Conditioned Reinforcement: An Attempt to Use Zimmerman Technique with Children

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CONDITIONED REINFORCEMENT: AN ATTEMPT TO USE ZIMMERMAN TECHNIQUE WITH CHILDREN

by

Priscila R. Derdyk

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
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Priscila R. Derdyk
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INTRODUCTION

The value of conditioned reinforcers is well recognized. Skinner (1953) stressed the necessity of conditioned reinforcers in order to control behavior since only a few human behaviors are affected directly by primary reinforcers. Lovaas, Freitag, Kinder, Reubenstein, Schaeffer, and Simmons (1966) suggested that one of the reasons some children become autistic is due to their failure to be affected by conditioned reinforcers, specifically social stimuli. However, despite the recognized importance of the concept, the large number of experiments in the area, and the widely accepted fact of the reinforcing properties of conditioned reinforcers, questions still persist about the way a neutral stimulus acquires strength based on its relationship to primary reinforcement. Several hypotheses have been proposed in an attempt to answer this question. The pairing hypothesis described by Skinner (1953) suggested that an arbitrary stimulus would strengthen an operant response if it were first paired with an unconditioned stimulus. The discriminative stimulus hypothesis, first formulated by Keller and Schoenfeld (1950), stated that "mere contiguity with reinforcement is not sufficient to make an Sr out of a neutral stimulus.... In order to act as an Sr for any response, a stimulus must have status as an S^D for some response" (p. 236). Fantino (1977) in his review of conditioned reinforcement indicated that in addition to these two hypotheses there are at least two other
viable proposals of how a neutral stimulus can acquire reinforcing properties. The first, the uncertainty reduction hypothesis, states that "the strength of a stimulus is a function of its informativeness about primary reinforcement, i.e., how much uncertainty reduction it provided about reinforcement" (p. 313-314). The second, the delay reduction hypothesis, states that the strength of a stimulus as a conditioned reinforcer is a function of the reduction in time to primary reinforcement which is signaled by that stimulus. "In other words, the contribution of contiguity to the conditioning reinforcing strength of a stimulus must be considered in the context of how remote primary reinforcement had been prior to the onset of the stimulus" (p. 314). It is noteworthy that the uncertainty reduction hypothesis considers negative information (information about punishment or non-reinforcement) as well as positive information as serving as conditioned reinforcement. The delay reduction hypothesis would, however, only consider positive information as able to serve this function. Negative information would have aversive characteristics or at least would be less reinforcing than a cue signaling a shorter delay to positive reinforcement.

Lovaas et al. (1966) reported failure to establish a neutral stimulus as a conditioned reinforcer through the simple temporal association of the neutral stimulus with the primary reinforcer (food) when autistic children were the subjects. Based on literature dealing with classical conditioning (Maltzman, 1965), Lovaas
et al. suggested that the negative results occurred because of the children's failure to attend to social or to any external stimuli. To attend to or to orient toward the conditioned stimulus would be essential to learning, they argued. To solve this problem, they developed a procedure which established the social stimulus as a discriminative stimulus for the primary reinforcer, which was delivered on an intermittent schedule of reinforcement. With this procedure a neutral social stimulus functioned as a conditioned reinforcer.

Schuster (1969) using a multiple variable interval, variable interval plus fixed ratio (VI, VI+FR) schedule, Thomas (1969) using a multiple fixed ratio fixed ratio (FR FR) schedule, and Zimmerman (1963) using a concurrent variable interval variable interval (VI VI) schedule, demonstrated the effectiveness of the pairing procedure with pigeons. They used procedures in which the neutral stimulus is continually paired with a primary reinforcer on one response key or in one schedule component, while on the other key or in the other schedule component only the neutral stimulus was presented. Their results all basically showed the same thing; pigeons maintained responding indefinitely when only the conditioned stimulus followed the response. However, the work of Brown and Jenkins (1968) suggested that the reflex nature of the pigeon key peck may account for at least some of the positive results obtained in the above experiments. It's clear that the conditions necessary to establish and maintain conditioned reinforcers across
species, including humans, is still not completely understood.

Walton (unpublished) tried to answer some of these questions with rats instead of pigeons as the experimental organism. Utilizing a pairing procedure similar to that of Zimmerman (1963), his results showed that the neutral stimulus (a light flash) did not acquire reinforcing properties for one of the subjects. The other subject responded at a very low rate when the paired stimulus was presented after the response on the light flash-only lever. However, when the pairing was discontinued (food was not paired with the light flash anymore) on the other lever, responding on the light flash-only lever persisted, thus possibly demonstrating that the rat's responding was not being maintained by any conditioned reinforcing properties acquired by the stimulus through pairing. Also, using a pairing procedure similar to that of Thomas (1969) but with rats as subjects, Walton (unpublished) obtained results different from those of Thomas. Responses were not maintained when they were followed by the stimulus alone. Oberlin (unpublished) replicated the Thomas experiment with normal children of age 3, 5, and 8 as subjects and obtained the same results as Walton.

So, the same questions are pertinent in relation to people. Lovaas et al. (1966) suggested that discrimination training required by the autistic children may not be a necessary procedure for normal children since normals "should acquire reinforcing stimuli merely by pairings of the stimuli to be acquired with
already powerful reinforcers" (p. 133). Furthermore, Lovaas, Schaeffer, and Simmons (1965) demonstrated that the prior discriminative training is not necessary with autistic children when one exploits aversive stimuli paired with social stimuli. Also, when discussing the maintenance of the social reinforcer, Lovaas et al. (1966) suggested that if the child is prevented from discriminating that only the conditioned reinforcer will be delivered following responding, the child will continue to respond only for the conditioned reinforcement as the consequence. Squires, Norborg, and Fantino (1975), as summarized by Fantino (1977), suggested a similar explanation when discussing Zimmerman's experiment. They proposed that another possibility why pigeons would respond to obtain only the neutral stimulus could be "that the mechanism underlying conditioned reinforcement is stimulus generalization, so that the more similar are the conditioned and primary reinforcers, the more effective will be the conditioned reinforcer" (p. 316). In other words, due to the similarity between the primary and secondary reinforcer, the pigeons were unable to form a discrimination and thus responded similarly to both stimuli.

The present study had as its objective the providing of data related to some of the questions discussed above, but with normal children as subjects. The first objective was to determine in a laboratory situation whether a neutral stimulus could acquire reinforcing properties through simple pairing. The second objective was to determine whether this stimulus would maintain responding
when pairing with the previously effective reinforcer was terminated. To reach these objectives, a systematic replication of Zimmerman's (1963) study was undertaken; his study attempted to answer the above questions but with pigeons as subjects. In that study, pigeons could peck one of two keys that were available concurrently. Pecks on one key produced food intermittently. Pecks on the other key produced only the stimuli (lights and hopper sounds) associated with food presentation on the other key but without the food (a short hopper presentation, too short to allow feeding). His results showed that the neutral stimuli, not only acquired reinforcing properties, but were capable of maintaining a steady low rate of responses indefinitely. In the present study children could press one of two buttons that were available concurrently. Presses on one button produced a brief sound of a buzzer immediately followed by the delivery of a token. Presses on the other button produced only the brief sound of the buzzer. After the child received a certain number of tokens, he/she could exchange them for a backup item previously chosen. It is important to note that in this study, instead of using a primary reinforcer to impart reinforcing properties to the neutral stimulus, a generalized reinforcer (tokens) was employed which could be exchanged for any of several available items. Only occasional pairings of these tokens and edibles occurred. This condition resembles everyday situations in which neutral stimuli gain reinforcing properties with children. It may be that many conditioned reinforcers
acquire their reinforcing properties through pairing with generalized reinforcers such as social approval rather than with direct pairing with primary reinforcers. If this is true, the generalization of results from this laboratory experiment to the natural environment of children becomes easier.
METHOD

Subjects

Three children, a three and a six year old girl (S-1 and S-2) and a four year old boy (S-3) served. All children were living with their parents in family housing apartments at Western Michigan University in Kalamazoo, Michigan. They were selected as experimental subjects because of their ages, their willingness, and the fact that their parents permitted their participation in the experiment.

Apparatus and Experimental Setting

The apparatus consisted of two white wooden boxes, 21 x 18 x 9 cm. Each box contained a green button and one red and one white stimulus light. The red light was inoperative. The two boxes were situated on a rectangular platform, 150 x 30 x 30 cm. and were separated from each other by a distance of 100 cm. The platform was located on the floor in front of a table. Between the two white boxes and on the platform was a metal pan. Also, an automatic dispenser (Davis Scientific Instruments, Universal Feeder, Model No. 310) was placed in the middle of the table. Beans and/or small candies, and dried fruit could drop from the dispenser into the metal pan. A source of auditory stimulation (Sonalert, Mallory No. SC628H) was located approximately 2.25 meters in front of the S as he/she responded on the buttons. The lights, buttons,
Sonalert and automatic dispenser were connected to standard electro-mechanical relay programming equipment which arranged the presentation of stimuli and counted button presses and the delivery of consequences. A second set of relay devices was in operation throughout the experiment to provide masking noise. A stopwatch was used to measure session time. The experiment was conducted in an experimental laboratory which contained normal experimental apparatus and tools.

Procedure

Token Training

Before beginning formal experimental sessions, a token training phase was conducted with each child. This consisted of two sessions of approximately ten minutes with each of the youngest children and one such session with the oldest. Garbanzo beans served as tokens. Each child individually was shown the experimental room and allowed to explore the area. Toys, candies and fruits, restricted according to parental approval, were displayed on the floor. In front of each item was a 7 x 2 cm piece of white cardboard on which one or more red spots had been drawn. In front of the spots was a piece of masking tape with the adhesive part turned upward. The experimenter (E) explained to the child that he/she could win all the items, but to do so he/she had to have as many beans as the number of spots on the cardboard. E showed the subject the pan into which the beans fell from the
dispenser and demonstrated how to stick them onto the tape in front of the spots. The dispenser was operated manually during token training by E. When the number of beans equaled the number of spots, the child received what he/she had chosen. When the number of beans did not equal the number of spots, the child had to obtain more beans from the pan and then stick them on the tape. E assisted the S as necessary during token training. This procedure was repeated for all items the child had chosen.

**Experimental Sessions**

Separate experimental sessions were conducted daily for each subject; session length varied from 10 to 45 minutes. A session started with the illumination of the white lights on both button boxes, and terminated when an S had obtained enough tokens to exchange for some item he/she wanted, at which time the white lights on the boxes were turned off by E. After the S entered the experimental room, several toys as well as candies or gum were shown to S. Each item had one of two prices; some items could be obtained by exchanging a small bottle filled completely with beans (approximately 30 beans), while others were priced one half-filled bottle of beans. S chose what he/she wanted that day. At the beginning of the first few sessions, S was told that a game could be played in front of the table and that the game could be played any way S wanted in order to earn beans necessary to exchange for the toy, candy, or gum previously selected. S was also told

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that E would study while S was playing and could not talk. The E answered with "I do not know" to any question concerning the correctness of a subject's performance and with the shortest possible response to any other questions.

After session 37 for S-1 and session 33 for S-3, instead of presenting the menu of items E presented only one toy every session, which she termed "The surprise of the day". Though S was not allowed to choose the toy, he/she could choose a candy, fruit or piece of gum instead of the toy. The procedure was changed because it seemed for the experimenter that the smallest children were not as interested in choosing among a menu of items as they were in receiving a new item every session. Also, for S-1 after session 22 and for S-3 after session 33, all items were priced at one half-filled bottle of beans.

Subjects could press either of the two buttons which were available concurrently.

Condition 1 involved a shaping program to teach the S to press both buttons and to systematically establish responding on identical concurrent and independent variable interval 30 second (VI-30") schedules on both buttons. A changeover delay (COD) of three seconds was in effect to prevent immediate reinforcement of a switch from one button to the other. Pressing the left button or the right button intermittently produced a 1-sec sound of the buzzer followed immediately by the delivery of a token, or sometimes a token plus an edible (approximately 15 times per session).
Schedules of reinforcement were changed from continuous reinforcement to VI-10", VI-15", VI-23" and finally VI-30" as responding by S permitted.

In Condition 2, the baseline condition, pressing each button was reinforced on equal and independent VI-30" schedules with a 1-sec sound of the buzzer followed immediately by delivery of a token or sometimes a token plus an edible. Throughout the remainder of this experiment this occasional concurrent presentation of token and edible was in effect. The COD was discontinued when the condition began, and was never reinstated thereafter because it seemed to be reducing the rate of responses too much.

In Condition 3, pressing the button on the left side continued to be reinforced on the VI-30" schedule with the 1-sec buzzer followed by a token. However, pressing the button on the right side produced only the 1-sec sound of the buzzer according to its VI-30" schedule.

In Condition 4, pressing the button on the right side was followed on the VI-30" schedule by the 1-sec buzzer and a token. Pressing the left button produced only the 1-sec buzzer according to its VI-30" schedule.

Pressing the left button in Condition 5 was reinforced on the VI-30" schedule only with the delivery of a token; the 1-sec buzzer preceding the token was eliminated. Pressing the right button was reinforced on the VI-30" schedule with the 1-sec buzzer.

Finally, in condition 6 pressing the right button was reinforced...
on the VI-30" schedule only with delivery of a token; pressing the left button resulted in the 1-sec buzzer on the same schedule.

A summary of the experimental conditions is given in Table 1. Table 2 indicates the sequence of exposure to experimental conditions for each S and the duration of exposure. Each S was not exposed to all conditions, and the order of exposure was different for each.

TABLE 1

Button Sides, Schedules and Contingencies of Reinforcement in Effect on Each Phase of the Experiments

<table>
<thead>
<tr>
<th>Condition</th>
<th>Schedule of Reinforcement</th>
<th>Left</th>
<th>Right</th>
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<tbody>
<tr>
<td>1</td>
<td>CRF, VI: 10, 15, 23,30 + C.O.D.</td>
<td>Sound &amp; Token</td>
<td>Sound &amp; Token</td>
</tr>
<tr>
<td>2</td>
<td>VI 30</td>
<td>Sound &amp; Token</td>
<td>Sound &amp; Token</td>
</tr>
<tr>
<td>3</td>
<td>VI 30</td>
<td>Sound &amp; Token</td>
<td>Sound</td>
</tr>
<tr>
<td>4</td>
<td>VI 30</td>
<td>Sound &amp; Token</td>
<td>Sound &amp; Token</td>
</tr>
<tr>
<td>5</td>
<td>VI 30</td>
<td>Token</td>
<td>Sound</td>
</tr>
<tr>
<td>6</td>
<td>VI 30</td>
<td>Sound</td>
<td>Token</td>
</tr>
<tr>
<td>Subject 1</td>
<td></td>
<td>Subject 2</td>
<td></td>
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<td>-----------</td>
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<td>Condition</td>
<td>Days of Exposure</td>
<td>Condition</td>
<td>Days of Exposure</td>
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<td>1</td>
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<tr>
<td>6</td>
<td>7</td>
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RESULTS

Responses per minute are shown for S-1, S-2 and S-3 in Figure 1, Figure 2, and Figure 3, respectively. The legend in the figure indicated each consequence associated with each concurrent available button in each condition.

Subject 1 had 13 sessions with different schedules of reinforcement in condition 1. The rate of response varied considerably under each schedule. In Condition 2, variable but approximately equal rates of button pressing were maintained. Then when tokens were eliminated from the consequence associated with the right button, rate on this button dropped to somewhat less than 1.0 rpm by the end of Condition 3 as compared to a rate of 5-6 rpm on the left button. During the reversal of buttons with consequences in Condition 4, the rate on the tone-only left button was 2 per minute, while on the tone-plus-token right button a rate of slightly above 4.0 was maintained. Removal of the tone preceding the token associated with the right button had no great effect on either the rate of right button or left button (tone-only) responding compared to the last four days of condition 4.

Subject 2 in Condition 1 had five sessions, each one with a different schedule of reinforcement. There was great variability on the rate of responses on each schedule condition. During Condition 2 when responses to each button intermittently produced a 1" tone followed immediately by a token, the subject responded
Fig 1. Rate of pressing the right or left button per session for subject 1.
RESPONSE OF PRESSING BUTTON PER MINUTE

Fig 2. Rate of pressing the right or left button per session for subject 2.
Fig 3. Rate of pressing the right or left button per session for subject 3.
on each button at approximately 10 rpm, showing a slight preference for the left button. When in Condition 4 the left button was associated only with the 1" tone--consequences for right button presses continued to result in occasional 1" tone-plus-token consequences--responding on the left button dropped quickly to almost zero. Responses per minute on the right button were variable but substantially higher, averaging 26 rpm the last three days of the condition. Reversing the consequences associated with the two buttons in Condition 3 coincided with an immediate cessation of all presses to the right tone-only button and a high rate on the left button now associated with tone-plus-token consequences.

Phase 1, for S-3, had 9 sessions with several schedules of reinforcement. The response rate showed great variability on each schedule. The subject responded to both buttons in Condition 2 when equal consequences were programmed on the two buttons. Consistently higher rates on the left button (tone-plus-token) occurred in Condition 3, averaging approximately 9 per minute. However, rates of 5 per minute were maintained on the right button over the 23 days of the condition when the consequence associated with this button was only a 1" tone delivered on the VI-30" schedule. Removal of the 1" tone prior to the token on the left button Condition 5 did not greatly effect the response rate on either button; rates of approximately 11 per minute and 3 per minute were maintained on the left and the right button, respectively. When a reversal of the Condition 5 consequences and buttons
occurred in Condition 6 rates on the token-only right button increased to an average of above 30 rpm, while rates on the tone-only left button approached zero. Reinstatement of pairing of tone plus token on the right lever Condition 4 resulted in no change of rate in either lever.
DISCUSSION

Subject 2 behaved differently during the experimental manipulation than did the other two subjects. After five days of shaping (condition 1), this subject was responding consistently on both buttons (condition 2). But in the next phase (condition 4) when the subject stopped receiving tokens after responses on the left button and instead received only sound, the response rate dropped to almost zero. At the same time, the response rate on the right lever increased sharply. This clearly shows that the neutral stimulus (sound) did not acquire reinforcing properties through the simple pairing procedure. Furthermore, to insure that no side preference existed, the contingencies were reversed on the two levers and still the subject did not respond at all on the right side which provided only the neutral stimulus. On the left which provided tokens plus the neutral stimulus, a high response rate was maintained.

After the shaping procedure (condition 1), subject 1 was responding consistently on both buttons. Nevertheless, in condition 3 when only the sound was presented after responses on the right button, the response rate dropped considerably on this side and maintained at a low rate through the condition. The response rate on the left side, however, increased and continued higher than the rate on the right side. To control for preference side, the contingencies were reversed and rates on the two levers
reversed accordingly. Subject 1 decreased her response rate on the left side and increased it on the right side. These results are similar to those of Zimmerman (1963). In his experiment the neutral stimulus alone was able to maintain a low but persistent rate of responses for long periods with pigeons. In the present experiment, in order to further determine whether the neutral stimulus was maintaining the response due to pairing between neutral stimulus and tokens, the association between these two stimuli was terminated in condition 6 such that token delivery was not paired anymore with the sound. Responses on the right side were followed by tokens only, while responses on the left side were followed by the sound only. If pairing was maintaining some or all of the responding on the left button, the rate of response on the left side should drop to zero. However, this did not happen, although the rate did decrease slightly by the end of the condition when compared with that of the previous phase, the subject still continued pressing the button. This result suggests that for this subject, contrary to that of subject 2, the neutral stimulus was able to maintain a low rate of response, but its response-maintaining properties were not due to the pairing of the stimulus with previously effective consequences.

Subject 3 was very similar to subject 1. In general he had a higher rate than subject 1 on both buttons. In condition 5, in order to determine whether it was the pairing between sound and token that was maintaining responding on the right sound-only
side, sound preceding token delivery was eliminated from the left side consequence. The subject received only tokens for responses on the left side and only sound for responses on the right side. The response rate on the right side decreased slightly when compared with the previous phase but still maintained. To make sure the subject was not simply expressing a side preference, the contingencies were reversed in condition 6 and rate reversal occurred also. The subject decreased his responding on the left side and increased it on the right although the rate on the left side was slightly lower than the rate on the right side on the preceding phase. In condition 4, another reversal was implemented. If the termination of pairing between the neutral stimulus and token was responsible for the slight decrease in the rate on the left side of the preceding phase, the procedure of again associating the two stimuli should produce an elevation in the response rate on the current sound-only side. This did not happen; on the contrary, response rate on this side dropped to almost zero. Thus, as with subject 1, this result suggests that the neutral stimulus was able to maintain a low response rate for long periods but its reinforcing properties were not due to pairing. For subject 1 one might suggest the possibility that had the experiment continued longer, the response rate would perhaps have dropped to zero since the response curve in condition 6 showed a declining trend at the end of the experiment. However, such a statement cannot be made with as much support from the data for S-3 as shown in condition 4.
Several factors could account for the rate maintenance on the sound-only condition for S-1 and S-3. The previous experience where the sound was paired with the tokens could be relevant to this maintenance. Also some authors have suggested that some lights, noises or sounds could have an intrinsic reinforcing value. In addition, any stimulus change in the laboratory environment might be reinforcing.

Fantino (1977) and Lovaas et al. (1966) suggested that if the distinction between conditions existing when only primary reinforcers or only conditioned reinforcers are presented is not clearly discriminable by the subject, the subject may continue to respond when the only consequence is the conditioned reinforcer. Constant changing of experimental conditions could have initially hampered discrimination formation and would explain the decrease in the response rate on the tone-only button only in the last sessions of the experiment.

Similarly, the difference in age and experience among subjects could have affected their discrimination and thus accounted for some of the difference noted above between subject 2 and subjects 1 and 3. Subject 2 was two and three years older than S-3 and S-1 respectively and seemed more able to verbalize for herself the "rules of the game" and thus her behavior could have been controlled not only by the contingencies arranged by the experiment but also by the rules she may have formulated to herself. For example, she frequently made statements aloud such as "something
is wrong in this button" (the left button) at the first session on phase 4 or "I don't get the bean in this button (left) only the sound" at the second session on phase 4. Also, when phase 3 was introduced she said "Ah, a surprise for me" and started to press the other button (left) and said "Now I only get things (tokens) here" (left button). Skinner in Contingencies of Reinforcement (1969) emphasized the distinction between rule-governed and contingency shaped behavior. The two younger subjects with their more limited verbal repertoire and general experience were probably affected only by the contingencies of the experiment, and for this reason did not form the discrimination as quickly as the older subject.

Squires et al. (1975) when discussing experiments similar to those of Zimmerman, said that perhaps the neutral stimulus maintained pecking of pigeons due to the nature of the neutral stimulus chosen. Frequently the "conditioned reinforcer" is a brief presentation of the hopper--too brief to permit feeding, and often a cover further prevented spillage of grain into the chamber--together with some other components such as the sound of a buzzer and/or light flashes. Squires et al. argued that the similarity of the unconditioned with conditioned reinforcers (hopper sounds followed by food versus hopper sound without food) could have accounted for the results; again the point seems to be lack of discrimination. In the present experiment the token dispenser did not operate as part of the "conditioned reinforcer" stimulus.
Another factor present in the animal experiments which could have influenced those data was the use of deprivation and unconditioned reinforcers. Animal experiments use both factors and so obtain better control over behavior because of the strength of the reinforcer. In this experiment, deprivation of the children was not warranted, and the few edibles presented were probably weak in comparison to food provided to an organism deprived to 80 percent of its normal weight. Instead, tokens were used, and it is important to note that the items for which the children could exchange the tokens were not items which the children could not obtain elsewhere. These subjects come from average university families and lived in apartments in which candies and toys were not lacking. This may have accounted for some of the variability of the data across sessions and across subjects. Informal observations of subject 1 seems to confirm this fact. Many times this subject did not want any menu item, didn't want to go to the sessions, or during the sessions either engaged in other activities or did not do anything at all. This was not observed in the two other subjects.

In summary, the present study shows that the pairing procedure was not able to impart reinforcing properties to a neutral stimulus for one of the subjects (S-2). For the other two subjects the first experimental phases seemed to show that a low rate of responses could be maintained through pairing. Nevertheless, when more conclusive control procedures were instituted (such as
disassociating the pairing between the neutral stimulus and the already effective reinforcing stimulus (phase 5, phase 6) and then pairing both stimuli again (phase 4), it became clear that the low rate of responding was not due to the pairing procedure, although it's possible that the child's previous experience with pairing of the stimulus was not irrelevant.

Therefore, it seems that the pairing procedure is at best a weak one to endow a neutral stimulus with reinforcing properties. In this experiment it was not effective. Response rate didn't seem to be maintained because of the pairing procedure. Fantino (1977) and Schuster (1969) suggested that a positive correlation between the stimulus and the unconditioned reinforcer is necessary for the neutral stimulus to maintain a response rate. Fantino said the neutral stimulus has to be a cue for the reduction in delay to food. Schuster talked about the predictive value of the stimulus with relation to food. Lovaas (1966) suggested that pairing can be useful if one can prevent the subject from forming a discrimination between a presentation of the neutral stimulus and presentation of primary reinforcer.

In this study conditions were arranged in such a way that the neutral stimulus was not related in any functional way to currently effective reinforcers and did not function as a reinforcing consequence.
REFERENCES


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