DIFFERENTIAL EFFECTS OF POSITIVE AND NEGATIVE SOCIAL REINFORCEMENT ON JUVENILE DELINQUENTS AND SUNDAY SCHOOL STUDENTS

A Dissertation

Presented to

the Faculty of the Department of Psychology

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

---

by

William Hutchinson Kuenstler

May, 1970

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ABSTRACT

Two experiments were conducted to investigate the hypothesis that, as a result of different histories of social reinforcement, juvenile delinquents respond differently to such reinforcement than do Sunday School students. In an early review of the learning theory literature, Young (1936) reported studies which showed that a combination of positive and negative reinforcement (PR and NR) produced more learning than PR or NR alone, with the former producing better results than the latter, and with all three conditions leading to more improvement than a no-reinforcement (NoR) condition. In a recent pilot study, however, Martinez (1967) found that institutionalized delinquent girls did not conform to this pattern when reaction time (RT) responses were verbally reinforced by the statements "Good" following fast RTs and "That's bad" following slow RTs. (In an earlier (1966) study, he had found RT to be modifiable by verbal reinforcement). For these delinquent Ss, NoR was found to produce more learning than NR, with the PR condition producing more learning than the combination contingency. On the basis of these findings, it was hypothesized that juvenile delinquents, because of their histories of experience

with social reinforcement, have become oversensitized to NR so that it is detrimental to learning.

In the first experiment, then, a sample of 72 delinquent Ss and one of 60 Sunday School students were each equally divided into four groups. All Ss received 40 RT trials using the classic RT apparatus and procedure, excluding speed instructions, and the same verbal reinforcements employed by Martinez (1967). One group in each sample received no reinforcement after any of the trials, one group was positively reinforced for fast responses, one was negatively reinforced for slow responses, and one received both PR and NR for appropriate responses.

The results of this experiment were in accordance with previous reports in the literature of the relative effectiveness of the four reinforcement contingencies for the normal Ss. For the delinquents, however, while the NoR condition produced the least improvement and the combination contingency produced the greatest, the curves for the PR and NR groups were almost identical. Because of the significantly greater degree of improvement produced in these Ss by the combination condition, it was decided that the number of trials should be extended to 60 in Experiment II to investigate the hypothesis that, under this contingency, the per-

formance of the delinquents is more closely equal that of the normals.

Each reinforcement group in Experiment II was composed of 10 delinquent Ss who received 60 RT trials under the same conditions as in Experiment I. While the results duplicated those of the first experiment with regard to the NoR, PR, and NR groups, the combination group failed to show any improvement over these latter two groups; all three produced almost identical curves.

The overall results were interpreted as indicating that, while delinquents have some tendency to perceive PR and NR as cues for directing their behavior, in the manner of the normals, they apparently also react to reinforcement on the basis of some need not present in normals to such a degree. It was suggested that possible needs include attention (love), the production of an influence on the environment (self-assertion), and the solicitation of external controls upon their behavior. It was further suggested that a psychotherapeutic approach with these Ss, while focusing on the development of feelings of worth, "positive" self-assertiveness, and internalized controls, should also include a learning experience as to the nature of and intent behind PR and NR.

TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

TABLE PAGE

TABLE PAGE

LIST OF FIGURES

CHAPTER I

INTRODUCTION TO THE PROBLEM

The desirability of the use of punishment in behavior control and the inducement of learning is a long-debated issue. Estes and Skinner's (1941) early classic study suggested that punishment, or negative reinforcement (NR), served only to temporarily suppress the undesired (punished) response. Those writers who disclaim the utility of punishment on this basis also point out that it provides no indication to the punished S as to the response which is desired, as does positive reinforcement (PR) or reward. Thorndike (1932) ran chicks in a three-arm maze, one arm of which led to a large enclosure in which there were food and other chicks, the other two arms leading to solitary confinement in a small enclosure. When the preceding choice of a particular S had led to reward, there was a distinct tendency for him to repeat that choice on the next trial; however, when the preceding choice had led to punishment, there was little tendency to avoid that path on the next trial. The NR failed to tell the Ss what to do; in such situations, as Thorndike says, punishment may lead only to emotional upset, reduced

motivation, and other undesirable responses.

Azrin and Holz (1966) point out that the undesirable behavioral changes resulting from punishment can be far-reaching. When a response is punished, what is desired is the elimination of that response without changing other aspects of the individual's behavior; this, unfortunately, is not always what occurs. If a teacher punishes a child for talking in class, for instance, he desires the extinction of that response while leaving other responses intact. In many cases, however, the punishment reinforces tendencies to escape the punishment situation completely; the result is often truancy, tardiness, or a "drop-out." In the socialization process, Azrin and Holz contend, this is the undesirable effect of punishment of one individual by another; i.e., "the punished individual is driven away from the punishing agent, thereby destroying the social relationship (1966, p. 441)." Since socialization consists of the development of successful interaction with other individuals, this type of experience with punishment, generalized to other authority figures, (potential punishing agents), could readily lie at the root of much delinquent behavior. In support of this contention is the finding of Ulrich and Azrin (1962) with regard to punishment's tendency to stim-

ulate aggression, not only toward the punishing agent or authority figure, but even toward innocent bystanders. These authors found that two rats, when shocked together in the same cage, tended to turn upon and attack one another.

There is general agreement, however, that punishment can be effective in modifying behavior in the direction desired by the punishing agent when it serves as a discriminative cue for the S. In other words, it can be effective in facilitating learning by redirecting behavior so that the new desired response can be rewarded and, thereby, acquired. This, of course, implies that PR of the desired response must also be forthcoming when the response is emitted, if learning is to occur efficiently. In this regard, numerous early studies (reviewed by Young, 1936, pp. 278-315) found that, while PR of the desired response produced faster learning than NR of the undesired response, a reinforcement contingency involving a combination of these conditions was even more effective. Least effective was the condition in which no reinforcement was employed.

In the area of social reinforcement during verbal conditioning, there is great disagreement in the literature as to the relative effectiveness of these different reinforcement conditions. Much of this disagreement stems from the

fact that little effort has been directed toward investigating the variables, situational or subject, which influence the efficacy of NR in aiding learning, although a great deal of work has demonstrated the operation of such variables with respect to PR.

This study was designed to investigate one subject variable that doubtlessly plays a major role in determining the effectiveness with which punishment, as a social reinforcer, influences learning constructively. This variable is the degree to which a person perceives NR as providing a discriminative cue for his behavior, as a function of his past history of exposure to and experience with such reinforcement. As Martinez (1966) says, "reinforcement acts upon the responsive characteristics of the person as a function of his reinforcement history (p. 27)." A popular maxim in child psychology warns the parent to "punish the behavior, not the child." This is, of course, an attempt to instill in punishment the discriminative properties necessary for its constructive value in aiding learning, rather than providing it with only the destructive, undesirable stimulus value previously mentioned.

On the basis of the aforesaid, it was hypothesized that delinquent behavior stems in part from these undesirable

"anti-socialization" effects of punishment; i.e., it is a function of the individual's history of NR; as a result of "the child" rather than "the behavior" having been punished, he perceives NR, not as a discriminative cue for the development of desired behavior patterns, but rather, for example, as an attack upon his worth as an individual. In general, it was hypothesized that "normals" and delinquents perceive, and therefore react to, social reinforcement differently. The investigation of this hypothesis was the aim of this study. (The absence of PR when the desired response was emitted is also likely to be a major detrimental factor in such a history. This, however, is a question for another study, and was not considered in the present one.) The decision to use Sunday School students as the "normals" was based on the assumption that they have experienced quite a different history of positive and negative social reinforcement than have the delinquents.

Reaction time (RT), or the latency between the onset of a stimulus and the initiation of a movement response, was selected as the variable to measure the effects of social reinforcement, since it meets the criteria, proposed by Stevenson (1965), of a behavior sensitive to such reinforcement. As Stevenson observes, the task involving such

a response: (a) must not possess high intrinsic interest; (b) should minimize the effects of individual differences in earlier learning; (c) should permit the reinforcer to dispense reinforcement arbitrarily; (d) should utilize discrete responses; and (e) should not have a clear end point or product. The task involving RT measurement fulfills all of these requirements and, indeed, the RT learning curve has been found to be sensitive to social reinforcement, both positive (Martinez, 1966) and negative (Martinez, 1967).

Social PR was defined in this study as the word "Good" following the response desired by the investigator to be positively reinforced (fast RT responses), and NR was defined by the statement "That's bad" following slow RTs. As Cohen, Kalish, Thurston, and Cohen (1954) observe, the reinforcer "Good" may be considered as one of a large class of secondary reinforcing stimuli which "acquired their reinforcing properties through association with primary rewards or through higher-order conditioning with other secondary rewards connoting security, affection, nurturance, etc., in the histories of the individual subjects (p. 110)." A similar case can be made for the negative reinforcer "That's bad," as it acquired secondary negatively reinforcing properties in the S's history. It is the influence of these

"histories" that is the focus of this study.

For the descriptive part of the study, the following specific hypotheses were made:

1. "Normal" Ss demonstrate the relationship among reinforcement contingencies suggested by the findings of the studies reviewed by Young (1936), as noted; i.e., a combination of PR of fast RTs (reinforcement condition PF) and NR of slow RTs (condition NS) increases the steepness of the RT curve more than does PF alone. The latter curve is steeper than that of NS alone. The non-reinforced group (OR) attains the least steep curve.

2. "Delinquent" Ss, on the other hand, attain curve relationships, as found by Martinez (1967), in which PF produces a steeper gradient than the combination contingency (PF:NS) or, at least, a gradient that does not differ from the PF:NS slope. For this group, NR produces a gradient that is the least steep or, at least, one that does not differ from that of the OR group.

In the experimental part of the study, an attempt was to have been made to "sensitize" normals to NR, in the manner in which it was hypothesized that delinquents have been sensitized over the years. Because of the results obtained in the first part of the study, though, this plan became un-

desirable, and a change in strategy was effected. On the basis of these results, it was hypothesized that delinquents demonstrate much more learning in an extended RT task condition under the PF:NS reinforcement condition than they do under the other three contingencies; in addition, their performance in this case equals that of the normal Ss.

The investigation of these specific hypotheses constituted the purpose of this two-part study.

CHAPTER II

BACKGROUND LITERATURE

The first body of literature to be reviewed is that generated from the study of human reaction time (RT). The term "reaction time" was coined a century ago by Exner (1873), but study in this area had already been going on for quite some time before that. History credits the Greenwich astronomer, Maskelyne, in 1796, with first recognizing the existence of this concept, and the individual differences inherent in it (Boring, 1957). He noticed that his assistant, Kinnebrook, consistently observed stellar transit times later than he did. This led astronomers to attempt to invent methods to correct for this "personal equation," as they referred to it.

The first experimental work in psychology on RT was designed by Helmholtz in 1850, in an attempt to measure the speed of impulse conduction in nerve fibers (Woodworth and Schlosberg, 1956). Hirsch (1861) extended the study of RT to include the auditory and tactile modalities, in addition to the previously used visual system. Donders (1868) de-

signed the "disjunctive" RT experiment, using discriminative stimuli and responses, and found that the time required for the S to make a response choice increased his latency. Exner (1873) discovered the relationship between preparatory set and RT. Wundt (1883) utilized the disjunctive RT model in his study of the time required for the execution of mental operations. Cattell (1886) brought the RT experiment from Wundt's laboratory to America. Since that time, innumerable studies have been devoted to the investigation of factors that contribute to inter- and intra-subject differences in response latencies. Teichner surveyed the literature in 1954, concluding that the following relationships have been established:

> 1) There is a positive correlation between the visual and the auditory RT.
> 2) Simultaneous stimulation of more than one sense modality produces faster RTs than stimulation of just one. On the other hand, successive stimulation of different senses produces slower RTs than stimulation of a single sensory channel.
> 3) For visual and thermal RTs, the greater the extent of the stimulus in space, i.e., the greater the number of receptors stimulated, the faster the speed of reaction up to some limit.
> 4) Under daylight or illuminated conditions, the visual RT becomes longer, the greater the distance of stimulation from the fovea.
> 5) In the case of each receptor system, RT is a negatively accelerated decreasing function of intensity up to some maximum ... after which RT lengthens.
> 6) RT is a slowly falling growth function of chron-

> ological age until about 30 years, after which it is a slowly rising function.
> 7) In general, the RT of the human male is faster than that of the female.
> 8) The optimum foreperiod of RT may be thought of as lying in a range between approximately 1.5 and 8.0 sec. Its position in this range is determined by a large number of factors including the duration and intensity of warning signal ... and time of production of muscular tension.
> 9) RT is not related to length, direction, or speed of movement of the responding member.
> 10) Under vigilance conditions, the longer the period during which S must respond, the longer the RT (pp. 143-144).

In a more recent review, Martinez (1966) concludes that the following characteristics can now be added to Teichner's findings:

> 1) Stimulus complexity slows RT (Henry, 1961). ...
> 2) Motivating instructions produce faster RT than no instructions or standard instructions (Owen, 1959).
> 3) Foreperiod intertrial interval produces faster RT when it is in the neighborhood of 2 sec. (Aiken and Lichtenstein, 1964).
> 4) The age and sex findings for adults have been confirmed in children (Hodgkins, 1962; 1963).
> 5) Stimulus preparatory set produces slower RT and fewer errors than a motor preparatory set (Yates, 1961).
> 6) RTs of normal Ss are faster than deviant Ss, i.e., mentally ill, mentally retarded, brain damaged, etc. (King, 1954; Yates, 1961). ...
> 7) Motor components are independent of premotor components of RT. There is substantial evidence building up that the critical latencies of RT are central (Botwinick and Thompson, 1966) (pp. 21-22).

In the last few years, RT studies have come to focus on discriminative or choice RT and on the influence of learning on latency changes. As early as 1954, King referred to the

similarity between RT curves and learning curves in his comparison of the latencies of normal and deviant Ss. Yates, in 1961, emphasized the need to consider a learning variable in RT. In 1964, a series of studies (Aiken, 1964; Aiken and Lichtenstein, 1964; Church and Camp, 1965) began to appear which supported the notion that the learning factor is crucial to changes in latency. On the basis of these findings, some investigators concluded that principles generated from the body of literature known as learning theory should be applicable to RT. Martinez (1966, 1967), for example, investigated the instrumental conditioning of latency curves in children, finding them to be sensitive to both positive and negative reinforcement of RT responses. The reinforcement used in his studies was verbal in nature, which brings us to the second body of literature to be reviewed here.

Interest in verbal behavior as a system of responses led to the development of a verbal conditioning paradigm based on the operant conditioning model utilizing contingent reinforcement. The initial work in this area was done by Greenspoon (1951, 1955). He attempted to control the rate of emission of a predetermined type of response by the application of a verbal stimulus, assumed to have positively or negatively reinforcing properties, in the presence of that

response. Such stimuli included, for example, "good," "mmm-hmm," and "huh-uh." He found the verbal positive reinforcer "mmm-hmm" to significantly increase the number of plural nouns emitted in a free-responding situation as compared to a control group. Later studies (Taffel, 1955; Cohen, Kalish, Thurston, and Cohen, 1954; Matarazzo, Saslow, and Pareis, 1960) found essentially the same results with respect to other response classes. One such type of response class studied by other authors (Buss and Buss, 1956; Buchwald, 1959; Meyer and Seidman, 1960, 1961; Offenbach and Meyer, 1964) is concept acquisition. The usual finding of these studies is that negative reinforcement is more effective than positive reinforcement. The comparative influence of different reinforcers has been studied, as by Cairns and Proctor (1968), who used the reinforcer "correct" rather than the more strongly valent (as they assumed) "good." Differential effects of verbal reinforcement have been studied across populations; Slechta, Gwynn, and Peoples, (1963) found, for example, that reinforcement produced more criterion responses in normals than in schizophrenics.

One of the major questions which has arisen out of study in this area is whether awareness of the reinforcement contingency is necessary for verbal learning to occur. As Eriksen (1962) says, verbal responses, being "tied ... so

closely to our criteria of awareness, (may be) incapable of modification without this modification being represented in awareness (p. 5)." Several studies lend support to this contention (Dulaney, 1962; Spielberger, 1962). Verplanck (1956) defines "awareness" as "the disposition of S to verbalize one or more of the rules followed by E" with respect to the response-reinforcement contingency (p. 80). He concedes, however, that there are different degrees of "awareness," and this is borne out in a study by Miron (1964).

Eriksen (1960) contends that "attention" rather than "awareness" may be the important factor in verbal learning, this "attention" arising out of the S's drive state or motivation. While this is a sticky question, presently bogged down in semantics, in dealing with a delinquent population, as does the present study, subject motivation is a factor which obviously requires consideration in evaluating performance on a learning task. Spielberger (1962), in fact, asserts that what is learned in verbal conditioning experiments *is* awareness of the response-reinforcement contingency, and that the extent to which *Ss act* on this learned information depends upon how much they want to receive the reinforcement, i.e., motivation. This motivation factor is related to the findings of studies of the effect of depri-

vation and satiation of social reinforcement on the efficacy with which verbal reinforcement improves learning (e.g., Gewirtz and Baer, 1958b); this area will be discussed in the next section of this review.

Two further studies related to the motivation-awareness issue, and crucial to the present study of delinquents, are those by Mandler and Kaplan (1956) and Spielberger, Levin, and Shepard (1962), who found that where the S interprets the reinforcement as disapproval, he will not condition, even when aware of the experimental contingency. As was noted in the first chapter, this is the factor hypothesized to lie behind the predicted poor effects of negative reinforcement with delinquents, due to their histories of exposure to it. In other words, delinquents will be more prone to interpret negative reinforcement as disapproval rather than as a discriminative cue for learning.

An area of study which has generated interest during the last ten years is operant conditioning of children's behavior. While many of these studies (Estes, 1963; Ryan, 1965; Ryan and Moffitt, 1966) use material reinforcements, such as candy and toys, the influence of the verbal conditioning paradigm has directed attention to the use of verbal social reinforcement in this regard. Initial work

in this area was done by Gewirtz and Baer (1958a) in a study in which the effectiveness of verbal approval, in the form of the reinforcers "good" and "mmm-hmm," was found to increase following a period of isolation or social deprivation. This finding, however, was limited to the case where S was of the opposite sex from E. They extended this study (Gewirtz and Baer, 1958b), preceding a socially-reinforced marble-sorting task for some children with a period of isolation, and for others with a period of extensive activity and interaction with E. They found positive social reinforcement to be most effective after social deprivation, and least effective following the "satiation" experience.

In relation to this finding, Stevenson (1965) cites studies which show that children whose parents use high frequencies of praise and approval at home are less responsive to positive social reinforcement in an experimental task. Gewirtz and Baer explain their findings in terms of a "social drive" that is increased by social deprivation, and reduced by either the experimental social reinforcement or prior satiation. Walters and Karal (1960), however, contend that emotional arousal or anxiety, increased by the isolation experience, is the factor that increases the intensity of the child's responding and therefore facilitates

learning. In their study, one group of children was isolated, a second group socially "satiated." Then half of each group was subjected to an anxiety-provoking experience prior to the experimental task. While there was a difference found between the isolated and satiated Ss, a much greater difference was found between the anxious and non-anxious groups, collapsing across the former dimension.

Along these lines, Taylor and Chapman (1955) had shown that high anxiety or "drive" facilitates learning in a simple task, but hinders it in a more complex one. This finding has been confirmed with respect to social reinforcement; Allen (1966) found social reinforcement to be more effective "when the task involves merely repetition of a simple motor response with no apparent terminus" than in more complex tasks (p. 72).

Cairns (1963) offers a third explanation, contending that, rather than anxiety creating a "drive" toward learning, the social isolation produces frustration or anxiety, and the reduction of this anxiety by positive social reinforcement is the factor which produces the improved learning. Stevenson and Hill (1963) feel that anxiety interacts with social reinforcement to produce its influence on learning. They found that, in the presence of anxiety,

positive social reinforcement reduces the rate of learning, but in its absence, increases it.

In addition to this array of explanations, Hartup and Himeno (1959) propose "frustration" as an alternative, Walters and Ray (1960) suggest "dependency frustration" or anxiety produced by isolation, and Walters and Parke (1964) offer "arousal" as the key factor. In a more recent series of experiments, Landau and Gewirtz (1967) and Gewirtz (1969) reaffirmed the relative satiation explanation, showing the reinforcing effectiveness of the social stimulus to be an inverse function of the number of times that the stimulus was received contingently in a treatment period, both, respectively, immediately preceding the test and with a time lapse.

Other factors have been studied with respect to their interaction with social reinforcement in determining its effect on learning. McCullers and Stevenson (1960) found age to be important, in that younger elementary school children were more responsive to verbal approval than were older ones. Zigler (1962) found institutionalized children to be more responsive to social reinforcement than non-institutionalized children. As Stevenson (1965) observes, "institutionalization and isolation clearly affect the

child's response to adults," making him more desirous of their approval (p. 123). Cairns (1965) found dependency to be an important factor. In an earlier (1963) study, in which dependency was experimentally produced in children by requiring one group to seek E's aid in obtaining toys while another was left to their own devices, Cairns found a greater effect of positive social reinforcememt for the "dependency-trained" group. He interpreted these results as indicating that, if a child has come to look to an adult for support and aid, as a result of this history, he will be more affected by such support in the experimental task. These findings are in contradiction to those of the satiation-deprivation studies previously described.

Intelligence has been found not to influence the effect of social reinforcement (Zigler, 1963), while socioeconomic status has been found to be important (Zigler and Kanzer, 1962). These authors found social reinforcers with the connotation of "correctness" to be more effective with middle-class children, while those conveying "praise" were more effective with lower-class children. These results are certainly relevant to the present study's emphasis on the S's interpretation of the message carried by the social reinforcement, determined by his history of

exposure to it, as it influences his performance.

While there is agreement in the general area of operant conditioning as to the relative effectiveness of positive and negative reinforcement (Young, 1936), the area of social reinforcement is marked by contradictory findings in this regard. Some writers have found negative reinforcement (NR) to produce faster learning than does positive reinforcement (PR) (Meyer and Seidman, 1960; Stevenson and Cruse, 1961; Meyer and Offenbach, 1962), some have found PR better than NR (Willicut and Kennedy, 1963; Willicut, 1964), some have found no difference between the two conditions (Grace, 1948), and some have found a neutral condition better than either PR or NR (Stevenson and Snyder, 1960). Much of this disagreement stems from the fact that little effort has been made toward investigating the variables, situational or subject, which influence the efficacy of NR toward aiding learning, although a great deal of work, as described above, has demonstrated the operation of such variables with respect to PR.

The preceding findings, then, suggest that many organismic factors are influential in determining the effects of social reinforcement. It is certainly reasonable to assume that the S's history of social reinforcement would

be a primary one. With the phenomenon of "juvenile delinquency" being one of the more critical of contemporary society's problems, it would be extremely desirable to find effective means of modifying the behavior of these children. Social reinforcement appears to be a possible approach to this task. However, while many studies have been devoted to examining the differences in the relative influence of social reinforcement on the behavior of "normals" as contrasted to various "non-normal" groups, such as schizophrenics (Garmezy, 1952; Bleke, 1955; King, David, and Lovinger, 1957; Zahn, 1959; Turbiner, 1961; Lebow and Epstein, 1963; Slechta, Gwynn, and Peoples, 1963; Buss and Lang, 1965), mental retardates (Cromwell, 1963; Butterfield and Zigler, 1965), and "emotionally disturbed" children (Stone, Rowley, and Keller, 1968), there has been none directed toward this issue with respect to the "juvenile delinquent" population. The present study, then, is an attempt to initiate efforts in such a crucial area.

CHAPTER III

METHOD

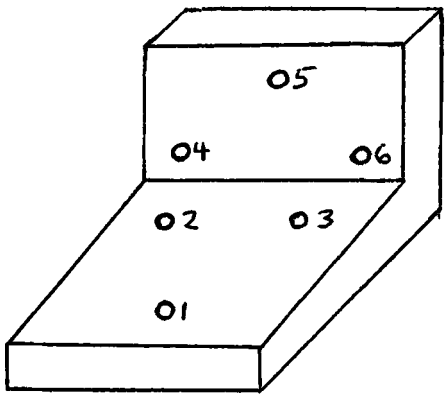
Experiment I

Subjects

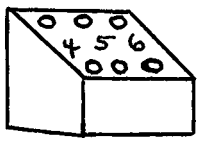
A sample of 72 children, ages 11 to 14 inclusive, was randomly selected from the high-turnover population of the Juvenile Detention Home of the Harris County Probation Department, Houston, Texas, to constitute the delinquent Ss. A second sample of 60 children in the same age range was selected from the populations of the "activities programs" of two Houston churches' Sunday School programs to constitute the "normal" sample.

Apparatus

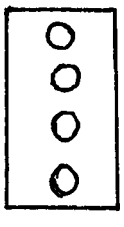
Illustration of apparatus. A drawing of the apparatus



Subject Console



Control Console



Klockounter

is presented on the preceding page. The subject console consisted of a horizontal response chassis 17" X 12" X 3" with three microswitch buttons mounted on it. The response chassis was connected, at its far end, to a vertical stimulus chassis 12" X 7" X 3" containing three lights. One button (1) served as the response key, another button (3) as the off switch for the stimulus light (5). The other button and lights were not used.

The control console consisted of three lights and three buttons. Only one of these buttons (5) was used to initiate the stimulus light. This console measured 4" X 4" X 6" and had a sloping front.

A Hunter Model 120A Klockounter was used to measure RT in milliseconds. It measured the latency between the onset of the stimulus light and the lift from the response button. The use of solid state relays insured against any sounds emanating from the apparatus. A sweep second hand stop watch was used to measure foreperiod intertrial intervals (FII).

Procedure

In both the delinquent and Sunday School samples, Ss were randomly assigned to one of four groups, distinguished by the following reinforcement contingencies:

a. Experimental group (P) consisted of Ss who received the reinforcer "Good" following RTs faster than the RT of the immediately preceding trial.

b. Experimental group (N) consisted of Ss who received the reinforcer "That's bad" following RTs slower than the RT of the immediately preceding trial.

c. Experimental group (B) consisted of Ss who received the reinforcer "Good" following faster RTs and the reinforcer "That's bad" following slower RTs.

d. Control group (0) consisted of Ss who received no reinforcement on any trial.

All groups had these characteristics in common:

a. All groups received 40 trials.

b. The first five trials for all groups were not reinforced, in order to check the assumption of equivalent baseline rates for the groups within each of the two samples.

c. Irregular FII of 1, 2, 3, and 4 seconds were presented at random for all groups. The FII averaged 2.25 seconds over the 40 trials.

d. For all Ss the instructions for the RT task were as follows: "This is a machine to play a game. I am going to say 'Press,' and you press this button (1) (see Illustration of Apparatus). Then I am going to say 'Ready';

when I say 'Ready,' you watch this light (5), and when it comes on, you lift your finger off the button." The standard emphasis on speed was not included in the instructions, since Martinez (1966) found RT curves to be more sensitive to social reinforcement when speed instructions were eliminated.

For the delinquent sample, Ss were sent one at a time to the room in which the apparatus was set up. In some cases this was the chapel, in others, a classroom. In the normal sample, for Ss of both churches, the data were collected in a classroom in the student-activity/gymnasium building. Again, Ss were sent one at a time by the activity program director. Randomization of groups was obtained by following a previously-determined rotation schedule for the application of the different reinforcement contingencies; i.e., before the first S entered the testing room, it was known that he would be placed in the O group, that the second S would be placed in the P group, and so on in rotation. All Ss were positioned before the table on which the apparatus was set up. The recording apparatus was situated behind the subject console, with E seated directly opposite S at the table. Instructions were given, followed by a very fast demonstration by E, who then took his position across from S. The

first trial was administered, after which E asked S to turn off the stimulus light by pressing button (3), and to continue to do so after each trial. The remaining 39 trials were then administered.

Experiment II

Subjects

A further sample of 56 children, ages 11 to 14 inclusive, was randomly selected from the population of the Juvenile Detention Home of the Harris County Probation Department.

Procedure

Ss were again divided into four groups according to the same reinforcement contingencies as in Experiment I. The same apparatus was used, and the same procedure was followed exactly, except that each S received 60 RT trials instead of 40. Mean FII for this sample was 2.22 seconds.

CHAPTER IV

RESULTS

Experiment I

The data were analysed in blocks of five trials. The design of the experiment provided for a statistical check on sampling errors in assigning Ss to the various groups within each of the two samples. The RTs of the first five trials for all Ss were obtained under identical no-reinforcement conditions.

Figure 1 illustrates the distribution of mean scores for the first block of trials for the normal groups. Base rate RTs in this sample ranged from 277 milliseconds (ms) to 852 ms, with a mean of 452 ms. As can be seen, the four groups are well represented on most points of the RT distribution. Base rate means did differ somewhat among the four groups in the normal sample; the mean for the O group was 510 ms, for the P group 464 ms, for the N group 410 ms, and for the B group 424 ms. RT is known, however, to be a highly variable phenomenon, and, as Table 1 shows, an analysis of variance indicated that these differences were not

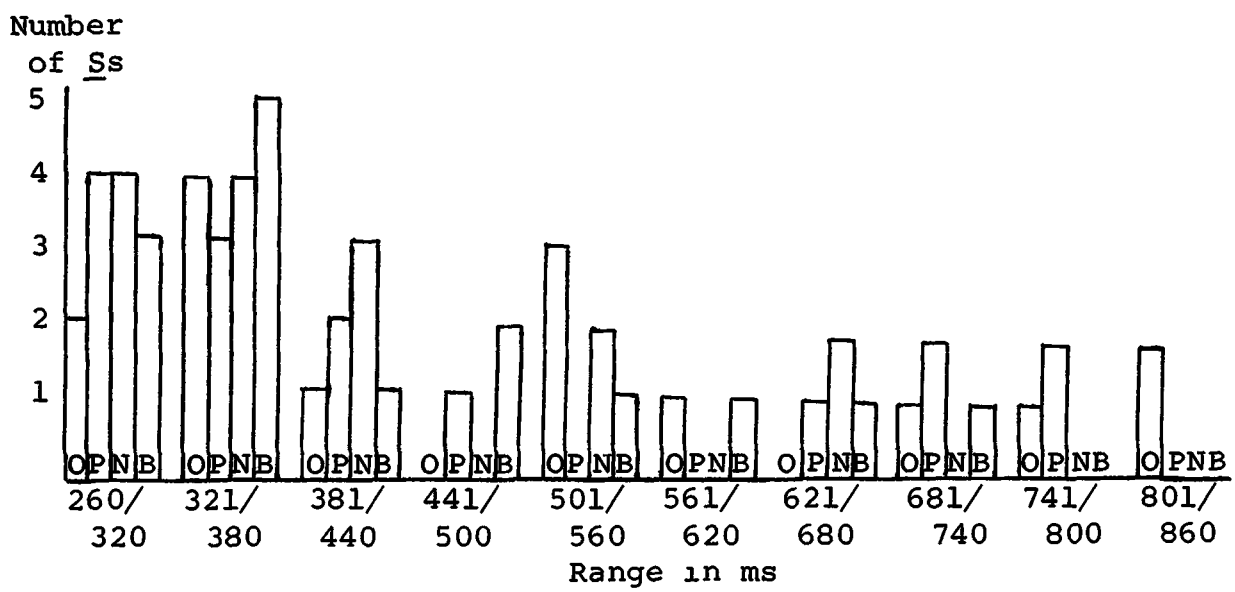


FIGURE 1

BASE RATES OF NORMALS BY REINFORCEMENT GROUPS

TABLE 1

COMPARISON OF BASE RATE MEANS OF NORMAL GROUPS

(N = 15 per group)

a. Analysis of Variance[a] of the Four Reinforcement Groups

Source of Variance	df	SS	MS	F	p
Reinforcement	3	90719	30240	1.12	ns
Within-Groups	56	1508987	26946		
Total	59	1599706			

b. Analysis of Variance of Extreme O and N Groups

Source of Variance	df	SS	MS	F	p
Reinforcement	1	74501	74501	2.74	ns
Within-Groups	28	760157	27148		
Total	29	834658			

[a]All variance and covariance analyses in this study were based on models presented in Winer (1962) on pages 46-62, 228-238, and 588-605. Tests for the homogeneity of variance of the different groups are given in Appendix H, based on Winer (1962), pages 92-96.

significant, nor was the difference between the extreme O and N groups.

The distribution of base rate means for the delinquent Ss is illustrated in Figure 2. RTs in this sample showed a considerably greater range, between 260 ms and 1386 ms, with a mean of 592 ms. Groups are again seen to be approximately equally represented along the distribution obtained for this sample. Base rate means for the four groups were O = 631, P = 587, N = 549, and B = 600. As Table 2 shows, these differences were not significant, nor was that between the two extreme groups.

The distribution of the normal sample was found to differ from that of the delinquent sample, however, as can be seen in Figure 3. Normals produced a curve skewed heavily toward the fast base rate RTs, while a much greater amount of variability is seen in the distribution for the delinquents. Table 3 indicates that the base rate difference between the two samples is significant, with the mean of 452 ms for the normals and 592 ms for the delinquents.

In contrast to Martinez's (1966) findings, no sex differences were found with respect to base rate RTs. In the normal sample (N = 15 in each of the four groups), there were 7 males in the O group, 8 in the P, 10 in the N, and 5

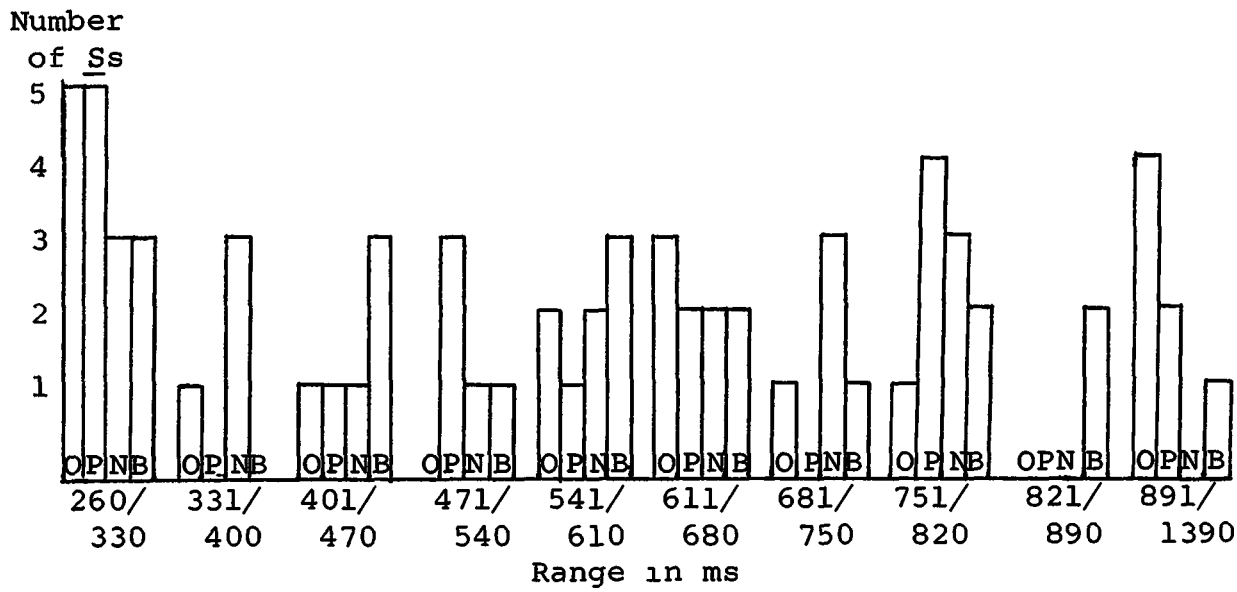


FIGURE 2

BASE RATES OF DELINQUENTS BY REINFORCEMENT GROUPS

TABLE 2

COMPARISON OF BASE RATE MEANS OF DELINQUENT GROUPS

(N = 18 per group)

a. Analysis of Variance of the Four Reinforcement Groups

Source of Variance	df	SS	MS	F	p
Reinforcement	3	62246	20749	0.33	ns
Within-Groups	68	4291363	63108		
Total	71	4353609			

b. Analysis of Variance of Extreme O and N Groups

Source of Variance	df	SS	MS	F	p
Reinforcement	1	60598	60598	0.84	ns
Within-Groups	34	2432731	71551		
Total	35	2493329			

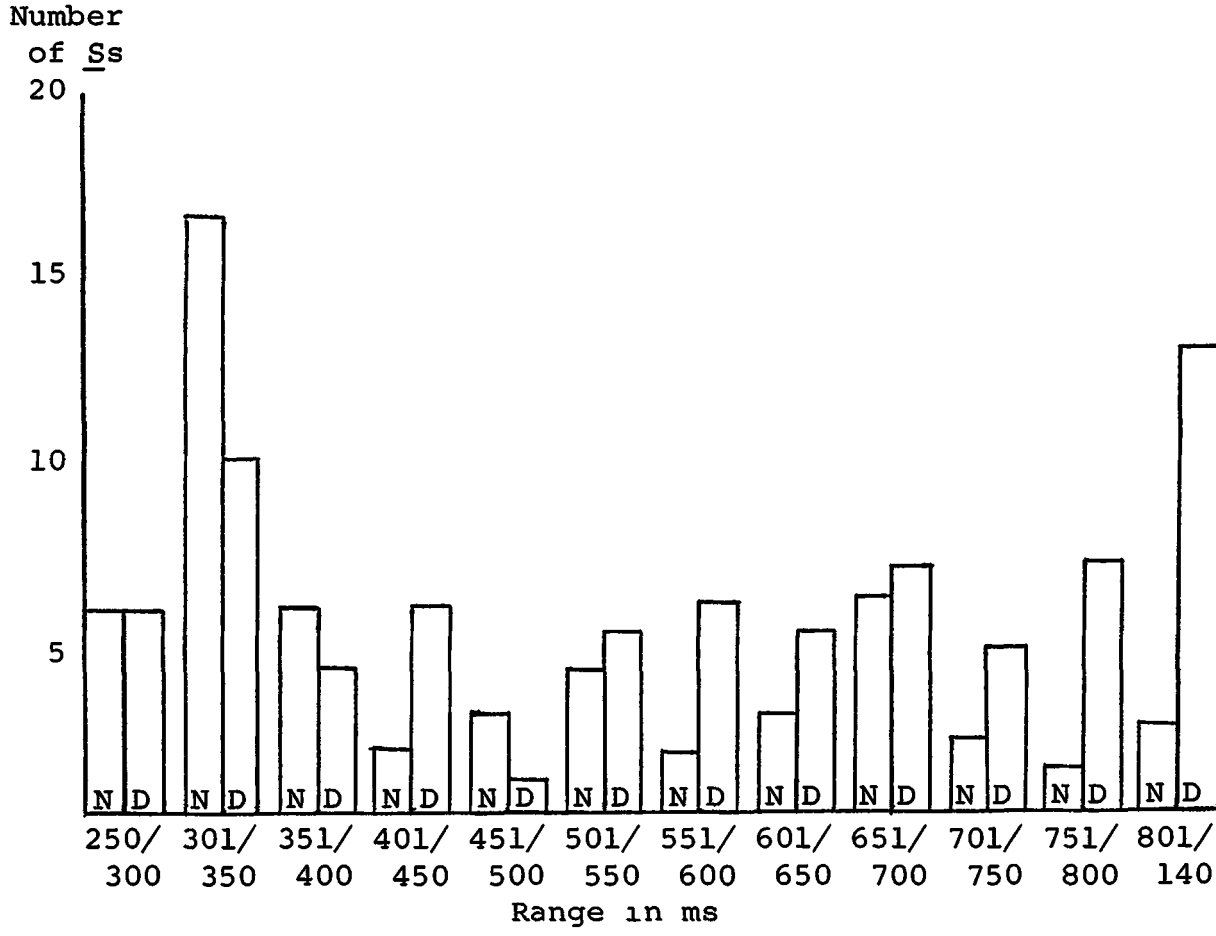


FIGURE 3

DISTRIBUTION OF BASE RATES FOR NORMALS AND DELINQUENTS

TABLE 3

COMPARISON OF BASE RATE MEANS OF NORMALS AND DELINQUENTS

Summary: Simple analysis of variance; 60 normals, 72 delinquents.

Source of Variance	df	SS	MS	F	p
Groups	1	304491	304491	6.64	.05
Error	130	5959362	45841		
Total	131	6263853			

in the B. The mean of the first block for males was 455, while for females, 449. As Table 4a shows, this is not a significant difference. In the delinquent sample there were decidedly fewer girls than in the normal, there being 3 in the O group, 4 in the P, 3 in the N, and 3 in the B, with an N of 18 per group. For the delinquents, the boys averaged 593 ms in initial rate, while the girls' mean was 588 ms; Table 4b shows this difference to be non-significant.

A (non-significant) tendency toward age differences was found, however, with Ss in both samples who were 13 or 14 years old manifesting a somewhat faster base rate than those 11 or 12 years old. In the normal sample there were 8 older Ss in the O group, 6 in the P, 10 in the N, and 9 in the B. Mean base rate for the older Ss was 419 ms, while it was 488 for the younger. Table 5a shows this difference not to achieve significance. In the delinquent sample, the proportion of older to younger Ss was somewhat higher, there being 13 in the O and P groups, and 14 in the N and B groups. The overall mean for these Ss was 563 ms, while for the younger Ss, 680. As Table 5b shows, this difference also does not quite achieve significance. The fact that these differences almost attained significance in both samples appears to suggest the presence of a true age difference. The

TABLE 4

SEX DIFFERENCES IN BASE RATE FOR NORMALS AND DELINQUENTS

a. Analysis of Variance for Normals; 30 Males, 30 Females

Source of Variance	df	SS	MS	F	p
Groups	1	505	505	0.02	ns
Error	58	1599176	27572		
Total	59	1599681			

b. Analysis of Variance for Delinquents; 59 Males, 13 Females

Source of Variance	df	SS	MS	F	p
Groups	1	296	296	0.01	ns
Error	71	4415490	62190		
Total	72	4415786			

TABLE 5

AGE DIFFERENCES IN BASE RATE FOR NORMALS AND DELINQUENTS

a. Analysis of Variance for Normals; 31 "Older" Ss, 29 "Younger" Ss

Source of Variance	df	SS	MS	F	p
Groups	1	70677	70677	2.68	.10
Error	58	1529054	26363		
Total	59	1599731			

b. Analysis of Variance for Delinquents; 54 "Older" Ss, 18 "Younger" Ss

Source of Variance	df	SS	MS	F	p
Groups	1	184509	184509	3.10	.08
Error	70	4169130	59559		
Total	71	4353639			

occurrence of such a difference in the opposite direction in the second delinquent sample, however, (see page 68) weighs against such a possibility.

No significant differences were found among base rates of different races of subjects. Table 6 shows the racial composition of the normal and delinquent samples. As is obvious in Table 6, a greater proportion of the delinquent sample was composed of Negro and Latin American Ss than was true in the normal sample. In the former, the mean for Caucasian Ss was 563 ms, for Negroes 609, and for Latin Americans 682. As Table 7b shows, these differences are not significant. In contrast, normal Negro Ss tended to be somewhat faster than whites, their mean base rate being 395 as compared to the latter's 461; however, Table 7a shows this difference to be also non-significant.

In addition to these factors, an admittedly very crude control of socio-economic status was established. This was determined primarily by the school attended by the S; in some cases, these data were supplemented by information regarding his father's occupation and/or the part of town in which he lived. Composition of the two samples according to this category is illustrated in Table 8; as is seen, a greater proportion of the delinquent sample came from the

TABLE 6

RACIAL COMPOSITION OF NORMAL AND DELINQUENT SAMPLES

	Normals			Delinquents		
Group	White	Negro	Latin	White	Negro	Latin
O	13	2	0	10	7	1
P	10	5	0	9	7	2
N	14	1	0	9	6	3
B	15	0	0	10	7	1

TABLE 7

RACE DIFFERENCES IN BASE-RATE FOR NORMALS AND DELINQUENTS

a. Analysis of Variance for Normals; 52 Caucasians, 8 Negroes

Source of Variance	df	SS	MS	F	p
Groups	1	30061	30061	1.11	ns
Error	58	1569654	27063		
Total	59	1599715			

b. Analysis of Variance for Delinquents; 38 Caucasians, 27 Negroes, 7 Latin Americans

Source of Variance	df	SS	MS	F	p
Groups	2	97014	48507	0.79	ns
Error	69	4256596	61690		
Total	71	4353610			

TABLE 8

SOCIO-ECONOMIC COMPOSITION
OF NORMAL AND DELINQUENT SAMPLES

	Normals		Delinquents	
Group	Middle	Lower	Middle	Lower
O	12	3	4	14
P	11	4	5	13
N	14	1	4	14
B	13	2	5	13

"lower" socio-economic class as thus determined than was true in the normal sample, which was predominantly "middle" class. This variable revealed no class differences in base rate. In the normal sample, the mean for the "middle" class Ss was 459 ms, while for the "lower," 437; in the delinquent sample, this comparison was 572 to 598, respectively. As Tables 9a and 9b show, neither of these differences is significant. It is acknowledged, however, that the absence of such a difference here may be a result of the crudity of the measure, rather than a reflection of a true lack of socio-economically determined differences in either of the two samples.

One further variable for which control was felt necessary was number of reinforcements for each S in order to ensure that all Ss received approximately the same number of them. Table 10 shows the makeup of the three reinforced groups for each of the two samples with regard to range of number of reinforcements per S within each group, mean number of reinforced trials per group, and the proportion of trials following the baseline block which received reinforcement. Tables 11a and 11b show that these distributions did not differ significantly within either of the two samples.

The effect of the different reinforcement contingencies on the RTs of the normal Ss is illustrated in Figure 4. For

TABLE 9

SOCIO-ECONOMIC DIFFERENCES IN BASE RATE
FOR NORMALS AND DELINQUENTS

a. Analysis of Variance for Normals; 41 "Middle-Class" Ss, 19 "Lower-Class" Ss

Source of Variance	df	SS	MS	F	p
Groups	1	6268	6268	0.23	ns
Error	58	1593438	27473		
Total	59	1599706			

b. Analysis of Variance for Delinquents; 18 "Middle-Class" Ss, 54 "Lower-Class" Ss

Source of Variance	df	SS	MS	F	p
Groups	1	9061	9061	0.15	ns
Error	70	4344548	62065		
Total	71	4353609			

TABLE 10

NUMBER OF REINFORCEMENTS RECEIVED BY NORMALS AND DELINQUENTS

	Normals			Delinquents		
Group	Range	Mean	%[a]	Range	Mean	%[a]
P	12 - 17	14.8	42.2	13 - 17	14.8	42.2
N	12 - 18	14.5	41.4	12 - 17	15.3	43.7
B	13 - 19	15.8	45.1	14 - 18	15.8	45.1

[a]Exclusive of first block.

TABLE 11

DIFFERENCES IN NUMBER OF REINFORCEMENTS RECEIVED BY NORMAL AND DELINQUENT GROUPS

a. Analysis of Variance for Normals; 3 Groups of 15 Ss each

Source of Variance	df	SS	MS	F	p
Groups	2	14	7.00	1.80	ns
Error	42	163	3.88		
Total	44	177			

b. Analysis of Variance for Delinquents; 3 Groups of 18 Ss each

Source of Variance	df	SS	MS	F	p
Groups	2	8	4.00	2.83	ns
Error	51	72	1.41		
Total	53	80			

the purposes of reliability and analytical clarity, the means of the second, third, and fourth blocks were collapsed, as were those of the fifth and sixth blocks, and the seventh and eighth. In addition, because the initial rates of the four normal groups were found not to differ significantly, the latency curves of these groups are represented in Figure 4 as amount of change manifested from a corrected mean of zero, which therefore corresponds to the initial rate of each group. This correction was obtained by subtracting the mean of the first block from the mean of each successive block, as was done in Martinez's (1966) study. Likewise, the curves of the four delinquent groups are represented in Figure 5 in the same manner. (It should be noted here, however, that while the data were analysed in this form, as they were in the Martinez study, they were also subjected to covariance analysis, in an effort to correct for any effects on the learning curves produced by the initial level of response).

An analysis of variance on the change between initial level and mean latency at blocks 2-4 revealed a difference produced by reinforcement conditions, but no difference between normals and delinquents (Table 12). These results were also obtained by an analysis of covariance on the un-

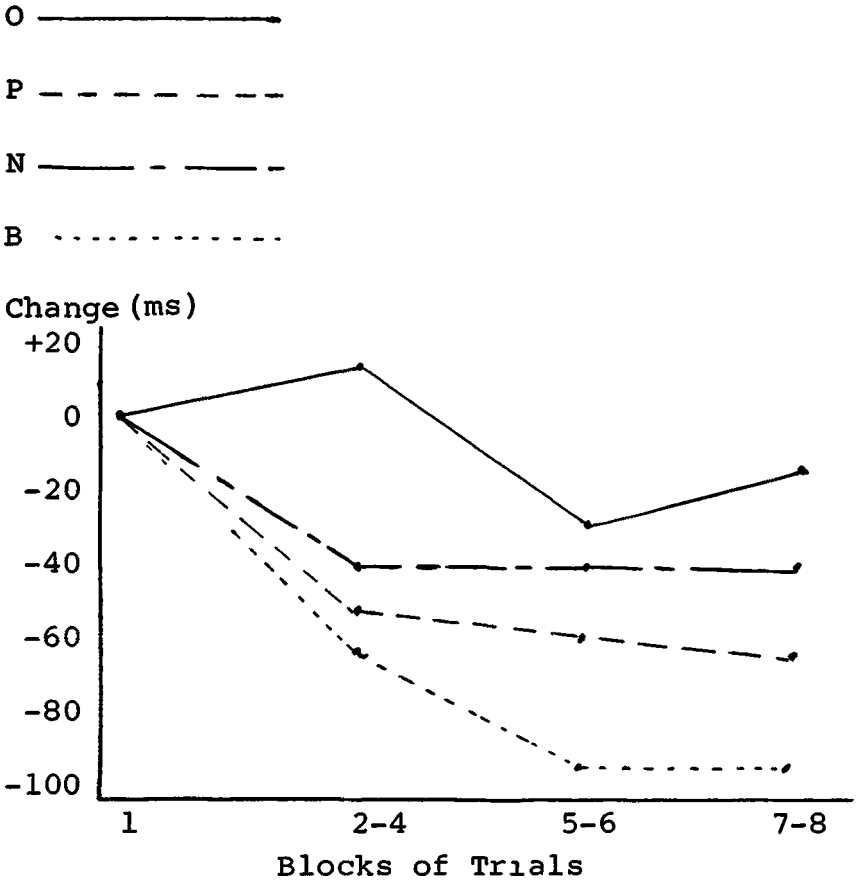


FIGURE 4

COMPARISON OF NORMAL GROUP DIFFERENCES
USING CORRECTED MEAN SCORES

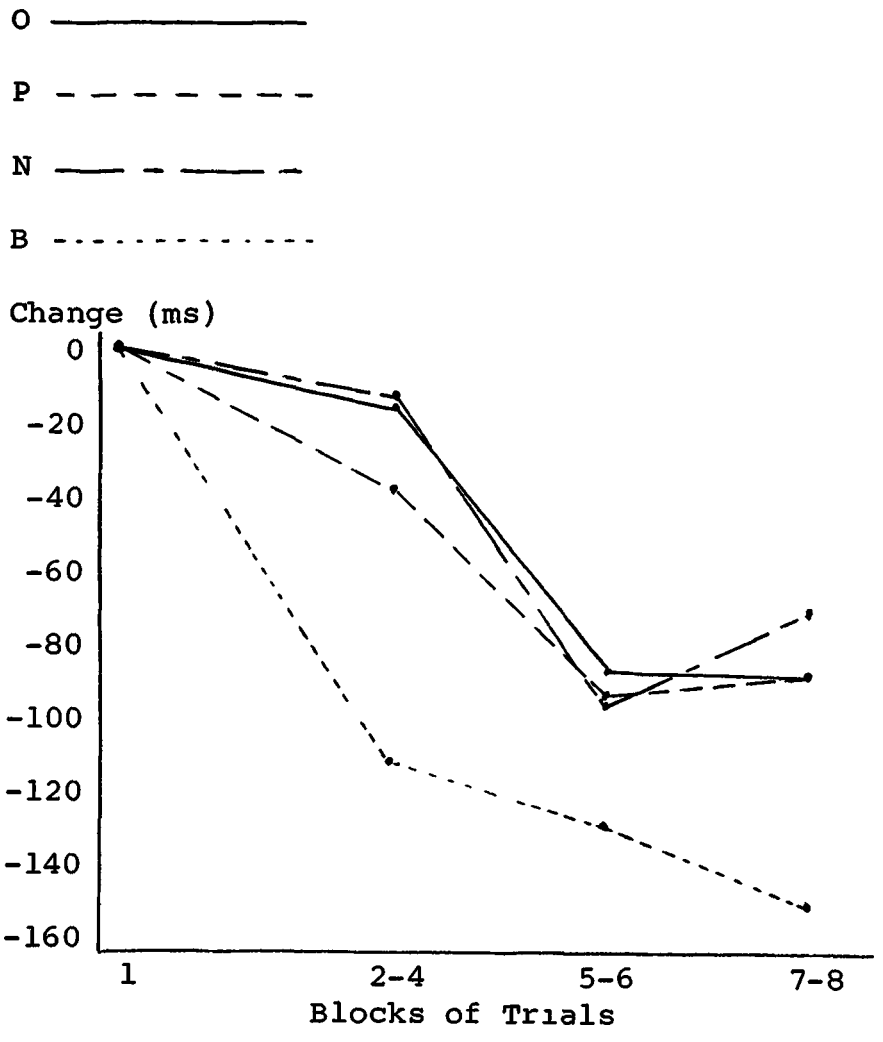


FIGURE 5

COMPARISON OF DELINQUENT GROUP DIFFERENCES
USING CORRECTED MEAN SCORES

TABLE 12

CHANGE FROM CORRECTED ZERO BASE LINE
TO BLOCKS 2-4: NORMALS AND DELINQUENTS

Summary: Reinforcement X Groups analysis of variance; 4 normal groups of N = 15, 4 delinquent groups on N = 18.

Source	df	SS	MS	F	p
Groups	1	3844	3844	0.45	ns
Reinforcements	3	139850	46617	5.48	.01
G X R	3	27156	9052	1.06	ns
Error	124	1054867	8506		
Total	131	1225717			

corrected data (Table 13). As inspection of Figures 4 and 5 indicates, the normal O-group and the delinquent B-group were the two deviant groups within their respective samples in this regard. This observation received statistical support (Table 18); i.e., the normal O-group was significantly different from the other three normal groups on blocks 2-4, and the delinquent B-group was significantly different from the delinquent P, N, and O groups on these blocks.

An analysis of variance on the change between initial level and level of response at blocks 5-6 indicated a significant difference between delinquents and normals, but no reinforcement differences (Table 14). As Table 15 shows, the same results were found for amount of change between base rate and blocks 7-8. With correction for baseline level through analysis of covariance, however, no such difference between samples was found. As Tables 16 and 17 show, these analyses revealed differences attributable to reinforcement conditions, with no significant difference in reinforcement effects between normals and delinquents. (A one-tailed test of significance was used since the order of the curves was predicted).

Because there were no overall differences in response to reinforcement conditions between normals and delinquents,

TABLE 13

PERFORMANCE ON BLOCKS 2-4 CONTROLLED FOR BASELINE PERFORMANCE: NORMALS AND DELINQUENTS

Summary: Reinforcement X Groups analysis of covariance; 4 normal groups of N = 15, 4 delinquent groups of N = 18.

Source	df	SS	MS	F	p
Groups	1	15706	15706	1.21	ns
Reinforcements	3	162773	54258	4.18	.01
G X R	3	29407	9802	0.75	ns
Error	123	1597299	12986		
Total	130	1805185			

TABLE 14

CHANGE FROM CORRECTED ZERO BASE LINE
TO BLOCKS 5-6: NORMALS AND DELINQUENTS

Summary: Reinforcement X Groups analysis of variance; 4 normal groups of N = 15, 4 delinquent groups of N = 18.

Source	df	SS	MS	F	p
Groups	1	67670	67670	4.07	.05
Reinforcements	3	54380	18127	1.09	ns
G X R	3	2664	888	0.05	ns
Error	124	2060017	16613		
Total	131	2184731			

TABLE 15

CHANGE FROM CORRECTED ZERO BASE LINE
TO BLOCKS 7-8: NORMALS AND DELINQUENTS

Summary: Reinforcement X Groups analysis of variance; 4 normal groups of N = 15, 4 delinquent groups of N = 18.

Source	df	SS	MS	F	p
Groups	1	73548	73548	4.38	.05
Reinforcements	3	138830	46277	2.75	.10
G X R	3	16714	5571	0.33	ns
Error	124	2085084	16815		
Total	131	2314176			

TABLE 16

PERFORMANCE ON BLOCKS 5-6 CONTROLLED FOR BASELINE PERFORMANCE: NORMALS AND DELINQUENTS

Summary: Reinforcement X Groups analysis of covariance; 4 normal groups of N = 15, 4 delinquent groups of N = 18.

Source	df	SS	MS	F	p
Groups	1	2351	2351	0.17	ns
Reinforcements	3	98219	32740	2.35	.05
G X R	3	7390	2463	0.18	ns
Error	123	1716828	13958		
Total	130	1824788			

TABLE 17

PERFORMANCE ON BLOCKS 7-8 CONTROLLED FOR BASELINE PERFORMANCE: NORMALS AND DELINQUENTS

Summary: Reinforcement X Groups analysis of covariance; 4 normal groups of N = 15, 4 delinquent groups of N = 18.

Source	df	SS	MS	F	p
Groups	1	3706	3706	0.25	ns
Reinforcements	3	158013	52671	3.60	.025
G X R	3	17101	5700	0.39	ns
Error	123	1800246	14636		
Total	130	1979066			

each group was analysed separately in an attempt to delineate the quality of reinforcement differences. Table 18 summarizes the probability-levels of the differences within the normal group. Covariance analyses from which Table 18 is derived are found in Appendix A. (In Appendices A through F, it will be observed that analyses are not reported for all individual group comparisons. In cases in which two groups were found not to differ significantly, a third group whose mean value fell between these two groups was assumed not to differ from either of these groups.) As Table 18 shows, the latency decrease from block 1 to blocks 2-4 manifested by the P, N, and B groups differed significantly from the definite lack of improvement displayed by the O group. On blocks 5-6 and 7-8, this difference diminished to a statistically non-significant level with regard to the N and P groups, although the B group continued to show significantly more improvement than the O group. While P was never found to differ from B in amount of conditioning, N was found to lag behind B after the initial rate of improvement between blocks 1 and 2-4.

Analyses of variance were also done for each reinforcement group between the initial block and each successive block. These results are summarized in Table 19; the anal-

TABLE 18

PROBABILITY VALUES OBTAINED FROM ANALYSES OF COVARIANCE ON INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: NORMALS

Groups Compared	Blocks Compared		
	1/2-4	1/5-6	1/7-8
O-P	.025	ns	ns
O-N	.025	ns	ns
O-B	.025	.005	.005
P-N	ns	ns	ns
P-B	ns	ns	ns
N-B	ns	.05	.025

TABLE 19

PROBABILITY VALUES OBTAINED FROM ANALYSES OF VARIANCE ON INDIVIDUAL REINFORCEMENT GROUPS: NORMALS

Group	Blocks Compared		
	1/2-4	1/5-6	1/7-8
O	ns	ns	ns
P	ns	ns	ns
N	ns	ns	ns
B	ns	.025	.025

yses on which this table is based are contained in Appendix B. As is seen, only the B group was found to improve significantly over base rate on blocks 5-6 and 7-8. It is felt that an increase in the size of reinforcement groups would produce similar significant results for the P group particularly, and probably also for N, since these tendencies are clearly discernible, as Figure 4 and Appendix B show.

For the delinquents, a summary of the results of the covariance analyses is given in Table 20; the analyses themselves comprise Appendix C. The only difference found to be significant was that between the B group and the other three groups from base rate to blocks 2-4. The absence of significant differences is doubtlessly due in great measure to the tremendous amount of variability contained in the delinquent sample.

As is seen in Figure 5, the O, P, and N latency curves are strikingly similar. For this reason, these three groups were combined and compared to the curve of the B group. As Table 20 shows, these differences were found to be significant for the 1 to 2-4 and the 1 to 7-8 comparisons.

The analyses of variance on the delinquent data, given in Appendix D and summarized in Table 21, indicate that the B group improved significantly after the first block, but

TABLE 20

PROBABILITY VALUES OBTAINED FROM ANALYSES OF COVARIANCE ON INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: DELINQUENTS

Groups Compared	Blocks Compared		
	1/2-4	1/5-6	1/7-8
O-P	ns	ns	ns
O-N	ns	ns	ns
O-B	.05	ns	ns
P-N	ns	ns	ns
P-B	.05	ns	ns
N-B	.05	ns	ns
OPN-B	.025	ns	.05

TABLE 21

PROBABILITY VALUES OBTAINED FROM ANALYSES OF VARIANCE ON INDIVIDUAL REINFORCEMENT GROUPS: DELINQUENTS

Group	Blocks Compared		
	1/2-4	1/5-6	1/7-8
O	ns	ns	ns
P	ns	ns	ns
N	ns	ns	ns
B	.025	.025	.025
OPN	ns	.025	.025

that the combined O-P-N group showed no improvement until blocks 5-6. As before, individual analyses of these latter three groups did not yield significant results.

Experiment II

Because the delinquent B group displayed such improvement relative to the other three groups, it was decided to extend the number of trials and replicate the first experiment on a second group of delinquents. The hypothesis was made that the B reinforcement contingency, in contrast to the O, P, or N conditions, produces in delinquents enough motivation to perform as to overcome to some degree those factors conducive to reduced performance in later trials, e.g., fatigue, boredom, rebelliousness, etc. On the basis of this hypothesis, it was predicted that the B group would again display superior performance, maintaining their increased level of responsiveness or possibly showing further improvement in the 9th through 12th blocks, while the O, P, and N curves would manifest a regression toward base line during these late trials.

As before, RTs of the first five trials for all four groups were obtained under no-reinforcement conditions. Figure 6 illustrates the distribution of mean scores for these groups. Base rate RTs in this sample ranged from 226 ms to

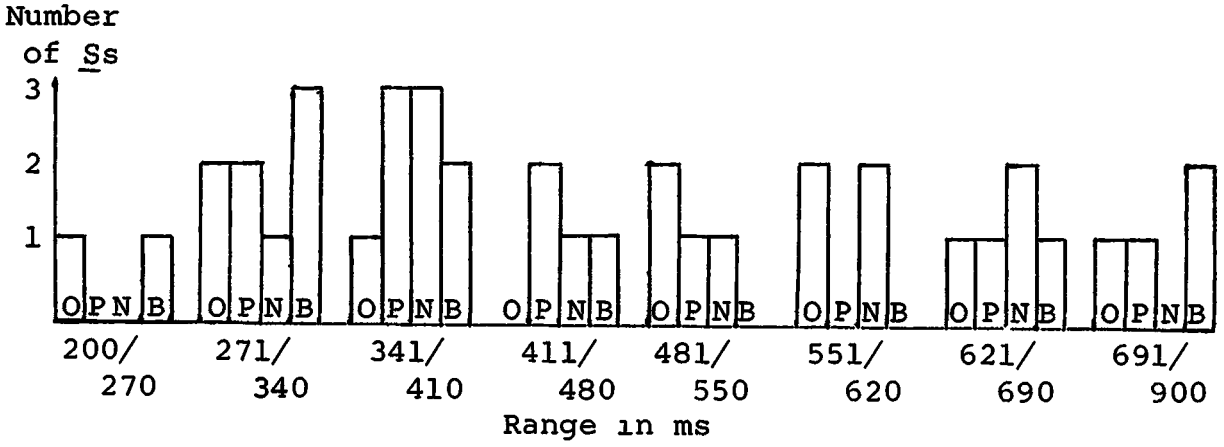


FIGURE 6

BASE RATES OF DELINQUENTS-2 BY REINFORCEMENT GROUPS

899 ms, with a mean of 476 ms. The four groups are seen to be approximately equally represented throughout the distribution. Base rate means of the four groups were also highly similar; the mean for the O group was 491 ms, for P 457, for N 484, and for B 466. As Table 22 shows, these differences were far from significant.

A comparison of Figure 6 to Figures 1 and 2 shows that this sample of delinquents more closely resembles the normal sample than the first delinquent sample with respect to base rate distribution. Indeed, an analysis of variance, given in Table 23, shows that the two delinquent samples are different in this regard at the .01 level of significance. In an attempt to explain this finding, it was noticed that the second delinquent sample contained no Ss with a base rate greater than 900 ms, while seven Ss in the first sample manifested initial levels ranging from 965 to 1386 ms. With these seven deviant Ss omitted from the data, following Martinez's (1966) procedure of omitting Ss with base rates greater than 900 ms, a comparison of the two delinquent samples produced non-significant results, as shown in Table 24.

As was true of the earlier two samples, there were no differences in base rate found according to sex, age, race,

TABLE 22

COMPARISON OF BASE RATE MEANS
OF DELINQUENT-2 REINFORCEMENT GROUPS

Summary: Simple analysis of variance; 4 groups of N = 10.

Source	df	SS	MS	F	p
Groups	3	7367	2456	0.08	ns
Error	36	1048148	29115		
Total	39	1055515			

TABLE 23

COMPARISON OF BASE RATES OF TWO DELINQUENT SAMPLES

Summary: Simple analysis of variance; Delinquent-1 N = 72, Delinquent-2 N = 40.

Source	df	SS	MS	F	p
Groups	1	342920	342920	6.87	.01
Error	110	5488702	49897		
Total	111	5831622			

TABLE 24

COMPARISON OF BASE RATES OF TWO DELINQUENT SAMPLES WITH SEVEN DEVIANT Ss OMITTED

Summary: Simple analysis of variance; Delinquent-1 N = 65, Delinquent-2 N = 40.

Source	df	SS	MS	F	p
Groups	1	93808	93808	2.86	ns
Error	103	3374383	32761		
Total	104	3468191			

or socio-economic class. With regard to the first variable, the four groups were approximately evenly matched; there were three females in the O and P groups, two in N, and one in B. As Table 25 shows, the mean base rate of 471 for the males did not differ significantly from that of 494 for the females.

With respect to age, Ss 11-12 years old manifested a mean base rate of 435 ms, while that for 13-14 year-old Ss was 485. This difference, as Table 26 shows, was not significant. Two of the O, N, and B groups were younger Ss, while there was one in the P group.

The racial composition of the four groups is given in Table 27. Caucasian Ss manifested a mean base rate of 477 ms, that of Negroes was 451, while that of Latin Americans was 555. These differences were also non-significant (Table 28).

The only variable for which differences approached significance was socio-economic class; "middle-class" Ss showed a mean base rate of 421 ms, while "lower-class" Ss produced one of 506 ms. The probability of this difference occurring by chance was found to be .13 (Table 29). There were three "middle-class" Ss in each of the O, N, and B groups, and five in P. The proportion of "middle-" to "lower-class" Ss

TABLE 25

SEX DIFFERENCES IN BASE RATE FOR DELINQUENTS-2

Summary: Simple analysis of variance; 31 males, 9 females.

Source	df	SS	MS	F	p
Groups	1	3577	3577	0.12	ns
Error	38	1131526	29777		
Total	39	1135103			

TABLE 26

AGE DIFFERENCES IN BASE RATE FOR DELINQUENTS-2

Summary: Simple analysis of variance; 33 "older" Ss, 7 "younger" Ss.

Source	df	SS	MS	F	p
Groups	1	14478	14478	0.49	ns
Error	38	1120620	29490		
Total	39	1135098			

TABLE 27

RACIAL COMPOSITION OF DELINQUENT-2 SAMPLE

Group	White	Negro	Latin
O	3	6	1
P	3	4	3
N	4	5	1
B	5	4	1

TABLE 28

RACE DIFFERENCES IN BASE RATE FOR DELINQUENTS-2

Summary: Simple analysis of variance; 15 Caucasian Ss, 19 Negro Ss, 6 Latin American Ss.

Source	df	SS	MS	F	p
Groups	2	49702	24851	0.85	ns
Error	37	1085395	29335		
Total	39	1135097			

TABLE 29

SOCIO-ECONOMIC DIFFERENCES IN BASE RATE FOR DELINQUENTS-2

Summary: Simple analysis of variance; 14 "middle-class" Ss, 26 "lower-class" Ss.

Source	df	SS	MS	F	p
Groups	1	65884	65884	2.34	ns
Error	38	1069206	28137		
Total	39	1135090			

was somewhat greater in the second delinquent sample than in the first; 35% of this sample were rated "middle-class," while only 25% of the first sample were so classified. A X^2 test, shown in Table 30, indicated that this difference was significant only at the .27 level, however. It should be noticed, though, that "middle-class" Ss in the second delinquent sample manifested a lower base rate than the "lower-class" Ss, following the trend of the normal sample, while the reverse, albeit non-significant, was true in the earlier delinquent sample.

Table 31 shows the makeup of the three reinforced groups of the second delinquent sample with regard to range of number of reinforcements per S within each group, mean number of reinforced trials per group, and the proportion of trials following the baseline block which received reinforcement. A comparison of Table 31 to Table 10 shows these proportions to be approximately equal to those of the earlier two samples. As Table 32 shows, the distributions for the three groups of the second delinquent sample did not differ significantly.

The effect of the different reinforcement contingencies on this sample is illustrated in Figure 7. Again, the latency curves are represented as change scores from a corrected zero baseline. As can be seen in Figure 7, the curves

TABLE 30

COMPARISON OF SOCIO-ECONOMIC MAKEUP OF DELINQUENTS-1 AND DELINQUENTS-2

Summary: X^2 analysis; 72 delinquents-1, 40 delinquents-2.

	Middle	Lower
D-1	20.6 18	51.4 54
D-2	11.4 14	28.6 26

$X^2 = 1.29$ df = 1 p = .27

TABLE 31

NUMBER OF REINFORCEMENTS RECEIVED BY DELINQUENTS-2

Group	Range	Mean	%[a]
P	20 - 26	23.4	42.5
N	19 - 28	23.0	41.8
B	20 - 28	25.2	45.8

[a]Exclusive of first block

TABLE 32

COMPARISON OF NUMBER OF REINFORCEMENTS
RECEIVED BY DELINQUENT-2 REINFORCEMENT GROUPS

Summary: Simple analysis of variance; 3 groups of 10 Ss each.

Source	df	SS	MS	F	p
Groups	2	28	14	2.28	ns
Error	27	166	6.15		
Total	29	194			

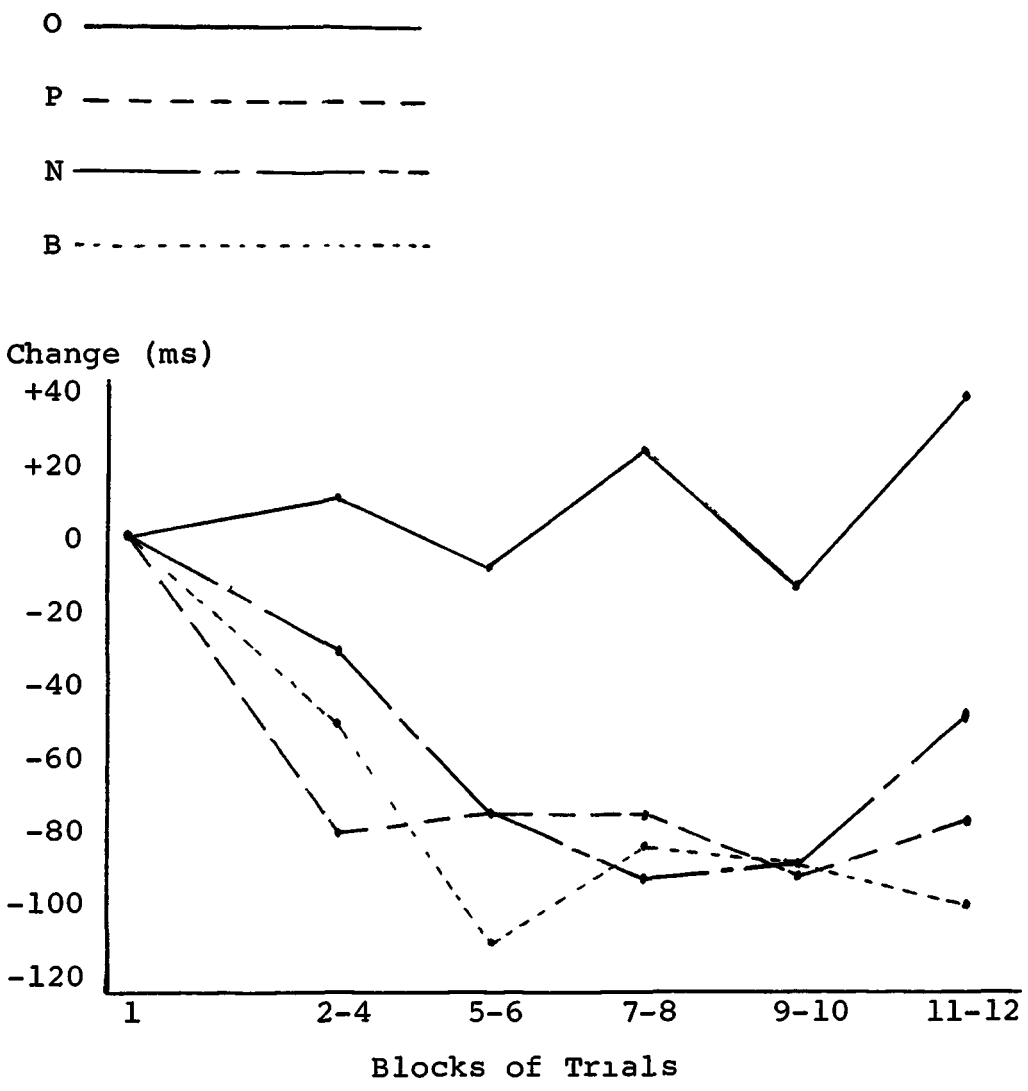


FIGURE 7

DELINQUENT-2 REINFORCEMENT GROUP DIFFERENCES
USING CORRECTED MEAN SCORES

of the O and B groups did not follow the pattern of the two corresponding groups in the earlier delinquent sample. While O in the first sample manifested the same improvement over base rate as P and N, in the second delinquent sample it showed no improvement whatsoever. Rather, it more resembles the performance of the normal O group. In this regard, if the performance of the O group in the earlier delinquent sample is considered with the seven previously-mentioned deviant Ss deleted from the data (four of whom were in the O group), it is clear that this group also performed in much the same manner as the O groups of the other two samples (Figure 8).

In addition, while the first delinquent B group displayed much greater latency decrease than the P and N groups in the same sample, in the second experiment the B group responded to the combination reinforcement contingency in almost exactly the same manner as the P and N groups. The analyses of covariance on this latter set of data, summarized in Table 33 and presented in Appendix E, show that there were no differences in the performance of P, N, and B throughout the 12 blocks of trials, but that the O group did differ significantly from these groups from the fifth block on. Also, the analyses of variance, summarized in Table 34 and

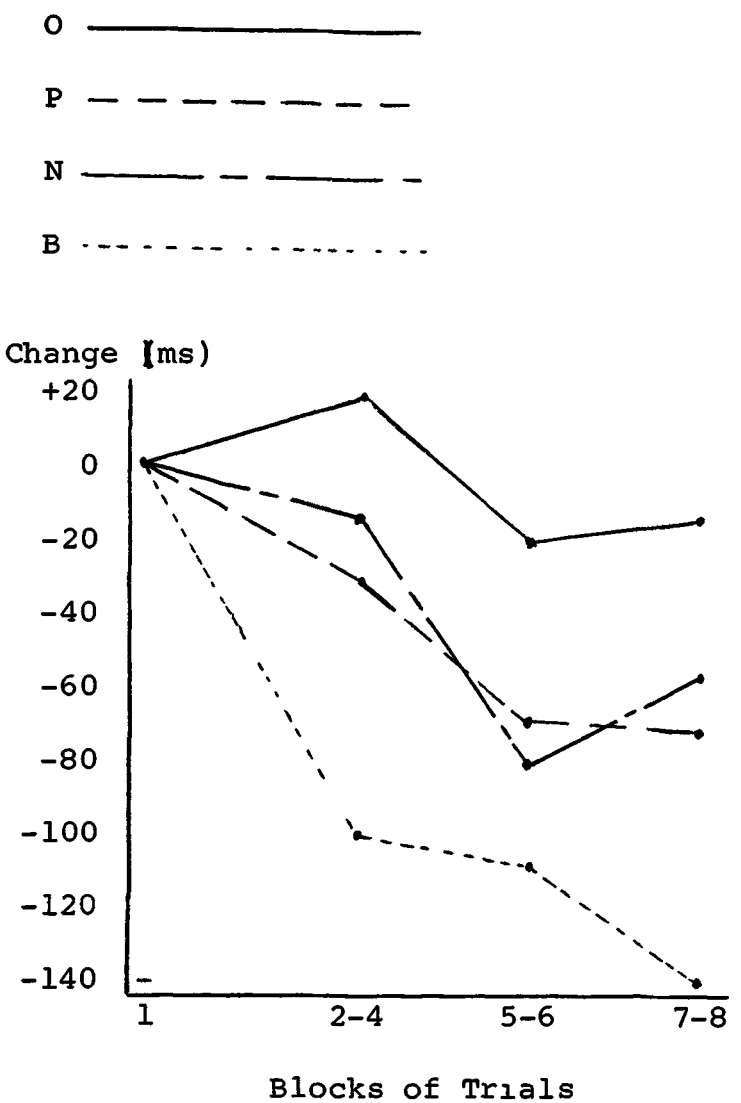


FIGURE 8

DELINQUENT-1 REINFORCEMENT GROUP DIFFERENCES
WITH SEVEN DEVIANT Ss OMITTED

TABLE 33

PROBABILITY VALUES OBTAINED FROM ANALYSES OF COVARIANCE ON INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: DELINQUENTS-2

Groups Compared	Blocks Compared				
	1/2-4	1/5-6	1/7-8	1/9-10	1/11-12
P-N-B	ns	ns	ns	ns	ns
PBN-O	.05	.025	.005	.025	.005

TABLE 34

PROBABILITY VALUES OBTAINED FROM ANALYSES OF VARIANCE ON INDIVIDUAL REINFORCEMENT GROUPS: DELINQUENTS-2

Group	Blocks Compared				
	1/2-4	1/5-6	1/7-8	1/9-10	1/11-12
O	ns	ns	ns	ns	ns
PNB	ns	.025	.025	.025	.025

presented in Appendix F, indicate that the combined P-N-B group did manifest a significant increase over base rate beginning at the fifth block, while the O group never differed from its initial level.

CHAPTER V

DISCUSSION

The results of this study tend to sustain the general hypothesis that delinquents and Sunday School students react differently to social reinforcement. The specific hypothesis that the performance of delinquents is impaired by the introduction of negative reinforcement, whether alone or conjointly with positive reinforcement, did not receive support, however.

Although the limited size of the sample used in this study prevented many normal group differences from achieving statistical significance, examination of Figure 4 shows that normals appear to respond consistently to social reinforcement contingencies in the same manner as they do to more traditional operant reinforcement models, as reported in the literature (Young, 1936); i.e., more improvement in performance is produced by a combination of positive and negative reinforcement than by either alone, with positive reinforcement producing more learning than negative, and with an absence of reinforcement producing no improvement at all.

This consistency, on the other hand, was not found in

the juvenile delinquent samples. While the combination contingency did produce more improvement in the first delinquent sample--the finding from which the hypothesis underlying Experiment II was derived--it was no different in this respect from the positive or negative conditions in the second delinquent sample. In addition, these latter two contingencies produced almost identical curves in both delinquent samples, which is interpreted as indicating that, at least under the conditions of the present study, delinquents are motivated no more greatly by positive social reinforcement than by negative reinforcement, when each is given separately.

In conjunction with the findings regarding the effects of the various reinforcement contingencies on the normal sample, these results indicate that, while normals do utilize positive and negative reinforcement as information cues for their behavior in the manner suggested in the literature, delinquents do not discriminate between these two types of reinforcement, and, at least to some degree, apparently tend to respond to reinforcement on a different basis; thus the finding that positive and negative reinforcement produced almost identical results in their behavioral effects on the delinquent samples.

In general, then, in keeping with Martinez's (1966) findings, the present study demonstrates that reaction time is subject to the effects of learning. Of the four conditions, the no-reinforcement contingency was found to generate the least improvement in reducing latency, and, except for the performance of a few initially very deviant subjects in the first delinquent sample, there were no differences in the RT curves of the 0 groups of the three samples. For both the normals and the delinquents, under this condition, their performance appears to be a rather random fluctuation around the initial baseline level.

In this regard, motivation of the individual subject to perform appears to be, not surprisingly, of central importance in determining degree of improvement. Thus, while the reinforced delinquent groups began at a slower initial level than did the corresponding normal groups, they displayed quantitatively more improvement over trials. This improvement, moreover, occurred at a slower rate than did that of the normals, as is seen in the comparison of the samples with respect to amount of change between blocks 1 and 2-4 and between 2-4 and 5-6.

Taken together, these results indicate that the slower base rate of the delinquents is a function of lower motiva-

tion to succeed, whether out of rebellion, fear, or whatever, rather than being a reflection of some relative physiological handicap. The normals, in other words, being more highly motivated from the outset, had less latitude to increase their rate of response than did the delinquents. A further indication of the role of motivation in RT is seen in the comparative results of the different reinforcement groups themselves; i.e., in all three samples, the least improvement occurred in the group in which no reinforcement was dispensed.

As has been mentioned, Spielberger (1962) contends that awareness of the response-reinforcement contingency is all that is learned in a verbal conditioning situation, and that the extent to which an individual acts upon this learned information depends upon his motivation or need to receive the reinforcement. The absence of a difference between the effects of positive and negative reinforcement on delinquents, then, would suggest that these Ss want to receive any type of reinforcement, regardless of whether it is positive or negative. In other words, the findings of this study support the popular belief that much delinquent behavior is an attempt to solicit attention, even if it must come in the form of negative reinforcement. Thus, an addition could be made to

Stevenson's (1965) statement, previously noted; i.e., the child's changed response to adults makes him more desirous of their approval or even disapproval. This idea will be developed more fully shortly.

The motivation aspect is also seen in findings related to the variability of RT across samples, reinforcement groups, and trials. It is well known that RT is a very unstable response, both inter- and intra-individually, and is highly susceptible to transient motivational factors. This characteristic of RT was particularly apparent in the delinquent samples; as examination of Appendix H shows, while homogeneity of base rate variance was shared between the normals and the second delinquent group, the variability within the first delinquent group was much greater. For all three samples, however, within each sample the variance of the base rates of each of the four reinforcement groups was homogeneous. As can also be seen in Appendix H, the amount of inter-subject variability was reduced by the three reinforcement conditions in all three samples. As Martinez (1966) also found,

> the verbal reinforcer "good" apparently has the effect of reducing the variability of the RT response. The hypothesis that contingent (positive) reinforcement should improve the stability of the response ... was supported (p. 74).

The combination contingency was particularly effective in this regard, especially in the normal sample. The extreme reduction in variability across trials within this reinforcement group is interpreted as an indication that this contingency provided enough incentive for the normals to reach their physiological limit, while this degree of incentive was not produced in any other group. In general, these findings represent the general assumption underlying learning theory with respect to reinforcement's ability to control behavior through its elicitation of responses that are more or less invariant or predictable across individuals.

In contrast to Stevenson's (1965) finding that children who had a history of positive reinforcement at home were less responsive to it in the experimental setting, this study discovered no such tendency, if one can assume that more positive reinforcement occurs in the homes of Sunday School students than in those of delinquents. The normals responded under this condition in the same manner and to approximately the same degree as did the delinquents. There was a tendency, in fact, for the delinquents to improve somewhat more than the normals under the positive reinforcement condition; i.e., both delinquent groups de-

creased their latency by about 80 ms after 40 trials under this contingency, while the normals improved by only 60 ms. Covariance analysis, however, showed this difference to be a function of the delinquents' slower initial rate.

The findings of this study appear to lend support to those of some of the previously-cited studies with respect to the role of anxiety in socially-reinforced learning. More initial anxiety was observed in delinquent Ss than in the normals, in the form of questions such as "Does it (the RT apparatus) shock you?" or "Is this a lie detector?" As would be predicted from the findings of previous studies with respect to the facilitating effects of anxiety on simple tasks, the delinquent reinforcement groups manifested a greater degree of improvement than those of the normal sample. It must be remembered, however, that, because the delinquents' baseline was slower than that of the normals, the former had more "room" in which to improve. Furthermore, while more anxiety was displayed throughout the trial series by negative reinforcement groups than by positive, in the form of verbalizations such as "Bad?," "How about that one?," "How much longer do I have to do this?," plus a greater frequency of "jumping-the-gun" trials, these groups showed no more improvement than the positive reinforcement

groups in the delinquent samples.

These findings do not support Stevenson and Hill's (1963) proposed interaction between social reinforcement and anxiety as the factor which produces "learning" in such situations; i.e., positive social reinforcement was found to increase the rate of learning independently of anxiety, as observed in these samples at any rate. In addition, the present results appear to contradict Cairns' (1963) hypothesis that the reduction by positive social reinforcement of isolation-produced anxiety is the motivating mechanism, unless the assumption could be accepted that negative social reinforcement also possesses the ability to reduce such anxiety. On the basis of the findings of this study, it is precisely this assumption that is going to be argued as underlying the performance of the delinquents.

The primary question raised by this study is "Why do delinquents respond in the same manner and to the same extent to negative reinforcement as to positive reinforcement?" It is suggested that, rather than providing different types of informational cues as for normals, both forms of reinforcement serve to satisfy some need present to a greater degree in delinquents than in normals. This is possibly a need for attention or recognition of their existence, often

equated with "love" by individuals with psychological problems. Another possibility is that the delinquent, lacking "normal" feelings of worth which allow "positive" self-assertiveness, welcomes social reinforcement in any form as acknowledgement of his having made an impact upon his environment. A third possibility is that the delinquent has a greater need to seek external controls over his behavior, with his early experience having precluded the development of a sense of control over his behavior. Whatever the cause, though, the results of this study indicate that delinquents do not utilize positive and negative reinforcement differentially in shaping their behavior, but rather seek it out to satisfy some more neurotic, non-constructive need. It is possible that the delinquent has been raised by parents who are more capable of dispensing negative reinforcement than positive or who dispense both relatively indiscriminately, and that this is the factor which provides the former with its ability to satisfy this need as efficiently as the latter. A psychotherapeutic approach with these individuals, then, while focusing on the development of feelings of worth, "positive" self-assertiveness, and internalized controls, should also include a learning experience as to the nature of and intent behind positive and negative reinforcement.

SUMMARY

Two experiments were conducted to investigate the hypothesis that, as a result of different histories of social reinforcement, juvenile delinquents respond differently to such reinforcement than do Sunday School students. In an early review of the learning theory literature, Young (1936) reported studies which showed that a combination of positive and negative reinforcement (PR and NR) produced more learning than PR or NR alone, with the former producing better results than the latter, and with all three conditions leading to more improvement than a no-reinforcement (NoR) condition. In a recent pilot study, however, Martinez (1967) found that institutionalized delinquent girls did not conform to this pattern when reaction time (RT) responses were verbally reinforced by the statements "Good" following fast RTs and "That's bad" following slow RTs. (In an earlier (1966) study, he had found RT to be modifiable by verbal reinforcement). For these delinquent Ss, NoR was found to produce more learning than NR, with the PR condition producing more learning than the combination contingency. On the basis of these findings, it was hypothesized that juvenile delinquents, because of their histories of experience

with social reinforcement, have become oversensitized to NR so that it is detrimental to learning.

In the first experiment, then, a sample of 72 delinquent Ss and one of 60 Sunday School students were each equally divided into four groups. All Ss received 40 RT trials using the classic RT apparatus and procedure, excluding speed instructions, and the same verbal reinforcements employed by Martinez (1967). One group in each sample received no reinforcement after any of the trials, one group was positively reinforced for fast responses, one was negatively reinforced for slow responses, and one received both PR and NR for appropriate responses.

The results of this experiment were in accordance with previous reports in the literature of the relative effectiveness of the four reinforcement contingencies for the normal Ss. For the delinquents, however, while the NoR condition produced the least improvement and the combination contingency produced the greatest, the curves for the PR and NR groups were almost identical. Because of the significantly greater degree of improvement produced in these Ss by the combination condition, it was decided that the number of trials should be extended to 60 in Experiment II to investigate the hypothesis that, under this contingency,

the performance of the delinquents is more closely equal that of the normals.

Each reinforcement group in Experiment II was composed of 10 delinquent Ss who received 60 RT trials under the same conditions as in Experiment I. While the results duplicated those of the first experiment with regard to the NoR, PR, and NR groups, the combination group failed to show any improvement over these latter two groups; all three produced almost identical curves.

The overall results were interpreted as indicating that, while delinquents have some tendency to perceive PR and NR as cues for directing their behavior, in the manner of the normals, they apparently also react to reinforcement on the basis of some need not present in normals to such a degree. It was suggested that possible needs include attention (love), the production of an influence on the environment (self-assertion), and the solicitation of external controls upon their behavior. It was further suggested that a psychotherapeutic approach with these Ss, while focusing on the development of feelings of worth, "positive" self-assertiveness, and internalized controls, should also include a learning experience as to the nature of and intent behind PR and NR.

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APPENDICES

APPENDIX A

ANALYSES OF COVARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: NORMALS

APPENDIX A

ANALYSES OF COVARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: NORMALS

Groups	Blocks	Source	df	SS	MS	F	p
O - P	$\overline{1/2\text{-}4}$	Rein.	1	37718	37718	4.64	.025
		Error	27	219536	8130		
		Total	28	257254			
O - N	$\overline{1/2\text{-}4}$	Rein.	1	38839	38839	7.24	.025
		Error	27	144833	5364		
		Total	28	183672			
N - B	$\overline{1/2\text{-}4}$	Rein.	1	1115	1115	0.38	ns
		Error	27	78391	2903		
		Total	28	79506			
N - B	$\overline{1/5\text{-}6}$	Rein.	1	14311	14311	3.31	.05
		Error	27	116601	4318		
		Total	28	130912			
O - P	$\overline{1/5\text{-}6}$	Rein.	1	11720	11720	0.98	ns
		Error	27	321467	11906		
		Total	28	333187			

Groups	Blocks	Source	df	SS	MS	F	p
O - B	$\overline{1/5\text{-}6}$	Rein.	1	75045	75045	9.39	.005
		Error	27	215866	7995		
		Total	28	290911			
P - B	$\overline{1/5\text{-}6}$	Rein.	1	22180	22180	2.57	ns
		Error	27	233136	8634		
		Total	28	255316			
N - B	$\overline{1/7\text{-}8}$	Rein.	1	11604	11604	5.50	.025
		Error	27	57012	2111		
		Total	28	68616			
P - B	$\overline{1/7\text{-}8}$	Rein.	1	19395	19395	2.55	ns
		Error	27	205347	7605		
		Total	28	224742			
O - B	$\overline{1/7\text{-}8}$	Rein.	1	99416	99416	10.37	.005
		Error	27	258774	9584		
		Total	28	358190			
O - P	$\overline{1/7\text{-}8}$	Rein.	1	29981	29981	2.23	ns
		Error	27	363551	13465		
		Total	28	393532			

APPENDIX B

ANALYSES OF VARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUPS: NORMALS

APPENDIX B

ANALYSES OF VARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUPS: NORMALS

Group	Blocks	Source	df	SS	MS	F	p
B	$\overline{1/2\text{-}4}$	Rein.	1	28892	28892	2.50	ns
		Error	28	323979	11570		
		Total	29	352871			
N	$\overline{1/5\text{-}6}$	Rein.	1	25913	25913	1.99	ns
		Error	28	364259	13009		
		Total	29	390172			
B	$\overline{1/5\text{-}6}$	Rein.	1	67120	67120	6.43	.025
		Error	28	292364	10442		
		Total	29	359484			
P	$\overline{1/7\text{-}8}$	Rein.	1	27847	27847	0.89	ns
		Error	28	873759	31205		
		Total	29	901606			
N	$\overline{1/7\text{-}8}$	Rein.	1	15687	15687	1.51	ns
		Error	28	290499	10374		
		Total	29	306186			

Group	Blocks	Source	df	SS	MS	F	p
B	$\overline{1/7\text{-}8}$	Rein.	1	65240	65240	6.25	.025
		Error	28	292455	10444		
		Total	29	357695			

APPENDIX C

ANALYSES OF COVARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: DELINQUENTS

APPENDIX C

ANALYSES OF COVARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: DELINQUENTS

Groups	Blocks	Source	df	SS	MS	F	p
P - B	$\overline{1/2\text{-}4}$	Rein.	1	45445	45445	2.97	.05
		Error	33	504625	15291		
		Total	34	550070			
N - B	$\overline{1/5\text{-}6}$	Rein.	1	1138	1138	0.06	ns
		Error	33	652363	19768		
		Total	34	653501			
N - B	$\overline{1/7\text{-}8}$	Rein.	1	33782	33782	1.64	ns
		Error	33	679855	20601		
		Total	34	713637			
OPN - B	$\overline{1/2\text{-}4}$	Rein.	1	103858	103858	5.67	.025
		Error	69	1264604	18327		
		Total	70	1368462			
OPN - B	$\overline{1/5\text{-}6}$	Rein.	1	14968	14968	0.81	ns
		Error	69	1273431	18455		
		Total	70	1288399			

Groups	Blocks	Source	df	SS	MS	F	p
OPN - B	$\overline{1/7-8}$	Rein.	1	63221	63221	3.23	.05
		Error	69	1350536	19572		
		Total	70	1413757			

APPENDIX D

ANALYSES OF VARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUPS: DELINQUENTS

APPENDIX D

ANALYSES OF VARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUPS: DELINQUENTS

Group	Blocks	Source	df	SS	MS	F	p
B	$\overline{1/2\text{-}4}$	Rein.	1	137643	137643	4.55	.025
		Error	34	1028921	30262		
		Total	35	1166564			
O	$\overline{1/5\text{-}6}$	Rein.	1	86305	86305	1.02	ns
		Error	34	2887796	84935		
		Total	35	2974101			
N	$\overline{1/5\text{-}6}$	Rein.	1	65873	65873	2.01	ns
		Error	34	1116157	32828		
		Total	35	1182030			
P	$\overline{1/7\text{-}8}$	Rein.	1	68731	68731	1.25	ns
		Error	34	1869834	54995		
		Total	35	1938565			
OPN	$\overline{1/2\text{-}4}$	Rein.	1	78314	78314	1.18	ns
		Error	106	7061412	66617		
		Total	107	7139726			

Group	Blocks	Source	df	SS	MS	F	p
OPN	$\overline{1/5\text{-}6}$	Rein.	1	287473	287473	5.16	.025
		Error	106	5902873	55687		
		Total	107	6190346			
OPN	$\overline{1/7\text{-}8}$	Rein.	1	240437	240437	4.30	.025
		Error	106	5920734	55855		
		Total	107	6161171			

APPENDIX E

ANALYSES OF COVARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: DELINQUENTS-2

APPENDIX E

ANALYSES OF COVARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUP COMPARISONS: DELINQUENTS-2

Groups	Blocks	Source	df	SS	MS	F	p
All	$\overline{1}/\overline{2\text{-}4}$	Rein.	3	55411	18471	1.58	ns
		Error	35	409721	11706		
		Total	38	465132			
O - P	$\overline{1}/\overline{2\text{-}4}$	Rein.	1	47386	47386	3.81	.05
		Error	17	211636	12449		
		Total	18	259022			
P-N-B	$\overline{1}/\overline{5\text{-}6}$	Rein.	2	6792	3396	0.67	ns
		Error	26	131778	5068		
		Total	28	138570			
PBN-O	$\overline{1}/\overline{5\text{-}6}$	Rein.	1	58767	58767	4.15	.025
		Error	37	523588	14151		
		Total	38	582355			
P-N-B	$\overline{1}/\overline{7\text{-}8}$	Rein.	2	14	7	0.00	ns
		Error	26	185306	7127		
		Total	28	185320			

Groups	Blocks	Source	df	SS	MS	F	p
PNB-O	$\overline{1/7\text{-}8}$	Rein.	1	171716	171716	23.33	.005
		Error	37	272323	7360		
		Total	38	444039			
PNB-O	$\overline{1/9\text{-}10}$	Rein.	1	89181	89181	6.39	.025
		Error	37	516431	13957		
		Total	38	605612			
P-B-N	$\overline{1/11\text{-}12}$	Rein.	2	16833	8416	1.52	ns
		Error	26	143443	5517		
		Total	28	160276			
PNB-O	$\overline{1/11\text{-}12}$	Rein.	1	117286	117286	10.47	.005
		Error	37	414477	11202		
		Total	38	531763			

APPENDIX F

ANALYSES OF VARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUPS: DELINQUENTS-2

APPENDIX F

ANALYSES OF VARIANCE ON UNCORRECTED CHANGE VALUES FOR INDIVIDUAL REINFORCEMENT GROUPS: DELINQUENTS-2

Group	Blocks	Source	df	SS	MS	F	p
P	$\overline{1/2\text{-}4}$	Rein.	1	31919	31919	1.89	ns
		Error	18	304313	16906		
		Total	19	336232			
PNB	$\overline{1/2\text{-}4}$	Rein.	1	68765	68765	2.93	ns
		Error	58	1360554	23457		
		Total	59	1429319			
PNB	$\overline{1/5\text{-}6}$	Rein.	1	139127	139127	7.56	.025
		Error	58	1067004	18396		
		Total	59	1206131			
PNB	$\overline{1/7\text{-}8}$	Rein.	1	130195	130195	6.73	.025
		Error	58	1121396	19334		
		Total	59	1251591			
PNB	$\overline{1/9\text{-}10}$	Rein.	1	147450	147450	8.11	.025
		Error	58	1054159	18175		
		Total	59	1201609			

Group	Blocks	Source	df	SS	MS	F	p
PNB	$\overline{1/11\text{-}12}$	Rein.	1	117963	117963	6.18	.025
		Error	58	1107314	19091		
		Total	59	1225277			
O	$\overline{1/11\text{-}12}$	Rein.	1	7144	7144	0.14	ns
		Error	18	720028	50205		
		Total	19	727172			

APPENDIX G

INDIVIDUAL SUBJECT MEANS OF BLOCKS

APPENDIX G

INDIVIDUAL SUBJECT MEANS OF BLOCKS

Group	Subject Code*	Blocks 1	2-4	5-6	7-8
Delinquent-1 O	M O C L	284	322	346	354
	F O C M	370	330	308	350
*Column 1 = Sex	F O C L	312	328	352	316
M = male	M Y C L	543	329	293	310
F = female	M Y N L	587	636	543	565
Col. 2 = Age	M O C M	429	377	389	362
O = 13-14	M O N L	319	369	394	530
Y = 11-12	M O C L	271	268	273	316
Col. 3 = Race	M Y C L	691	727	724	726
C = Caucasian	M Y L M	655	838	693	644
N = Negro	F O N L	632	848	801	766
L = Latin	M O C L	641	596	742	732
Col. 4 = Soc-eco.	M O N L	775	794	402	356
M = "middle"	M Y C L	966	744	622	582
L = "lower"	M O N L	1386	1529	1033	932
	M O C M	976	862	547	564
	M O N L	1223	807	1058	1088
	M O N L	303	326	312	290
Delinquent-1 P	M Y N L	559	811	793	597
	M O N L	521	630	497	628
	M O N L	500	346	306	288
	M O N L	502	597	624	624
	M O C M	309	332	312	327
	M O N L	271	245	255	262
	F O C M	419	356	348	330
	F O C M	264	273	299	293
	M O N L	666	853	686	672
	F O L L	673	629	549	653
	M O C L	273	284	278	332
	M Y C L	327	291	326	377
	F O C L	789	586	458	438
	M Y N L	1165	980	925	1079
	M O C M	808	457	410	432
	M Y C M	753	705	624	584
	M O C L	807	535	522	434
	M Y L L	965	954	657	648

Group	Subject Code	1	2-4	5-6	7-8
Delinquent-1 N	M Y N L	321	390	278	350
	M O C M	389	361	280	342
	M O N L	489	564	626	816
	M O C L	260	290	272	268
	M O C L	361	472	412	444
	M Y L L	300	411	352	380
	M O C L	366	348	334	337
	M O N L	730	697	842	798
	M O L L	702	842	632	540
	F O C M	602	659	549	643
	M O C M	635	445	476	528
	M Y N L	575	493	384	398
	M O C L	771	462	416	402
	F O C M	751	355	301	267
	M Y L L	808	842	600	618
	M O N L	426	328	284	304
	F O C L	738	906	768	856
	M O N L	662	747	342	324
Delinquent-1 B	M O N L	323	302	284	311
	M O N L	559	565	493	462
	M O C M	418	583	495	278
	M Y N L	419	414	330	303
	M O C L	424	343	356	368
	M O C L	325	330	328	314
	M O C M	516	377	344	335
	M O N L	597	404	438	477
	M O L L	671	412	384	334
	F O C M	594	482	527	470
	M O C M	660	467	362	346
	F O C L	738	421	440	398
	M Y C L	968	636	495	624
	M Y N L	839	735	992	832
	M O C L	886	569	519	523
	F O C M	757	651	715	682
	M O N L	313	305	268	292
	M Y N L	792	741	673	661

Group	Subject Code	1	2-4	5-6	7-8
Normal O	M O C M	284	282	288	299
	F Y C M	845	801	672	792
	F O C M	327	329	299	310
	F O C M	696	676	510	472
	M Y C M	508	434	434	436
	M Y C M	764	913	886	900
	M Y C M	587	649	626	698
	M O C M	325	461	378	433
	F Y C L	852	837	573	572
	F Y C M	536	696	700	699
	F O C M	438	309	364	344
	F Y C M	336	307	312	348
	F O C M	341	391	424	462
	M O N L	292	282	310	331
	M O N L	519	462	430	394
Normal P	F Y C M	684	739	779	842
	F O C M	747	694	708	648
	F O C M	336	340	372	357
	M Y C M	679	365	357	384
	M Y C M	693	457	376	354
	F Y C M	431	395	378	378
	M O C M	322	294	322	301
	M Y C M	292	301	291	308
	M Y N L	741	653	738	618
	M Y N L	324	339	316	292
	M Y N L	388	310	310	346
	F Y N L	285	261	248	267
	F Y N M	301	300	264	292
	F O C M	283	310	280	280
	M Y C M	457	401	367	382
Normal N	F O C M	356	360	332	318
	F O C M	363	341	355	334
	F O C M	398	346	347	352
	M Y C M	387	334	288	308
	M O C M	654	383	382	406
	M O C M	636	606	690	512
	M O C M	294	258	252	268
	M O C M	525	497	500	510
	M Y N L	310	301	260	366
	M O C M	412	350	370	398
	F Y C M	310	302	335	293
	M O C M	362	314	328	316
	M Y C M	338	306	288	296
	F Y C M	515	510	478	496
	M O C M	295	300	296	296

Group	Subject Code	1	2-4	5-6	7-8	9-10	11-12
Normal B	F O C M	607	402	383	372		
	F O C M	461	412	368	356		
	F O C M	304	295	264	284		
	F O C M	305	310	278	274		
	F O C M	337	321	342	333		
	F O C M	383	465	426	415		
	F Y C L	325	320	301	290		
	F Y C L	336	294	304	315		
	M Y C M	543	478	348	340		
	M Y C M	641	418	360	398		
	F O C M	696	424	366	376		
	F O C M	341	296	270	300		
	M Y C M	454	386	335	337		
	M Y C M	277	286	276	247		
	M O C M	346	318	316	320		
Delinquent-2 O	M Y L L	537	799	724	659	721	681
	M O N L	318	335	312	336	308	337
	M Y N L	267	323	347	320	325	372
	M O N L	501	407	396	389	430	506
	M O N L	608	707	469	560	521	506
	M O C M	276	277	254	267	260	273
	F O N L	675	465	397	421	355	561
	F O C M	382	366	429	476	472	514
	F O N L	732	853	1088	1261	1103	1078
	M O C M	616	489	426	470	298	462
Delinquent-2 P	M O C M	390	379	354	358	361	332
	M O L M	471	289	285	312	295	290
	F O C M	445	339	342	358	362	340
	M O C M	322	328	373	408	384	378
	M O L L	770	532	519	458	397	490
	M O N L	342	262	270	272	263	298
	M O N L	534	542	530	496	483	450
	M O N L	354	267	262	265	277	286
	F Y L M	627	501	541	566	468	579
	F O N L	318	335	330	315	344	318

Group	Subject Code	1	2-4	5-6	7-8	9-10	11-12
Delinquent-2 N	M Y N L	295	298	355	315	334	363
	M O N L	400	313	246	279	281	263
	M O N L	535	543	487	381	340	469
	M O C M	633	634	448	332	421	400
	M O C L	624	515	475	503	373	447
	M Y N L	620	597	471	435	506	580
	F O N L	440	462	367	360	398	415
	F O C M	352	349	430	396	431	454
	M O C M	368	317	311	348	343	333
	M O L L	568	537	490	566	519	571
Delinquent-2 B	M O C L	754	286	276	323	292	317
	M O C M	313	256	240	256	242	251
	M O L L	359	534	446	434	349	354
	M O C M	226	220	220	228	233	231
	M O N L	300	282	280	266	280	269
	M Y N L	338	347	365	396	448	381
	M O N L	629	675	568	599	557	520
	M Y N L	362	354	322	360	331	328
	F O C M	475	423	367	306	379	368
	M O C L	899	759	477	663	663	631

APPENDIX H

HOMOGENEITY OF VARIANCE

APPENDIX H

HOMOGENEITY OF VARIANCE

Normals

Base Rate

Group	Within-Cell SS	$F_{max}(F_{.95}(4,14) = 4.25)$
O	565326	2.90
P	487901	
N	194832	
B	260929	

Blocks 2-4

O	676337	10.73
P	342060	
N	128751	
B	63050	

Blocks 5-6

O	439324	14.18	
P	445903		$F_{O/N} = 2.43$
N	181083		
B	31436		$F_{N/B} = 5.76$

Blocks 7-8

O	503798	15.98
P	385859	
N	95668	
B	31526	

Delinquents-1

Base Rate

Group	Within-Cell SS	$F_{max}(F_{.95}(4,17) = 3.70)$
O	1852055	3.18
P	1152029	
N	582898	
B	703905	

Blocks 2-4

Group	Within-Cell SS	$F_{max}(F_{.95}(4,17) = 3.70)$
O	1751556	5.08
P	991386	
N	669608	
B	344552	

Blocks 5-6

O	1057896	1.98
P	644347	
N	533344	
B	546151	

Blocks 7-8

O	942153	2.13
P	717806	
N	633001	
B	441596	

Delinquents-2

Base Rate

Group	Within-Cell SS	$F_{max}(F_{.95}(4,9) = 6.31)$
O	261678	3.04
P	199006	
N	145545	
B	441920	

Blocks 2-4

O	393049	3.73
P	105306	
N	145768	
B	303325	

Blocks 5-6

O	545596	8.57
P	107456	$F_{N/B} = 1.78$
N	63650	
B	113171	

Blocks 7-8

Group	Within-Cell SS	$F_{max}(F_{.95}(4,9) = 6.31)$
O	739097	10.52
P	89620	
N	70289	
B	191727	

Blocks 9-10

O	601208	12.17
P	49406	
N	52606	
B	176408	

Blocks 11-12

O	458350	5.23
P	87861	
N	87677	
B	139008	