210	0	0	0	0	49	-	0
		8	211-240	0	0	0	0	27	-	0
		9	241-270	0	0	0	0	25	-	0

* includes agreements only.

Appendix E (cont.)

Subject	Condition	Session	Trials	# of Target Responses (Ω)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
				ITI	CS	ITI-5 sec	UCS			
C5cont.		10	271-300	0	0	0	0	106	NA	0
		11	301-330	0	0	0	0	84	-	0
		12	331-360	0	0	0	0	83	-	0
		13	361-395	2	0	0	0	330	-	0
		14	396-430	1	0	0	0	206	-	0
		15	431-465	0	0	0	0	273	-	0
		16	466-500	0	0	0	0	228	-	0

* includes agreements only.

Appendix F

Summary of Session Data on Percent Trials With CR, Number of Target Vocalizations ("Q"), and Mean Number of Vocalizations for Each Subject in Experiment 2.

Subject	Condition	Session	Percent Trials with CR*+	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial*
A1	B	1	0.0	0	2.15
		2	0.0	1	4.90
		3	0.0	0	5.37
		4	0.0	0	2.50
		5	0.0	0	4.94
		($\bar{X}$)	0.0	0.20	3.97
	A	1	3.33	1	8.87
		2	3.33	1	11.47
		3	0.0	0	4.10
		4	4.00	1	5.32
		5	0.0	0	8.85
		6	0.0	0	4.36
		7	0.0	2	1.27
		8	0.0	6	8.72
		9	6.67	8	8.20
		10	6.67	6	4.37
		11	26.27	18	6.00
		12	3.33	1	3.30
		13	6.67	9	5.77
		14	13.33	14	5.40
		15	0.0	2	5.80
		16	0.0	0	4.10
		17	0.0	0	4.83
		18	0.0	6	9.20
		19	0.0	2	6.93
		($\bar{X}$)	3.87	4.05	6.15
A2	B	1	0.0	2	1.23
		2	0.0	0	3.10
		3	0.0	0	2.60
		4	0.0	0	2.13
		5	0.0	0	6.07
		6	0.0	0	1.67
		($\bar{X}$)	0.0	0.33	2.79
	A	1	0.0	0	2.08
		2	0.0	0	10.30
		3	0.0	0	11.87
		4	0.0	0	8.30
		5	0.0	0	8.63
		6	0.0	0	3.83
		7	0.0	0	8.87
		8	0.0	0	8.83
		9	0.0	7	9.50
		10	0.0	0	6.73
		11	0.0	0	7.17
		12	0.0	0	14.10
		13	3.33	2	9.87
		14	0.0	0	8.10
		15	0.0	5	6.00
		16	0.0	0	15.55
		17	0.0	0	13.92

*includes agreements only.
+or Qs in CR period

Appendix F (cont.)

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
A2cont.	A	18	0.0	0	13.25
		($\bar{X}$)	0.18	0.78	9.27
A3	B	1	15.79	29	16.26
		2	3.33	11	16.27
		3	0.0	1	10.60
		4	0.0	0	6.67
		5	0.0	0	6.93
		6	0.0	0	11.00
		($\bar{X}$)	3.19	6.83	11.29
	A	1	0.0	1	5.43
		2	3.33	1	8.27
		3	0.0	2	7.43
		4	0.0	0	8.67
		5	0.0	0	9.00
		6	0.0	0	8.87
		7	5.00	2	7.80
		8	0.0	0	7.20
		9	0.0	4	10.57
		10	7.14	13	8.21
		11	0.0	4	4.70
		12	3.33	4	7.00
		13	0.0	3	3.80
		14	0.0	0	2.64
		15	0.0	0	2.43
		16	0.0	0	4.03
		17	0.0	0	5.80
		18	0.0	1	12.90
		($\bar{X}$)	1.04	1.94	6.93
A4	B	1	0.0	0	2.08
		2	0.0	0	0.40
		3	0.0	0	6.60
		4	0.0	0	6.30
		5	0.0	0	8.57
		($\bar{X}$)	0.0	0	4.79
	A	1	3.33	3	3.90
		2	3.33	1	2.10
		3	0.0	0	6.27
		4	0.0	2	2.30
		5	0.0	0	2.47
		6	0.0	0	1.50
		7	0.0	1	0.27
		8	0.0	0	1.33
		9	0.0	0	3.40
		10	0.0	1	1.47
		11	0.0	0	3.43
		12	0.0	0	2.83
		13	0.0	0	3.87
		14	0.0	0	2.75
		15	0.0	1	4.97

Appendix F (cont.)

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
A4cont.	A	16	0.0	1	1.53
		17	0.0	0	4.23
		($\bar{X}$)	0.39	0.59	2.85
A5	B	1	0.0	0	6.67
		2	0.0	0	7.53
		3	0.0	0	5.87
		4	0.0	1	10.80
		5	0.0	0	0.10
		($\bar{X}$)	0.0	0.20	6.19
	A	1	0.0	0	1.90
		2	0.0	0	1.77
		3	0.0	0	6.03
		4	0.0	0	6.27
		5	0.0	0	7.90
		6	0.0	0	7.90
		7	0.0	0	1.47
		8	0.0	0	12.23
		9	0.0	0	5.13
		10	0.0	0	5.77
		11	0.0	0	13.27
		12	0.0	5	10.43
		13	0.0	2	9.17
		14	0.0	0	8.67
		15	0.0	0	2.35
		16	0.0	0	7.40
		($\bar{X}$)	0.0	0.44	6.73
C1	B	1	0.0	0	2.00
		2	0.0	0	0.13
		3	0.0	0	2.80
		4	0.0	0	3.57
		5	0.0	0	0.18
		($\bar{X}$)	0.0	0	1.74
	C	1	0.0	0	0.10
		2	0.0	0	0.03
		3	0.0	0	1.17
		4	0.0	0	1.40
		5	0.0	0	0.66
		6	0.0	0	0.29
		7	0.0	0	0.31
		8	0.0	0	0.91
		9	0.0	0	0.14
		10	0.0	0	0.83
		11	0.0	0	0.34
		12	0.0	0	0.40
		13	0.0	0	0.14
		14	0.0	0	1.20
		15	0.0	0	0.82
		16	0.0	0	6.80
		($\bar{X}$)	0.0	0	0.97

Appendix F (cont.)

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
C2	B	1	0.0	0	9.89
		2	0.0	0	2.50
		3	0.0	0	11.72
		4	0.0	0	5.23
		5	0.0	0	17.43
		6	0.0	0	22.04
		($\bar{X}$)	0.0	0	11.47
	C	1	0.0	0	17.83
		2	0.0	0	20.07
		3	0.0	0	14.03
		4	0.0	0	10.20
		5	0.0	0	6.30
		6	0.0	0	7.43
		7	0.0	0	4.40
		8	0.0	0	12.03
		9	0.0	0	6.23
		10	0.0	0	11.63
		11	0.0	0	15.70
		12	0.0	0	15.29
		13	0.0	0	10.49
		14	0.0	0	7.97
		15	0.0	0	10.26
		16	0.0	0	8.27
		($\bar{X}$)	0.0	0	11.13
C3	B	1	0.0	1	3.84
		2	0.0	0	7.65
		3	0.0	0	6.00
		4	0.0	0	4.05
		5	0.0	1	9.15
		6	0.0	0	6.55
		7	0.0	0	5.20
		8	0.0	0	10.71
		($\bar{X}$)	0.0	0.25	6.64
	C	1	0.0	0	6.00
		2	5.0	1	6.95
		3	0.0	1	4.40
		4	0.0	1	7.15
		5	0.0	1	4.80
		6	0.0	0	5.75
		7	0.0	0	6.20
		8	0.0	0	4.85
		9	0.0	0	5.85
		10	0.0	0	5.55
		11	0.0	1	7.95
		12	0.0	1	3.00
		13	0.0	0	5.90
		14	0.0	1	3.40
		15	0.0	0	4.78
		16	6.67	4	10.63
		17	0.0	0	6.53
		18	0.0	1	4.75

Appendix F (cont.)

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
C3cont.		19	0.0	1	9.26
		20	0.0	1	5.26
		($\bar{X}$)	0.58	0.70	5.95
C4	B	1	0.0	0	1.17
		2	0.0	0	2.27
		3	0.0	0	1.00
		4	0.0	0	0.03
		5	0.0	0	1.54
		($\bar{X}$)	0.0	0	1.20
	C	1	0.0	0	1.17
		2	0.0	1	1.23
		3	0.0	0	1.71
		4	0.0	0	0.29
		5	0.0	0	1.83
		6	0.0	0	2.29
		7	0.0	0	0.57
		8	0.0	0	0.11
		9	0.0	0	1.40
		10	0.0	0	0.63
		11	0.0	0	1.23
		12	0.0	0	1.69
		13	0.0	0	2.83
		14	0.0	0	10.55
		15	0.0	0	1.90
		($\bar{X}$)	0.0	0.07	1.96
C5	B	1	0.0	0	10.00
		2	0.0	0	0.43
		3	0.0	0	3.50
		4	0.0	0	1.73
		5	0.0	0	2.23
		6	0.0	0	2.78
		($\bar{X}$)	0.0	0	3.44
	C	1	0.0	0	1.13
		2	0.0	0	0.50
		3	0.0	0	0.93
		4	0.0	0	1.60
		5	0.0	0	0.43
		6	0.0	0	0.73
		7	0.0	0	1.63
		8	0.0	0	0.90
		9	0.0	0	0.83
		10	0.0	0	3.53
		11	0.0	0	2.80
		12	0.0	0	2.77
		13	0.0	2	9.43
		14	0.0	1	5.89
		15	0.0	0	7.80
		16	0.0	0	6.51
		(X)	0.0	0.19	2.96

Appendix G

Observer Agreement Measures: Experiment 2

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Responses)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
A1	1	B	1	N.A.	100.00	100.00	70.69	93.33	76.32
			2	N.A.	100.00	100.00	84.63	100.00	86.68
			3	N.A.	100.00	100.00	90.97	100.00	91.27
			4	N.A.	100.00	100.00	89.27	100.00	93.56
			5	N.A.	100.00	100.00	98.42	100.00	98.61
		A	1	100.00	100.00	100.00	90.47	66.67	91.10
			2	100.00	100.00	100.00	87.61	0.00	87.61
			3	N.A.	100.00	100.00	85.57	75.00	87.73
			4	100.00	100.00	100.00	90.01	100.00	92.01
			5	N.A.	100.00	100.00	85.50	100.00	87.11
			6	N.A.	100.00	100.00	95.64	100.00	96.58
			7	N.A.	100.00	100.00	90.88	100.00	94.22
			8	N.A.	100.00	100.00	84.83	100.00	85.44
			9	100.00	100.00	100.00	90.34	100.00	90.66
			10	100.00	100.00	100.00	90.99	100.00	91.59
			11	100.00	100.00	100.00	92.62	100.00	93.11
			12	100.00	100.00	100.00	85.55	90.91	90.37
			13	100.00	100.00	100.00	85.29	75.00	86.76
			14	100.00	100.00	100.00	85.14	85.71	88.11
			15	0.00	0.00	0.00	81.33	100.00	83.19
			16	0.00	0.00	0.00	81.10	100.00	85.51
			17	N.A.	100.00	100.00	88.30	100.00	90.69
			18	N.A.	100.00	100.00	92.08	100.00	92.35
			19	N.A.	100.00	100.00	92.12	100.00	92.68
	$\bar{X}$			81.82	91.67	91.67	87.87	91.11	89.72
A2	1	B	1	N.A.	100.00	100.00	31.22	28.57	40.88
			2	N.A.	100.00	100.00	75.80	80.00	82.53
			3	N.A.	100.00	100.00	92.23	100.00	95.85
			4	N.A.	100.00	100.00	91.54	100.00	97.18
			5	N.A.	100.00	100.00	87.65	66.67	89.30
			6	N.A.	100.00	100.00	100.00	100.00	100.00
		A	1	N.A.	100.00	100.00	94.44	100.00	95.83
			2	N.A.	100.00	100.00	88.71	0.00	88.71
			3	N.A.	100.00	100.00	92.13	100.00	92.39
			4	N.A.	100.00	100.00	89.54	100.00	90.93
			5	N.A.	100.00	100.00	93.15	N.A.	93.15
			6	N.A.	100.00	100.00	94.31	66.67	94.69
			7	N.A.	100.00	100.00	89.37	100.00	89.72
			8	N.A.	100.00	100.00	85.13	66.67	86.17
			9	N.A.	100.00	100.00	90.11	50.00	90.44
			10	N.A.	100.00	100.00	94.94	100.00	95.78

Appendix G (cont.)

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Responses)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
A2cont.	1	A	11	N.A.	100.00	100.00	95.23	100.00	95.55
			12	N.A.	100.00	100.00	87.69	N.A.	87.69
			13	100.00	100.00	100.00	87.48	100.00	88.73
			14	N.A.	100.00	100.00	94.06	100.00	94.26
			15	N.A.	100.00	100.00	89.29	100.00	89.94
			16	N.A.	100.00	100.00	84.82	N.A.	84.82
			17	N.A.	100.00	100.00	88.85	100.00	89.28
			18	0.00	95.00	95.00	82.05	N.A.	82.05
A2	$\bar{X}$			50.00	99.80	99.80	87.49	82.93	88.99
A3	3	B	1	50.00	87.50	89.47	69.80	N.A.	69.80
			2	100.00	100.00	100.00	89.01	N.A.	89.01
			3	N.A.	100.00	100.00	92.57	100.00	92.82
			4	N.A.	100.00	100.00	84.56	66.67	85.59
			5	N.A.	100.00	100.00	89.00	75.00	90.10
			6	N.A.	100.00	100.00	95.48	N.A.	95.48
		A	1	N.A.	100.00	100.00	84.14	N.A.	84.14
			2	100.00	100.00	100.00	89.38	N.A.	89.38
			3	N.A.	100.00	100.00	88.69	50.00	89.06
			4	N.A.	100.00	100.00	76.50	50.00	78.07
			5	N.A.	100.00	100.00	88.16	100.00	88.95
			6	N.A.	100.00	100.00	86.90	N.A.	86.90
			7	100.00	100.00	100.00	87.49	100.00	88.12
			8	N.A.	100.00	100.00	83.98	100.00	85.81
			9	N.A.	100.00	100.00	85.90	100.00	86.37
			10	100.00	100.00	100.00	85.98	100.00	86.98
			11	N.A.	100.00	100.00	83.60	85.71	86.88
			12	100.00	100.00	100.00	82.79	75.00	84.51
			13	N.A.	100.00	100.00	85.68	90.00	89.97
			14	N.A.	100.00	100.00	86.92	100.00	90.66
			15	N.A.	100.00	100.00	71.67	73.33	82.06
			16	N.A.	100.00	100.00	90.61	85.71	92.49
			17	N.A.	100.00	100.00	79.65	80.00	85.08
			18	N.A.	100.00	100.00	84.87	50.00	85.38
A3	$\bar{X}$			91.67	99.48	99.56	85.14	82.30	86.82
A4	3	B	1	N.A.	100.00	100.00	76.29	90.00	87.82
			2	N.A.	100.00	100.00	100.00	100.00	100.00
			3	N.A.	100.00	100.00	87.69	100.00	90.56
			4	N.A.	100.00	100.00	95.17	100.00	95.49
			5	N.A.	100.00	100.00	100.00	100.00	100.00
		A	1	100.00	100.00	100.00	88.74	87.50	91.36
			2	100.00	100.00	100.00	91.75	94.12	96.15

Appendix G (cont.)

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Responses)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
A4cont.	3	A	3	N.A.	100.00	100.00	90.01	100.00	93.67
			4	N.A.	100.00	100.00	94.71	100.00	96.83
			5	N.A.	100.00	100.00	89.71	100.00	95.20
			6	N.A.	100.00	100.00	92.54	100.00	96.52
			7	N.A.	100.00	100.00	93.33	100.00	98.89
			8	N.A.	100.00	100.00	83.01	100.00	94.34
			9	N.A.	100.00	100.00	81.40	100.00	85.12
			10	N.A.	100.00	100.00	78.05	88.24	89.02
			11	N.A.	100.00	100.00	82.87	92.86	90.29
			12	N.A.	100.00	100.00	87.70	100.00	93.44
			13	N.A.	100.00	100.00	82.72	88.89	87.33
			14	N.A.	100.00	100.00	89.71	88.89	93.83
			15	N.A.	100.00	100.00	77.61	83.33	81.34
			16	N.A.	100.00	100.00	76.48	92.31	85.89
			17	N.A.	100.00	100.00	80.86	100.00	87.24
A4	$\bar{X}$			100.00	100.00	100.00	87.29	95.73	92.29
A5	1	B	1	N.A.	100.00	100.00	70.99	66.67	76.79
			2	N.A.	100.00	100.00	82.73	75.00	84.45
			3	N.A.	100.00	100.00	98.09	100.00	98.79
			4	N.A.	100.00	100.00	92.01	85.71	93.61
			5	N.A.	100.00	100.00	100.00	100.00	100.00
		A	1	N.A.	100.00	100.00	98.76	100.00	99.71
			2	N.A.	100.00	100.00	100.00	100.00	100.00
			3	N.A.	100.00	100.00	88.54	100.00	91.60
			4	N.A.	100.00	100.00	95.16	100.00	96.29
			5	N.A.	100.00	100.00	90.52	100.00	95.58
			6	N.A.	100.00	100.00	81.90	100.00	89.74
			7	N.A.	100.00	100.00	96.43	100.00	98.33
			8	N.A.	100.00	100.00	89.43	N.A.	89.43
			9	N.A.	100.00	100.00	90.94	100.00	93.36
			10	N.A.	100.00	100.00	93.85	100.00	95.69
			11	N.A.	100.00	100.00	92.81	100.00	93.29
			12	N.A.	100.00	100.00	88.97	100.00	90.07
			13	N.A.	100.00	100.00	88.69	83.33	90.57
			14	N.A.	100.00	100.00	77.36	83.33	81.14
			15	N.A.	100.00	100.00	79.40	94.12	87.64
			16	N.A.	100.00	100.00	89.66	100.00	91.47
A5	$\bar{X}$			N.A.	100.00	100.00	89.82	94.41	92.26
C1	2	B	1	N.A.	100.00	100.00	82.84	100.00	88.20
			2	N.A.	100.00	100.00	100.00	100.00	100.00
			3	N.A.	100.00	100.00	66.28	66.67	73.02
			4	N.A.	100.00	100.00	85.00	85.71	88.00
			5	N.A.	100.00	100.00	73.34	96.67	96.08

Appendix G (cont.)

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Responses)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
C1cont.	2	C	1	N.A.	100.00	100.00	100.00	100.00	100.00
			2	N.A.	100.00	100.00	100.00	100.00	100.00
			3	N.A.	100.00	100.00	77.69	89.47	90.33
			4	N.A.	100.00	100.00	85.88	80.00	92.00
			5	N.A.	100.00	100.00	92.17	100.00	97.76
			6	N.A.	100.00	100.00	75.00	96.67	95.71
			7	N.A.	100.00	100.00	100.00	100.00	100.00
			8	N.A.	100.00	100.00	84.79	100.00	96.52
			9	N.A.	100.00	100.00	100.00	100.00	100.00
			10	N.A.	100.00	100.00	89.44	100.00	95.48
			11	N.A.	100.00	100.00	90.48	100.00	98.64
			12	N.A.	100.00	100.00	89.29	100.00	97.86
			13	N.A.	100.00	100.00	100.00	100.00	100.00
			14	N.A.	100.00	100.00	96.33	100.00	99.01
			15	N.A.	100.00	100.00	93.59	100.00	97.92
			16	N.A.	100.00	100.00	N.A.	N.A.	N.A.
C1	$\bar{X}$			N.A.	100.00	100.00	89.11	95.76	95.33
C2	2	B	1	N.A.	100.00	100.00	92.48	N.A.	92.48
			2	N.A.	100.00	100.00	58.32	50.00	62.11
			3	N.A.	100.00	100.00	89.07	100.00	89.94
			4	N.A.	100.00	100.00	70.90	66.67	74.78
			5	N.A.	100.00	100.00	83.71	N.A.	83.71
			6	N.A.	100.00	100.00	85.90	N.A.	85.90
		C	1	N.A.	100.00	100.00	83.95	N.A.	83.95
			2	N.A.	100.00	100.00	N.A.	N.A.	N.A.
			3	N.A.	100.00	100.00	73.10	50.00	74.00
			4	N.A.	100.00	100.00	78.15	100.00	81.07
			5	N.A.	100.00	100.00	85.21	N.A.	85.21
			6	N.A.	100.00	100.00	91.52	100.00	92.37
			7	N.A.	100.00	100.00	86.70	100.00	88.48
			8	N.A.	100.00	100.00	85.31	0.00	85.31
			9	N.A.	100.00	100.00	81.73	100.00	84.78
			10	N.A.	100.00	100.00	82.73	100.00	83.31
			11	N.A.	100.00	100.00	86.43	100.00	86.88
			12	N.A.	100.00	100.00	84.02	100.00	84.94
			13	N.A.	100.00	100.00	83.90	100.00	86.20
			14	N.A.	100.00	100.00	73.35	50.00	74.11
			15	N.A.	100.00	100.00	89.76	N.A.	89.76
			16	N.A.	100.00	100.00	89.87	100.00	90.21
C2	$\bar{X}$			N.A.	100.00	100.00	82.67	81.11	83.79

Appendix G (cont.)

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Response)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
C3	1	B	1	N.A.	100.00	100.00	89.80	100.00	91.94
			2	N.A.	100.00	100.00	90.62	100.00	91.72
			3	N.A.	100.00	100.00	91.85	N.A.	91.85
			4	N.A.	100.00	100.00	84.75	100.00	87.80
			5	N.A.	100.00	100.00	88.90	N.A.	88.90
			6	N.A.	100.00	100.00	95.27	100.00	95.98
			7	N.A.	100.00	100.00	93.50	100.00	94.80
			8	N.A.	100.00	100.00	89.77	N.A.	89.77
		C	1	N.A.	100.00	100.00	87.93	100.00	89.94
			2	100.00	100.00	100.00	91.36	100.00	92.22
			3	N.A.	100.00	100.00	92.92	100.00	95.75
			4	N.A.	100.00	100.00	90.40	80.00	92.32
			5	N.A.	100.00	100.00	83.11	62.50	85.93
			6	N.A.	100.00	100.00	84.17	71.43	88.13
			7	N.A.	100.00	100.00	85.26	80.00	88.21
			8	N.A.	100.00	100.00	88.77	100.00	89.89
			9	N.A.	100.00	100.00	91.18	100.00	92.95
			10	N.A.	100.00	100.00	86.18	100.00	88.60
			11	N.A.	100.00	100.00	92.75	100.00	93.48
			12	N.A.	100.00	100.00	62.99	66.67	70.40
			13	N.A	100.00	100.00	88.89	100.00	89.44
			14	N.A.	100.00	100.00	93.49	100.00	94.80
			15	N.A.	100.00	100.00	92.08	100.00	95.25
			16	50.00	93.33	90.44	84.77	80.00	86.80
			17	N.A.	100.00	100.00	87.67	100.00	90.14
			18	N.A.	100.00	100.00	84.15	80.00	86.80
			19	N.A.	100.00	100.00	78.81	33.33	79.41
			20	N.A.	100.00	100.00	85.21	83.33	87.32
C3	$\bar{X}$			75.00	99.76	99.66	87.73	89.49	89.66
C4	2	B	1	N.A.	100.00	100.00	65.88	75.00	79.52
			2	N.A.	100.00	100.00	70.64	88.24	85.32
			3	N.A.	100.00	100.00	87.50	100.00	98.53
			4	N.A.	100.00	100.00	100.00	100.00	100.00
			5	N.A.	100.00	100.00	93.75	100.00	96.88
		C	1	N.A.	100.00	100.00	100.00	100.00	100.00
			2	N.A.	100.00	100.00	76.83	94.44	89.96
			3	N.A.	100.00	100.00	90.09	100.00	95.47

Appendix G (cont.)

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Response)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
C4cont.	2	C	4	N.A.	100.00	100.00	100.00	100.00	100.00
			5	N.A.	100.00	100.00	75.30	86.67	86.00
			6	N.A.	100.00	100.00	80.80	93.75	89.03
			7	N.A.	100.00	100.00	71.59	88.89	91.07
			8	N.A.	100.00	100.00	100.00	100.00	100.00
			9	N.A.	100.00	100.00	79.53	90.48	90.64
			10	N.A.	100.00	100.00	78.18	100.00	95.64
			11	N.A.	100.00	100.00	71.67	90.00	86.24
			12	N.A.	100.00	100.00	85.06	100.00	94.02
			13	N.A.	100.00	100.00	94.07	100.00	97.29
			14	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			15	N.A.	100.00	100.00	77.54	90.48	88.21
C4	$\bar{X}$			N.A.	100.00	100.00	84.13	94.63	92.83
C5	3	B	1	N.A.	100.00	100.00	86.54	N.A.	86.54
			2	N.A.	100.00	100.00	88.89	100.00	96.67
			3	N.A.	100.00	100.00	93.56	100.00	95.49
			4	N.A.	100.00	100.00	89.05	90.00	92.33
			5	N.A.	100.00	100.00	93.67	100.00	95.36
			6	N.A.	100.00	100.00	72.64	83.33	85.78
		C	1	N.A.	100.00	100.00	91.67	87.50	95.56
			2	N.A.	100.00	100.00	92.86	100.00	98.33
			3	N.A.	100.00	100.00	97.78	100.00	98.89
			4	N.A.	100.00	100.00	93.52	100.00	96.11
			5	N.A.	100.00	100.00	90.00	95.24	96.67
			6	N.A.	100.00	100.00	96.30	100.00	98.89
			7	N.A.	100.00	100.00	97.14	100.00	99.05
			8	N.A.	100.00	100.00	86.36	95.00	95.00
			9	N.A.	100.00	100.00	80.17	95.00	92.73
			10	N.A.	100.00	100.00	92.16	100.00	95.82
			11	N.A.	100.00	100.00	89.84	100.00	96.61
			12	N.A.	100.00	100.00	80.19	72.73	85.48
			13	N.A.	100.00	100.00	85.31	100.00	87.83
			14	N.A.	100.00	100.00	83.31	100.00	84.74
			15	N.A.	100.00	100.00	87.65	100.00	89.41
			16	N.A.	100.00	100.00	84.72	100.00	87.78
C5	$\bar{X}$			N.A.	100.00	100.00	88.79	96.13	93.23

Appendix H

Summary of Raw Data: Experiment 3

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
					CR					
				ITI	CS	ITI-5 sec	UCS			
B1	No B/Auto	1	1-30	0	1	0	0	182	70.00	0
		2	31-60	0	0	0	0	74	90.00	0
		3	61-90	0	0	0	0	212	80.00	0
		4	91-125	3	0	0	0	231	74.29	0
		5	126-160	0	0	0	1	242	68.57	0
		6	161-195	0	0	0	0	119	85.71	0
		7	196-230	0	0	0	0	96	68.57	0
		8	231-270	0	0	0	0	315	90.00	0
		9	271-300	0	0	0	0	132	63.33	0
B2	No B/Auto	1	1-22	0	0	0	0	100	90.91	0
		2	23-34	0	0	0	0	35	83.33	0
		3	35-64	0	0	0	0	164	93.33	0
		4	65-94	0	0	0	0	182	86.67	0
		5	95-124	0	0	0	0	263	93.33	0
		6	125-154	0	1	0	0	119	86.67	0
		7	155-184	1	0	0	0	157	30.00	0
		8	185-214	0	0	0	0	106	66.67	0
		9	215-244	0	0	0	0	151	76.67	0
		10	245-274	2	0	0	0	217	50.00	0
		11	275-300	0	0	0	0	129	92.31	0
B3	No B/Auto	1	1-30	2	1	0	0	314	76.67	0
		2	31-60	1	0	0	2	181	86.67	0
		3	61-90	0	0	0	0	199	96.67	0
		4	91-120	0	0	0	0	150	93.33	0
		5	121-160	0	0	0	0	111	95.00	0
		6	161-200	2	5	1	1	271	100.00	0
		7	201-230	1	1	0	0	324	100.00	0
		8	231-260	0	1	0	0	307	76.67	0
		9	261-300	2	1	0	0	409	97.50	0
M1	Ma/No B/ Auto	1	1-30	4	0	0	0	163	93.33	0
		2	31-60	0	0	0	1	110	N.A.	0
		3	61-90	0	0	0	0	194	73.33	0
		4	91-120	0	0	0	1	116	N.A.	0

*Includes agreements only.

Appendix H (cont.)

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" trials
					CR					
				ITI	CS	ITI-5 sec	UCS			
M1cont.		5	121-150	1	0	0	0	148	90.00	0
		6	151-180	0	0	0	0	192	83.30	0
		7	181-210	4	0	0	0	178	96.67	0
		8	211-240	0	0	0	0	176	100.00	0
		9	241-270	1	0	0	0	239	93.33	0
		10	271-300	0	0	0	0	168	96.67	0
M2	Ma/No B/ Auto	1	1-30	17	0	1	1	55	100.00	0
		2	31-60	44	0	1	1	176	100.00	0
		3	61-90	15	0	2	0	163	100.00	0
		4	91-120	4	0	0	0	72	100.00	0
		5	121-150	32	1	3	1	247	100.00	0
		6	151-180	11	0	1	1	133	93.33	0
		7	181-207	2	0	0	0	135	33.33	0
		8	208-237	7	0	0	2	229	80.00	0
		9	238-267	2	0	2	2	258	100.00	0
		10	268-300	13	2	1	1	243	100.00	0
M3	Ma/No B/ Auto	1	1-15	0	0	0	0	252	73.33	0
		2	16-45	0	2	0	0	410	96.67	0
		3	46-71	0	0	0	1	312	46.15	0
		4	72-88	0	0	0	0	239	23.53	0
		5	89-118	0	1	0	0	480	93.33	0
		6	119-148	0	3	0	0	569	96.67	0
		7	149-178	4	0	0	0	488	93.33	0
		8	179-208	0	1	0	0	416	93.33	0
		9	209-238	0	0	0	0	515	96.67	0
		10	239-268	0	2	0	0	490	96.67	0
		11	269-300	0	0	0	0	424	96.88	0

*Includes agreements only.

Appendix I

Summary of Session Data on Percent Trials With CR, Number of Target Vocalizations ("Q"), And Mean Number of Vocalizations For Each Subject In Experiment 3

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
B1	No B/Auto	1	3.33	1	6.07
		2	0.00	0	2.47
		3	0.00	0	7.07
		4	0.00	3	6.60
		5	2.86	1	6.91
		6	0.00	0	3.40
		7	0.00	0	2.74
		8	0.00	0	7.88
		9	0.00	0	4.40
	$\bar{X}$		0.69	0.56	5.28
B2	No B/Auto	1	0.00	0	4.55
		2	0.00	0	2.92
		3	0.00	0	5.47
		4	0.00	0	6.07
		5	0.00	0	8.77
		6	3.33	1	3.97
		7	0.00	1	5.23
		8	0.00	0	3.53
		9	0.00	0	5.03
		10	0.00	2	7.23
		11	0.00	0	4.96
	$\bar{X}$		0.30	0.36	5.25
B3	No B/Auto	1	3.33	3	10.47
		2	6.67	3	6.03
		3	0.00	0	6.63
		4	0.00	0	5.00
		5	0.00	0	2.78
		6	12.50	9	6.78
		7	3.33	2	10.80
		8	3.33	1	10.23
		9	2.50	3	10.22
	$\bar{X}$		3.52	2.33	7.66
M1	Ma/No B/Auto	1	0.00	4	5.43
		2	3.33	1	3.67
		3	0.00	0	6.47
		4	3.33	1	3.87
		5	0.00	1	4.93
		6	0.00	0	6.40
		7	0.00	4	5.93
		8	0.00	0	5.87
		9	0.00	1	7.97
		10	0.00	0	5.60
	$\bar{X}$		0.67	1.20	5.61
M2	Ma/No B/Auto	1	6.67	19	1.83
		2	6.67	46	5.87
		3	3.33	17	5.43
		4	0.00	4	2.40
		5	10.00	37	8.23
		6	3.33	13	4.43

Appendix I (cont.)

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
M2cont.	Ma/No B/Auto	7	0.00	2	5.00
		8	6.67	9	7.63
		9	3.33	6	8.60
		10	9.09	17	7.36
	$\bar{X}$		4.91	17.0	5.68
M3	Ma/No B/Auto	1	0.00	0	16.80
		2	6.67	2	13.67
		3	3.85	1	12.00
		4	0.00	0	14.06
		5	3.33	1	16.00
		6	10.00	3	18.97
		7	0.00	4	16.27
		8	3.33	1	13.87
		9	0.00	0	17.17
		10	6.67	2	16.33
		11	0.00	0	13.25
	$\bar{X}$		3.08	1.27	15.31

Appendix J

Observer Agreement Measures: Experiment 3(a)

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Vocalizations)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
B1	2	No B/Auto	1	100.00	100.00	100.00	61.37	28.57	63.95
			2	N.A.	100.00	100.00	74.61	87.50	80.54
			3	N.A.	100.00	100.00	73.70	50.00	75.45
			4	N.A.	100.00	100.00	72.43	77.78	77.94
			5	100.00	100.00	100.00	78.30	60.00	80.16
			6	N.A.	100.00	100.00	66.45	50.00	72.20
			7	N.A.	100.00	100.00	64.70	94.74	82.86
			8	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			9	N.A.	100.00	100.00	78.78	83.33	82.32
		$\bar{X}$		100.00	100.00	100.00	71.29	66.49	76.93
B2	3	No B/Auto	1	N.A.	100.00	100.00	60.32	66.67	74.75
			2	N.A.	100.00	100.00	72.41	100.00	79.31
			3	N.A.	100.00	100.00	83.29	100.00	85.52
			4	N.A.	100.00	100.00	76.96	33.33	77.73
			5	N.A.	100.00	100.00	72.62	33.33	73.53
			6	100.00	100.00	100.00	70.74	0.0	70.74
			7	N.A.	100.00	100.00	82.05	N.A.	82.05
			8	N.A.	100.00	100.00	71.45	100.00	78.11
			9	N.A.	100.00	100.00	81.33	100.00	82.14
			10	N.A.	100.00	100.00	83.50	100.00	85.15
			11	N.A.	100.00	100.00	72.83	50.00	75.97
		$\bar{X}$		100.00	100.00	100.00	75.23	68.33	78.64
B3	1	No B/Auto	1	100.00	100.00	100.00	87.50	100.00	87.92
			2	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			3	N.A.	100.00	100.00	90.92	50.00	91.22
			4	0.00	97.50	97.50	87.48	66.67	88.31
			5	N.A.	100.00	100.00	93.13	85.71	94.16
			6	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			7	50.00	96.55	96.67	87.94	100.00	88.34
			8	100.00	100.00	100.00	92.13	N.A.	92.13
			9	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
		$\bar{X}$		62.50	99.01	99.03	89.85	80.48	90.35

Appendix K

Summary of Raw Data: Experiment 4

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" Trials
					CR					
				ITI	CS	ITI-5 sec	UCS			
My1	Myers/Auto	1	1-30	1	0	0	0	76	76.67	0
		2	31-65	1	0	0	0	115	82.86	0
		3	66-105	1	1	0	0	105	77.50	0
		4	106-145	0	0	1	0	98	85.00	0
		5	146-185	0	0	0	0	95	82.50	0
		6	186-225	1	0	0	0	168	80.00	0
		7	226-265	0	0	0	0	96	100.00	0
		8	266-300	1	0	0	0	127	92.50	0
My2	Myers/Auto	1	1-40	2	1	0	0	182	37.50	0
		2	41-75	5	0	0	4	171	51.43	0
		3	76-105	0	0	0	0	50	90.00	0
		4	106-140	2	0	0	0	42	88.57	0
		5	141-180	0	1	0	0	80	62.50	0
		6	181-220	0	1	0	0	49	52.50	0
		7	221-260	2	0	0	2	110	57.50	0
		8	261-300	0	0	0	0	41	55.00	0
My3	Myers/Auto	1	1-27	2	0	0	0	102	14.81	0
		2	28-60	1	0	0	0	44	51.52	0
		3	61-95	7	1	0	0	72	74.29	0
		4	96-125	6	1	2	0	54	43.33	0
		5	126-165	8	0	1	0	194	80.00	0
		6	166-200	2	0	0	0	56	94.29	0
		7	201-230	0	0	0	0	48	80.00	0
		8	231-270	2	0	1	0	54	87.50	0
		9	271-300	3	0	0	0	98	96.67	0

* Includes agreements only.

Appendix L

Summary of Session Data on Percent Trials With CR, Number of Target Vocalizations ("Q"), And Mean Number of Vocalizations For Each Subject In Experiment 4

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
My1	Myers/Auto	1	0	1	2.53
		2	0	1	3.29
		3	2.5	2	2.62
		4	2.5	1	2.45
		5	0	0	2.38
		6	0	1	4.20
		7	0	0	2.40
		8	0	1	3.18
	$\bar{X}$		0.62	0.88	2.88
My2	Myers/Auto	1	2.5	3	4.55
		2	5.71	9	4.89
		3	0	0	1.70
		4	0	2	1.20
		5	2.5	1	2.00
		6	2.5	1	1.22
		7	5.0	4	2.75
		8	0	0	1.02
	$\bar{X}$		2.28	2.50	2.42
My3	Myers/Auto	1	0	2	3.78
		2	0	1	1.33
		3	2.86	8	2.06
		4	6.67	9	1.30
		5	2.5	9	4.85
		6	0	2	1.60
		7	0	0	1.60
		8	2.5	3	1.35
		9	0	3	3.27
	$\bar{X}$		1.61	4.11	2.40

Appendix M

Observer Agreement Measures: Experiment 4

Subject	Experimenter	Condition	Session	% Agreement on CRs (Target Vocalizations)/ Session			% Agreement on Vocalizations/ Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
My1	AM	Myers/Auto	1	N.A.	100.00	100.00	81.53	100.00	87.07
			2	N.A.	100.00	100.00	84.62	100.00	86.38
			3	100.00	100.00	100.00	78.31	85.71	81.56
			4	100.00	100.00	100.00	80.47	100.00	86.33
			5	N.A.	100.00	100.00	87.36	93.33	91.78
			6	N.A.	100.00	100.00	86.53	83.33	88.21
			7	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			8	N.A.	100.00	100.00	85.57	100.00	88.10
		$\bar{X}$		100.00	100.00	100.00	83.48	94.62	87.06
My2	AM	Myers/Auto	1	100.00	100.00	100.00	78.76	100.00	79.29
			2	100.00	100.00	100.00	75.74	60.00	77.82
			3	N.A.	100.00	100.00	84.72	100.00	87.78
			4	N.A.	100.00	100.00	77.24	81.82	83.09
			5	100.00	100.00	100.00	84.41	84.62	88.70
			6	100.00	100.00	100.00	68.62	90.91	84.31
			7	100.00	100.00	100.00	67.96	75.00	72.77
			8	N.A.	100.00	100.00	86.19	95.65	93.78
		$\bar{X}$		100.00	100.00	100.00	77.96	86.00	83.44
My3	AM	Myers/Auto	1	N.A.	100.00	100.00	74.37	71.43	79.11
			2	N.A.	100.00	100.00	74.89	90.00	88.59
			3	100.00	100.00	100.00	67.02	86.36	84.92
			4	100.00	100.00	100.00	70.21	75.00	79.14
			5	33.33	94.87	95.00	78.23	83.33	80.95
			6	N.A.	100.00	100.00	89.04	100.00	91.55
			7	N.A.	100.00	100.00	75.26	85.71	85.16
			8	100.00	100.00	100.00	79.55	85.71	85.68
			9	N.A.	100.00	100.00	80.19	83.33	83.49
		$\bar{X}$		83.33	99.43	99.44	76.53	84.54	84.29

Appendix N

Summary of Raw Data: Experiment 5

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% of UCSs (food items) delivered	# of "Disruption" Trials
				ITI	CR					
					CS	ITI-5 sec	UCS			
O1	Operant	1	1-30	0	9	1	3	339	N.A.	0
		2	31-50[C]	0	19	0	1	157	--	0
O2	Operant	1	1-30	0	0	0	0	47	N.A.	0
		2	31-60	1	0	0	1	115	--	0
		3	61-90	0	1	0	0	253	--	0
		4	91-123	21	4	0	2	205	--	0
		5	124-139[C]	1	10	0	5	178	--	0
O3	Operant	1	1-30	1	9	0	0	207	N.A.	0
		2	31-60	3	1	0	2	258	--	0
		3	61-81	0	0	0	1	248	--	0
		4	82-91	0	0	0	0	114	--	0
		5	92-121	0	4	0	1	204	--	0
		6	122-145	4	0	0	0	155	--	0
		7	146-175	0	9	0	19	288	--	0
		8	176-192[C]	2	5	0	0	186	--	0
OR1	Op&Res	1	1-40	0	0	0	0	438	100.00	0
		2	41-48	0	0	0	0	32	0.00	0
		3	49-88	3	1	0	0	209	87.50	0
		4	89-128	0	0	0	0	224	85.00	0
		5	129-168	0	0	0	0	162	82.50	0
		6	169-213	2	2	0	0	389	77.78	0
		7	214-258	1	0	0	0	299	84.44	0
		8	259-300	0	0	0	0	355	64.29	0
OR2	Op&Res	1	1-20	0	0	0	0	14	85.00	0
		2	21-55	0	0	0	1	203	88.57	0
		3	56-90	4	0	0	1	182	82.86	0
		4	91-130	1	0	0	2	273	85.00	0
		5	131-170	0	0	0	0	258	87.50	0
		6	171-200	0	0	0	0	113	50.00	0
		7	201-235	1	0	0	0	193	88.57	0
		8	236-272	15	1	0	0	302	67.57	0
		9	273-302	0	0	0	2	212	63.33	0
		10	303-332	2	0	1	1	172	66.67	0

*Includes agreements only.
[C]Criterion met.

Appendix N (cont.)

Subject	Condition	Session	Trials	# of Target Responses (Q)				# of Vocalizations/ Session*	% OF UCSs(food items) delivered	# of "Disruption" Trials
				ITI	CR					
					CS	ITI-5 sec	UCS			
OR3	Op&Res	1	1-30	3	0	0	0	406	86.67	0
		2	31-60	1	0	0	0	341	76.67	0
		3	61-90	3	0	0	1	269	53.33	0
		4	91-120	7	2	0	1	457	56.67	0
		5	121-150	3	3	1	1	362	73.33	0
		6	151-180	3	8	1	1	344	43.33	0
		7	181-210	3	6	0	4	351	73.33	0
		8	211-240	2	18	0	2	394	76.67	0
		9	241-270	4	11	2	1	305	76.67	0
		10	271-300	2	10	1	5	449	56.67	0

*Includes agreements only.

Appendix O

Summary of Session Data on Percent Trials With CR, Number of Target Vocalizations ("Q"), And Mean Number of Vocalizations For Each Subject In Experiment 5

Subject	Condition	Session	Percent Trials with CR	Number of Target Vocalizations	$\bar{X}$ Number of Vocalizations/Trial
O1	Operant	1	43.33	13	11.30
		2	95.00	20	7.85
	$\bar{X}$		69.16	16.50	9.58
O2	Operant	1	0	0	1.57
		2	3.33	2	3.83
		3	3.33	1	8.43
		4	18.18	27	6.21
		5	93.75	16	11.12
	$\bar{X}$		23.72	9.20	6.23
O3	Operant	1	30.00	10	6.90
		2	10.00	6	8.60
		3	4.76	1	11.81
		4	0	0	11.40
		5	16.67	5	6.80
		6	0	4	6.46
		7	76.67	28	9.60
		8	88.24	17	10.94
	$\bar{X}$		28.29	8.88	9.06
OR1	Op&Res	1	0	0	10.95
		2	0	0	4.00
		3	2.50	4	5.22
		4	0	0	5.60
		5	0	0	4.05
		6	4.44	4	8.64
		7	0	1	6.64
		8	0	0	8.45
	$\bar{X}$		0.87	1.12	6.69
OR2	Op&Res	1	0	0	0.70
		2	2.86	1	5.80
		3	2.86	5	5.20
		4	5.00	3	6.32
		5	0	0	6.45
		6	0	0	3.77
		7	0	1	5.51
		8	2.70	16	8.16
		9	3.33	2	7.07
		10	6.67	4	5.73
	$\bar{X}$		2.34	3.20	5.52
OR3	Op&Res	1	0	3	13.53
		2	0	1	11.37
		3	3.33	4	8.97
		4	10.00	10	15.23
		5	13.33	8	12.07
		6	33.33	13	11.47
		7	33.33	13	11.70
		8	53.33	22	13.13
		9	46.67	18	10.17
		10	50.00	18	14.97
	$\bar{X}$		24.33	11.00	12.26

Appendix P

Observer Agreement Measures: Experiment 5

Subject	Experimenter	Condition	Session	% Agreement on Trials with CRs (Target Vocalizations)/Session			% Agreement on Vocalizations/Trial/Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
O1	2	Operant	1	92.86	94.12	96.67	87.09	100.00	87.95
			2	100.00	100.00	100.00	79.87	N.A.	79.87
		$\bar{X}$		96.43	97.06	98.34	83.48	100.00	83.91
O2	3	Operant	1	N.A.	100.00	100.00	83.49	91.67	89.55
			2	100.00	100.00	100.00	93.36	100.00	94.91
			3	100.00	100.00	100.00	87.66	100.00	89.72
			4	100.00	100.00	100.00	77.68	100.00	79.04
			5	100.00	100.00	100.00	83.63	N.A.	83.63
		$\bar{X}$		100.00	100.00	100.00	85.16	97.92	87.37
O3	2	Operant	1	90.00	95.24	96.67	75.66	100.00	81.82
			2	100.00	100.00	100.00	75.47	N.A.	75.47
			3	N.A.	N.A.	N.A.	76.16	100.00	77.41
			4	N.A.	100.00	100.00	82.63	N.A.	82.63
			5	100.00	100.00	100.00	77.66	100.00	79.15
			6	N.A.	100.00	100.00	68.69	0.00	68.69
			7	100.00	100.00	100.00	89.76	100.00	90.45
			8	100.00	100.00	100.00	84.03	N.A.	84.03
		$\bar{X}$		98.00	99.32	99.52	78.76	80.00	79.96
OR1	1	Op&Res	1	N.A.	100.00	100.00	92.56	100.00	92.75
			2	N.A.	100.00	100.00	90.48	100.00	94.05
			3	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			4	N.A.	100.00	100.00	80.30	50.00	80.80
			5	N.A.	100.00	100.00	89.24	80.00	90.32
			6	100.00	100.00	100.00	83.00	50.00	83.38
			7	N.A.	100.00	100.00	81.36	66.67	82.19
			8	N.A.	100.00	100.00	90.30	100.00	91.92
		$\bar{X}$		100.00	100.00	100.00	86.75	78.10	87.92
OR2	3	Op&Res	1	N.A.	100.00	100.00	100.00	100.00	100.00
			2	100.00	100.00	100.00	83.02	100.00	87.39
			3	100.00	100.00	100.00	69.24	80.00	72.75
			4	100.00	100.00	100.00	80.12	90.00	84.59
			5	N.A.	100.00	100.00	83.01	50.00	84.28
			6	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			7	N.A.	100.00	100.00	75.83	33.33	76.52
			8	100.00	100.00	100.00	80.67	100.00	81.72
			9	50.00	96.55	96.67	84.12	N.A.	84.12
			10	100.00	100.00	100.00	84.34	50.00	84.87
		$\bar{X}$		91.67	99.62	99.63	82.26	75.42	84.03

Appendix P (cont.)

Subject	Experimenter	Condition	Session	% Agreement on Trials with CRs (Target Vocalizations)/Session			% Agreement on Vocalizations/Trial/ Session		
				Occurrence	Nonoccurrence	Overall	Occurrence	Nonoccurrence	Overall
OR3	2	Op&Res	1	N.A.	100.00	100.00	71.78	N.A.	71.78
			2	N.A.	100.00	100.00	53.44	0.00	53.44
			3	100.00	100.00	100.00	87.87	N.A.	87.87
			4	100.00	100.00	100.00	78.74	100.00	79.53
			5	100.00	100.00	100.00	81.89	N.A.	81.89
			6	100.00	100.00	100.00	73.62	100.00	75.38
			7	100.00	100.00	100.00	60.67	N.A.	60.67
			8	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
			9	82.35	81.25	90.00	73.79	N.A.	73.79
			10	100.00	100.00	100.00	80.74	N.A.	80.74
		X		97.48	97.92	98.89	73.62	66.67	73.90

VITA

Alexander M. Myers

Candidate for the Degree of

Doctor of Philosophy

Dissertation: Autoshaping Infant Vocalizations

Major Field: Psychology

Vita Highlights:

* Graduate education (M.S., Ph.D.) in Psychology (Analysis of Behavior).

* One year experience as a Preschool Evaluator/Meta-Analysis researcher.

* Three years experience as a Behavior Manager working with hearing impaired and multihandicapped children and youth at the Utah School for the Deaf. Competent at the intermediate level in the use of sign language.

* Three years experience as a Teaching Assistant for undergraduate Psychology courses (Statistics--2 years; Motivation--1 quarter; Experimental Child Psychology--1 quarter; Physiological Psychology--1 semester).

* One year experience as a Psychology Laboratory Manager.

* One year as a Research Assistant dealing with Social Psychology issues (sleep behavior, hypnosis, demand characteristics).

* Six years experience with basic animal and human research.

* Excellent knowledge of theoretical and practical applications of Behavior Modification.

* Excellent knowledge of basic and applied research and single subject designs.

Education:

B.S. Denison University, Granville, Ohio, 1974, Major area: Psychology.

M.S. Utah State University, Logan, Utah, 1978, Major area: Psychology (Analysis of Behavior).

Ph.D. Utah State University, Logan, Utah, 1981, Major area: Psychology (Analysis of Behavior).

Experience:

Utah State University
Logan, Utah

TITLE: Coordinator, Wyoming Preschool Evaluation Program/ Meta-Analysis Researcher.

DATES: 7-1-80 to 7-1-81

RESPONSIBILITIES: Prepare a preschool evaluation package for Wyoming preschools. Involved writing evaluation forms, professional review forms, and training staff to use forms. Director: Glendon Casto.

Conduct computer search of literature in the area of "Early Intervention" and assisted in writing a grant for federal funding for meta-analysis of this area.

Assisted in conducting a meta-analysis of the effectiveness of drug intervention on hyperactivity. Directors: Karl White and Glendon Casto.

Behavior Management
Company
367 Lauralin Drive
Logan, Utah

TITLE: Behavior Manager

DATES: 9-1-77 to 6-1-80

RESPONSIBILIITES: Provide Behavior Management services at the Utah School for the Deaf in Ogden, Utah. Involved working with teachers, staff, and students to correct or improve behavior. Involved working with a wide range of behaviors; e.g., disruptive behaviors, off-task behaviors, social behaviors, self-control behaviors, autistic behaviors, control of behaviors related to medical problems (diabetes), teaching behaviors, dorm counselor performance, designing vocational workshop programs, etc. Director: J. Grayson Osborne.

TITLE: Behavior Manager/Teaching Assistant

DATES: August, 1979

RESPONSIBILITIES: Assist in teaching a workshop on Behavior Modification to dormitory personnel at the Utah School for the Deaf. Conducted with J. Grayson Osborne, this workshop emphasized the use of behavior modification in deaf and juvenile delinquent communities.

Utah State University
Logan, Utah

TITLE: Teaching Assistant--Undergraduate Statistics.
DATES: 9-77 to 6-79
RESPONSIBILITIES: Prepare tests and exams; grade tests, exams, homework; provide tutorial assistant to students; give tests and exams; lecture occasionally; assist in determining final course grades. Director: J. Grayson Osborne.

TITLE: Laboratory Manager for Psychology Animal Lab.
DATES: 9-76 to 7-77
RESPONSIBILITIES: Supervise the running of the lab; supervise the care and breeding of laboratory animals; organize and maintain equipment; program electro-mechanical equipment; provide assistance to graduate and undergraduate students working in the lab. Director: Carl D. Cheney.

TITLE: Teaching Assistant--Undergraduate Motivation.
DATES: 3-76 to 6-76
RESPONSIBILITIES: Prepare tests and exams; give tests and exams; lecture occasionally; provide tutorial assistance to students; assist in determining final course grades. Director: J. Grayson Osborne.

TITLE: Teaching Assistant--Undergraduate Experimental Child Psychology.
DATES: 1-76 to 3-76
RESPONSIBILITIES: Prepare tests and exams; grade and conduct oral interviews covering course material; lecture occasionally; provide tutorial assistance to students; grade papers, abstracts, film reports; assist in determining final course grade. Director: J. Grayson Osborne.

Unit for Experimental Psychiatry, The Institute of the Pennsylvania Hospital
111 North 49th Street
Philadelphia, PA

TITLE: Research Assistant
DATES: 8-74 to 8-75
RESPONSIBILITIES: Provide data analyses and statistical analyses of data in the Social Psychology area (e.g., sleep pattern, hypnosis, demand characteristics); involved working with programable calculators and a PDP-12 computer; included general work in a multifaceted research organization that has published a large number of papers, published and edited a professional

journal (The International Journal of Clinical and Experimental Hypnosis), and has conducted research funded by national agencies. Directors: Martin T. Orne and Frederick J. Evans.

Denison University
Granville, Ohio

TITLE: Laboratory/Teaching Assistant--Physiological Psychology.
DATES: 1-74 to 6-74
RESPONSIBILITIES: Provide tutorial assistance and laboratory supervision to students in a Physiological Psychology Lab course; involved supervising animal surgery, electrode implants, brain lesions, etc., performed on rats by undergraduate students; care and supervision of the lab and the animal subjects; and assisted the teacher in lab instruction. Director: Rita Snyder.

Laboratory of Virology and Rickettsiology
The National Institutes of Health
Bethesda, Maryland

TITLE: Volunteer Research Assistant
DATES: 1-70 to 6-70
RESPONSIBILITIES: High school project working with a live monkey virus (Simian Hemorrhagic Fever); investigating the effects of time and temperature on the virulence of the serum (for purposes of laboratory storage). Involved using sterile techniques with a potentially dangerous virus in a professional lab. Directors: Martin G. Myers, M.D., and Nicolas Tauraso, M.D.

Awards:

Summer Fellowship — Utah State University, 1976
Logan, Utah

Student Representative — Ad Hoc faculty committee exploring the feasibility of merging two graduate psychology programs, Utah State University, 1980.

Workshops:

Workshop Assistant — August, 1979
Presented with J.G. Osborne at the Utah School for the Deaf. The topic of the workshop was Behavior Modification, with emphasis on its use in deaf and juvenile delinquent communities. Workshop students consisted of dormitory counselors at the Utah School for the Deaf.

Affiliations:

Student Member, Division 25, American Psychological Association, 1976-present.
Student Member, American Psychological Association, 1981-present.
Rocky Mountain Regional Representative, Division 25, American Psychological Association, 1977-1979.
Student Member, The Midwestern Association for Behavior Analysis, 1975-1978.
Member, The Association for Behavior Analysis, 1981-present.

Publications:

Autoshaping infant vocalizations. Dissertation.
Factors affecting the conditioned reinforcing strength of stimuli in differential reinforcement of other behavior and fixed-time schedules. Bulletin of the Psychonomic Society, 1980, 16, 27-30 (with E. K. Crossman).
Variables controlling cue redundancy. Paper in preparation. (with R. C. Lubeck and J. G. Williams).
The conditioned reinforcing strength of redundant stimuli. Paper in preparation. (with E. K. Crossman and P. M. Ghezzi).
Contrast and matching-to-sample. In progress. (with J. G. Osborne and K. Silverman).
Second-order autoshaping and conditioned reinforcement. In progress. (with W. Boyle and E. K. Crossman).
Autoshaping during multiple schedule training. In progress. (with W. Boyle and E. K. Crossman).

Presentations:

Lubeck, R. C.; Myers, A.M.; & Williams, J. G. The conditionality of redundant cues. Presented at the Midwestern Association for Behavior Analysis, Chicago, Illinois, May, 1977.
Lubeck, R. C.; Williams, J. G.; & Myers, A. M. The temporal variables controlling cue redundancy. Presented at the Rocky Mountain Psychological Association, Albuquerque, New Mexico, May, 1977.
Myers, A. M.; Crossman, E. K.; & Ghezzi, P. M. Conditioned reinforcement and redundant stimuli. Presented at the Utah Academy of Science, Logan, Utah, November, 1980.
Osborne, J. G.; & Myers, A. M. Behavior contrast in matching-to-sample by pigeons. Presented to the Association for Behavior Analysis, Milwaukee, Wisconsin, May, 1981.
Osborne, J. G.; & Myers, A. M. Behavior contrast in matching-to-sample by pigeons. Presented to the Rocky Mountain Psychological Association, Denver, Colorado, April, 1981.
Williams, J. G.; Myers, A. M.; Lubeck, R. C.; & Crossman, E. K. Stimulus duration and cue redundancy. Presented at the Midwestern Association for Behavior Analysis, Chicago, Illinois, May, 1978.

Grants Received:

Sigma Xi, student award, 1981. Funding received for Autoshaping infant vocalizations; a dissertation conducted at Utah State University.

Research Interests:

Use of ABA to control behaviors associated with medical disorders
Language and verbal behavior (especially acquisition)
Autoshaping vocalizations
Setting events
Conditioned reinforcement
Reinforcement theory
Contingency contracting
Stimulus control
Control procedures
Ethical considerations in human research
Overcorrection

Personal Data:

Date of birth: 2-28-52 Age: 29 Place of birth: Washington, D.C.
Married: Lynne Wilson Myers
Children: Two daughers: Rachel Allyn Myers (10-12-78)
Megan Anne Myers (1- 4-81)
Physical Condition: Excellent
Sports interests: Handball, tennis, hiking, sailing
Languages: English, Spanish, Sign Language (ASL, SEE)

Prepared Spring, 1981