THE EFFECT OF TYPE OF REWARD ON THE OPERANT CONDITIONING OF EXTRAVERTS

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CHAPTER I

THE PROBLEM

Verbal operant conditioning (VOC) has been studied extensively in psychological laboratories since the mid 1950's when Greenspoon (1955) published the results of his doctoral dissertation. The study of this phenomena has produced many parameters that help account for the observed fact that humans will say certain words more frequently than other words when they are rewarded for saying these preselected words. In Greenspoon's study students were asked to randomly say words. Each time the student said a plural noun Greenspoon would say "mmm-hmm." After a period of time it was observed that the students were saying a greater percentage of plural nouns. Charles Taffel (1955) also observed that he could influence a subject's (S's) choice of pronouns with which he started a sentence by saying "Good" after the preselected pronoun was used. This type of learning is called verbal operant conditioning.

In this and other types of conditioning experiments, attempts have been made to determine what are the important variables that account for some Ss being conditioned more quickly than other Ss. H. J. Eysenck (1957, 1963, 1967, 1969) has proposed a theoretical learning paradigm to help account for differences in rates of conditioning between different Ss. He states that those Ss who are more introverted will condition quicker than will those Ss who are more

extraverted. His definition of extraversion-introversion has a biological basis to it, but he does not feel that the biological aspect will eventually account for all the individual differences in rates of conditioning.

> We would, therefore, be quite willing to admit the importance of differences in social reinforcement situations in producing different types of conduct; but we would also stress the importance of biological factors such as that degree of conditionability of the individual. We would postulate that both social and biological differences are essential to account for the observed phenomena (Eysenck and Rachman, 1965).

Eysenck not only feels that extraverts and introverts differ quantitatively in their ability to form conditioned responses, but also that they differ in the way they interact with others. He sees extraverts as being both more impulsive and liking people more than introverts. Therefore, the purpose of this study is to determine whether: (1) introverts do condition better than extraverts in a VOC task, regardless of the rewarding event, and (2) whether introverts and/or extraverts differ as to their reactions to types of rewarding stimuli.

CHAPTER II

REVIEW OF THE LITERATURE

Purpose

The studies on verbal behavior and the discoveries of important parameters that govern its functioning have important implications to the clinical, social, and experimental areas of psychology. Behaviorists have accepted verbal behavior as an entity that can be studied in its own right in order to determine the variables of which it is a function. The purpose of this study is to help further delineate three of the many variables that affect verbal behavior: those of personality, type of reward, and the social conditions under which the reward is administered.

Personality Factors

Personality and how it differentially effects conditioning has been widely studied. Various studies have used the personality measures of anxiety (Taffel, 1955; Daily, 1953), dependency (Rosenburg, 1959), approval (Crowne and Strickland, 1961), psychopathy (Johns and Quay, 1962; Bryan and Kapche, 1967), and introversion-extraversion (Eysenck, 1959; Franks, 1956, 1957; Halberstam, 1961; Goodstein, 1967; Laungani, 1968) as possible variables that might partially account for differences in conditionability.

The last factor, that of introversion-extraversion, has been ex-

tensively developed into a theory by H. J. Eysenck and his coworkers over the past three decades. Eysenck (Eysenck, 1957, in Eysenck and Eysenck, 1969, p. 50) proposed the formal hypothesis that "introverted people are characterized by strong excitatory and weak inhibitory potentials, whereas extraverted people are characterized by weak excitatory and strong inhibitory potentials." In 1965 Eysenck (Eysenck and Rachman, 1965, in Eysenck and Eysenck, 1969, p. 52) reformulated this hypothesis into:

> Introverts are characterized by a reticular formation, the activating part of which has a relatively low threshold of arousal while the recruiting part of it has a relatively high threshold of arousal; conversely, extraverts are characterized by their possession of a recticular formation whose activation part has a high threshold of arousal and whose recruiting (synchronizing) part has a low threshold of arousal.

These two statements say, in effect, that extraverts would be expected to form conditioned reactions more slowly and that these conditioned reactions should break down more quickly than those of introverts.

From these two statements and Eysenck's belief (Eysenck and Eysenck, 1969, p. 49) that "a large portion, possibly as much as three quarters of the total variance for differences between individuals with respect to extraversion...is due to hereditary factors," many investigations have delved into whether the dimension of extraversion accounts for a significant source of variance in conditioning situations. One of the earlier efforts to test Eysenck's hypothesis was by C. M. Franks. In his first experiment Franks (1956) was interested in whether conditioning was, in fact, associated more with introversion-extraversion than with neuroticism (or anxiety). In an eyeblink conditioning experiment Franks used three groups of Ss,

dysthymics (introverts), hysterics (extraverts), and normals (ambiverts). In a partial conditioning situation where the 30 reinforced trials were interspersed with 18 test trials, he found that the dysthymics gave significantly more conditioned responses than did the hysterics ($P \leq .005$) and extinguished significantly less than did the hysterics. The group of normals came between the dysthymic and the hysteric groups. Franks concluded that:

> These results would indicate very strongly...that conditionability is related to introversion-extraversion and not to neuroticism [or anxiety level], the extraverted subjects tending to condition much less well than the introverted ones. The results also suggest that manifest anxiety is related to strong conditionability only to the extent that anxious people are introverted.

In a second experiment Franks (1957) replicated these findings using a group of 60 normal male students who were grouped according to extraversion and introversion. In this experiment the correlation between conditioning and extraversion was -.46 (high extraversion is associated with low conditionability) while neuroticism correlated only .04 with conditionability.

In applying his own hypothesis to VOC, Eysenck (1959) selected 19 extraverts and 28 introverts from a population of 137 adults and asked them to make up sentences using one of three given verbs, one of which was a verb implying muscular activity. Each time the Ss selected the verb implying muscular activity they were reinforced by having the experimenter (E) say "Hm-mmm." Eysenck found that the introverts choose the reinforced verb significantly more often than did the extraverts. Gelfand and Windor (1961) in a similar study used female inpatients who were classified as either dysthymic or hysteric through

psychiatric evaluations to test the same hypothesis. These two groups did differ in the predicted direction on the amount of conditioning they showed when a flat, unemotional "good" was used as a verbal reinforcer.

Some investigators, however, have failed to find a significant relationship in other VOC studies when specifically testing Eysenck's hypothesis. Goodstein (1967), using as his measure of extraversion Guilford's Scale R, found that the introversion-extraversion dimension did not significantly differentiate between high and low conditionability in a sentence completion task. Using the Junior Eysenck Personality Inventory, Laungani (1968) chose to apply Eysenck's theory to secondary school children. Choosing those children one standard deviation above and below the population mean as extraverts and introverts, he used a sentence completion task with the reinforcement of "good," said in a flat, unemotional tone. He also did not find a significant difference in conditionability between extraverts and introverts.

Several studies related to the introversion-extraversion dimension and conditionability have been undertaken using criteria other than those derived from the various Eysenck questionnaires (the Maudsley Medical Questionnaire, the Maudsley Personality Inventory, the Eysenck Personality Inventory, and the Junior Eysenck Personality Inventory). Perhaps the most widely studied group of Ss that fit into this framework are the psychopaths. Several studies (Eysenck and Eysenck, 1969) have shown that, as a group, psychopaths are significantly more extraverted than is a group of unselected normals. It would then be predicted that psychopaths would show lower VOC scores when compared to

normal groups. As was found in the above quoted studies, the results have been mixed, with some studies showing support for the Eysenck hypothesis and some not.

Johns and Quay (1962) compared psychopathic military offenders to neurotic military offenders in a VOC task. Using a sentence completion task and the reward of saying "good" in a flat, unemotional tone, the authors gave 80 conditioning trials. They identified the psychopathic and neurotic groups through questionnaires, and used a total of 64 Ss. They found that the neurotic group conditioned while the psychopathic group did not show significant conditioning effects. Another study (Craine, 1969) used 48 psychopaths and 48 nonpsychopaths as the independent variable. He used a sentence construction task with a social reinforcer. His hypothesis was that psychopaths would show a greater insensitivity to the social reinforcement by forming significantly fewer conditioned responses. Positive results were obtained.

Some studies have contradicted these results, one which used a verbal reinforcer and another used both verbal and monetary reinforcement. In a study comparing nonneurotic psychopaths and nonpsychopathic neurotics, Bryan and Kapche (1967) used the reinforcers "good" and "mmm-hmm" and a sentence construction task. Both of the experimental groups showed significant conditioning effects. There were no significant differences between the number of conditioned responses emitted by these two groups.

Benard and Eisenman (1967) also studied sociopaths (psychopaths). Their groups consisted of 40 female prisoners and 39 student nurses. The conditioning task was to construct sentences using a pronoun as

the first word in the sentence. Each time the S used "I" as the pronoun she was given a reinforcement. There were four reinforcement conditions, with a total of 60 conditioning trials: Condition 1 was a verbal reward of "good;" Condition 2 was a verbal reward of "good" for the first 30 trials and a nickel reward for the second 30 trials; Condition 3 consisted of only nickels being used as the reward; Condition 4 used a nickel as the reward during the first 30 trials and the verbal reward of "good" during the last 30 trials. An analysis of variance showed that under all the reward conditions combined, the sociopaths conditioned significantly more than did the normals. Further, there was a significant group by reward condition interaction which revealed that social reinforcement was significantly more effective than the monetary reinforcement in the conditioning of the sociopaths.

Thus the effect of personality on VOC is a complex one, with contradictory results being obtained even when similar groups of Ss have been studied. Yet none of the studies seem to test Eysenck's hypothesis by using clearcut groups of extraverts and introverts. They have not used well defined, more extreme groups of introverts and extraverts where Eysenck's hypothesis would be validly tested. They also did not select their experimental groups strictly according to Eysenck's criteria in many of the cases. The studies reviewed here also show that variability in the reinforcement used in the conditioning situation could possibly be a very relevant factor.

Reward Effects

In 1955 two studies were published in the area of VOC that really started serious investigations of the effects of rewards. Both had as part of their investigation the effects of reinforcement in this area of conditioning. Joel Greenspoon (1955) found that he could get students to say significantly more plural nouns in a free responding situation if he said "mmm-hmm" after each plural noun they spoke. Charles Taffel (1955) introduced a different type of experimental task to study the effects of type of reinforcement. In this task the S was presented with cards, serially; on each card was printed, in random order, the pronouns I, We, She, He, You, They, and a verb. Each trial consisted of the S making up a sentence choosing one of the pronouns as the first word and the verb as the second word in the sentence. After each sentence in which the S used the pronouns I or We, he was given a reinforcement. Taffel used a verbal "good" spoken in a flat, unemotional tone and a light turned on for 0.5 seconds as the two reinforcers. He found that Ss would choose I or We significantly more when followed by the verbal reinforcer, but did not when given the light as a reinforcer. These two tasks proved to be well suited to experimental use in the study of VOC, and one or the other or a variation of either has been used in much of the research in this area since.

In a study to determine the reinforcing properties of objects, Kanfer and Matarazzo (1959) studied the difference between secondary and generalized reinforcers in a learning task. For all the groups of female Ss he used poker chips as a token reward. Their control group

received only the poker chips, which were valueless. The secondary reinforcement group was subdivided into three subgroups. Each of these subgroups was given, without a choice on their part, only one of the following in exchange for the earned poker chips: cigarettes, candy, or hand lotion. The generalized reinforcement group received their choice of cigarettes, candy, or hand lotion for the poker chips which they earned. The results of this experiment showed that, as predicted, the generalized reinforcement group did perform better, but not significantly better, than did the secondary reinforcement group. Both of these groups performed significantly better than the control group. This study suggests that the reinforcement value for initially valueless objects is dependent upon the S's experience with those objects.

Buss, Gerjuoy, and Zusman (1958) studied the effects of verbal and nonverbal reinforcers in a VOC task of the Taffel type. The three groups in their experiment were: (1) reinforcement by saying "good," (2) reinforcement by being given a poker chip that could be exchanged for candy or cigarettes, and (3) reinforcement by being given a poker chip that was returned at the end of the experiment for nothing (the control group). They found that the control group did not condition. The other two groups did condition and there were no significant differences between these two groups and the amount of conditioning they showed.

In several studies cited in the previous section it was shown that different experiments have found that psychopaths and normals or nonpsychopaths have responded somewhat differently to social reinforcement and to monetary, or nonverbal reinforcement. It was diffi-

cult to assess whether the effects of psychopathy interacted with the amount of conditionability or to the reinforcement used in the conditioning situation, or to both. If Eysenck's theory is useful, then one hypothesis would be that the psychopaths (extraverts) were, overall, less conditionable. However, Eysenck describes the behavior of extraverts and introverts differently. He states (Eysenck and Eysenck, 1968, p. 6):

> High E scores are indicative of extraversion. High scoring individuals tend to be outgoing, impulsive and uninhibited, having many social contacts and frequently taking part in group activities.
>
> The typical extravert is sociable, likes parties, has many friends, needs to have people to talk to, and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment and is generally an impulsive individual. He is fond of practical jokes, always has a ready answer, and generally likes change. He is carefree, easy-going, optimistic, and likes to "laugh and be merry." He prefers to keep moving and doing things, tends to be aggressive and to loose his temper quickly. His feelings are not kept under tight control, and he is not always a reliable person.
>
> The typical introvert is a quiet, retiring sort of person, introspective, fond of books rather than people; he is reserved and distant except to intimate friends. He tends to plan ahead, "looks before he leaps" and distrusts the impulse of the moment. He does not like excitement, takes matters of everyday life with proper seriousness, and likes a well-ordered mode of life. He keeps his feelings under close control, seldom behaves in an aggressive manner, and does not loose his temper easily. He is reliable, somewhat pessimistic, and places great value on ethical standards.

This quote suggests that introverts and extraverts will react differently to social reinforcing stimuli. In the book Personality Structure and Measurement, Eysenck (1969) puts forth the hypothesis

that "the introvert does not care for people, would rather be alone, but if need be can effectively take part in social situations...(p. 69)." Further, he says that the "extravert...is a person who enjoys social intercourse with people as opposed to the introvert who does not enjoy social intercourse with people (p. 72)." Eysenck then goes on to explain that the stable introvert is not a person who is socially shy or actively avoids people, but is one who, when given a choice, would rather be alone or in the company of a few, very close friends.

These quotes indicate that perhaps extraverts might find social stimuli more rewarding than nonsocial stimuli, while introverts would not be so differentially affected by the sociability or the proffered reward. Gray (1970) comes to the same conclusion, but from a different viewpoint. He sees the main differences between extraverts and introverts as differences in their reaction to aversive stimulation, and that they should thus be differentially sensitive to social rewards:

> His [the extravert's] greater liking for people can be understood if we recall that people are the most important dispensers of both rewards and punishments for other people; therefore, those who are less sensitive to punishment [extraverts] are more likely to seek them out.

Social Conditions

All verbal reinforcement that was used in the studies cited above has been composed of at least two possible separate factors. The first factor is the actual words spoken. The second factor is that a person was present to speak the words. Studies with children (Gewirtz and Baer, 1958a, 1958b; Hill and Stevenson, 1970) have shown that the

effectiveness of social reinforcement (verbal reward plus the person giving it being visually present) is in part dependent upon whether the Ss were in a socially isolated or satiated preexperimental condition. It was found that Ss responded more to social reinforcement following a deprived precondition than following a satiated precondition. Gewirtz and Baer (1958b) investigated the effects of social deprivation and satiation on the reinforcing properties of social reinforcement. They concluded that a possible confounding factor with children was the visual presence of E when the verbal reinforcement was given. Hill and Stevenson (1970) controlled this factor in a conditioning task with six year olds by having the verbal reinforcement delivered when E was present for one group and with E absent for another group. They found that conditioning was increased when E was present than when E was absent. No studies were found with adults that tried to experimentally manipulate this variable. The previously cited experiments showed that conditioning took place when E was present and delivered the reward. One study with adults did show that E being present was not a necessary factor for conditioning to occur.

Bates (1968) employed an IBM 1620 computer to administer a Taffel type conditioning experiment. He used 60 college freshmen, dividing them into three groups. For group one (Rf), each time the S typed a sentence into the computer beginning with "I" or "We," the computer typed the word "good" below the S's sentence. For group two (R), the computer emitted the message "Your response falls into group 'X'" to I-We sentences; all other sentences received the typed message "Your response falls into class 'Y'." The third group (RR) obtained the message "Good--Your response falls in class X" for all the I-We sen-

tences, and "Not too good--Your response falls in class Y" to all other sentences. The results indicated that Ss from the Rf and RR groups conditioned while those in the R group showed no conditioning. This example indicates that conditioning by the use of "Good" given without a human being present is possible.

Thus the final variable in this research is that of the social conditions under which the reinforcement is given. If this variable is a significant factor in the conditioning situation, it is hypothesized that it will affect the extraverts more than the introverts.

CHAPTER III

METHODOLOGY

Introduction

The chapter on methodology is divided into the following areas: Subjects; Independent Variables; Dependent Variables; Experimental Conditions; Experimental Design; and Hypotheses.

Subjects

The Ss were 17 and 18 year old 12th grade students from Lawrence High School, Lawrence, Kansas. Seniors in high school were selected in order to control for effects of age, education, and being test-wise. The 96 Ss used in the experiment were selected from a group of 316 students taking courses in psychology, economics, government, and constitution. These 316 students were given the Eysenck Personality Inventory. There were 12 other students who were not included in this group. These students failed to either complete the EPI or left their name off the EPI, thus indicating their unwillingness to participate.

The mean and standard deviation of this group on the extraversion scale was 13.59 and 3.92 respectively. The mean and standard deviation reported by Eysenck (Eysenck and Eysenck, 1968) of 1003 college students on the extraversion scale was 13.1 and 4.1 respectively. The mean and standard deviation of the high school students on the neutoticism scale was 11.53 and 4.46, respectively, while for Eysenck's college sample it

was 10.9 and 4.7. An F-test showed that the variances of the high school population and the college norm group on the extraversion ($F = 1.10$, $P > .05$) and the neuroticism ($F = 1.05$, $P > .05$) scale were not significantly different. A t-test between the extraversion means of the high school and the college sample showed they were not significantly different ($t = 1.86$, $P > .05$), while a t-test between the same groups' means on the neuroticism scale was significant at the .05 level ($t = 2.10$, $P < .05$), showing that the high school students were higher on the neuroticism scale than were the college students. Eysenck stresses that his extraversion and his neuroticism dimensions are orthogonal ones (noncorrelated). The correlation between the neuroticism and the extraversion scores of the high school students was -0.04, a correlation that is not significantly different from zero.

The highest (extraverts) and the lowest (introverts) 20 percent of the students on the extraversion dimension were selected to be the subjects for the experiment. Thus, the criteria for their inclusion in the experiment became an extraversion score of ≥ 17 or ≤ 10. An additional criteria of a neuroticism score of ≤ 16, and a lie score of ≤ 4 was included. The criterion for the neuroticism score was made to delete the extreme scores on this dimension (greater than on standard deviation above the mean). The lie scale criterion was included to delete those Ss who were answering the inventory from a social desirability viewpoint. There were 47 females and 49 males that met this criteria and consented to be included in the research. None of the 96 Ss selected were excluded from the final experiment and all were cooperative with the E.

Independent Variables

Three independent variables were involved in this experiment. The first independent variable was the S's score on the extraversion dimension. This was determined by the Eysenck Personality Inventory (EPI). The EPI (Eysenck and Eysenck, 1968) is an outgrowth of H. J. Eysenck's research into the orthogonal personality dimensions of extraversion and neuroticism. This is a refinement of an earlier inventory, the Maudsley Personality Inventory. The EPI allows the two dimensions of personality to be measured through the S's answers to 48 questions answered Yes or No as they apply to the particular S. Each dimension of personality correlated highly with its counterpart on the Maudsley Personality Inventory, does not correlate with intelligence, and has retest reliability of 0.85 after several months. The EPI includes a nine item Lie scale that measures those Ss answering according to a 'desirability response set.' The EPI is a paper and pencil test and takes 10 to 15 minutes to complete.

The second independent variable was the type of reward administered for conditioning. Half of the Ss received the verbal reward "good" spoken in a mildly positive manner by E when each S had responded correctly. The other half of the Ss were given one penny after each correct response. The pennies were delivered by E into a glass cup that was situated in front and to the right of the S.

The third independent variable was the visual social situation in which the experiment was conducted. For half of the Ss in all the groups the E was sitting in front of him in full view. For the other half, the E was hidden behind the experimental apparatus. This allowed

for manipulation of the social conditions of the offered reward and its effects upon the conditioning of the extraverts and the introverts.

There were, then, eight experimental groups. These were: extraverts - E present - verbal reward; extraverts - E present - monetary reward; extraverts - E absent - verbal reward; extraverts - E absent - monetary reward; introverts - E present - verbal reward; introverts - E present - monetary reward; introverts - E absent - verbal reward; and introverts - E absent - monetary reward.

Dependent Variable

The response that was rewarded with each S was a sentence (see the next section) that began with either "I" or "We." Each sentence constituted a single trial. The S's response was recorded and for statistical purposes the responses were arranged into blocks of consecutive trials. Each block consisted of 20 consecutive trials and there were a total of 120 trials for each S. Thus for each S there were six scores corresponding to the six blocks.

The first block of 20 trials represented the basal operant level where a measure of the free response of each S's tendency to say "I" and "We" was taken. The next three blocks of 20 trials each were the conditioning blocks where the reward was delivered after each "I" or "We" response. This gave a measure of the amount of operant conditioning that took place. The final two blocks were done without any rewards being administered. This gave a measure of the experimental extinction.

Experimental Conditions

One week after taking the EPI the selected Ss participated in the experiment. Each S was brought into the experimental room individually and seated at the table. The room consisted of a plain wooden table, two chairs on opposite sides of the table and a partition that divided the table into two sections (see diagram in Appendix A). The partition was constructed so that it allowed the E to either be seen by the S from the waist up or to remain out of his vision during the experiment. The partition contained a holder in the lower center part in which the stimulus cards were placed. To the right of the card holder was a glass cup that was available to hold the monetary reward when it was given.

The conditioning cards consisted of 120 three inch by five inch plain index cards on which the following was printed: on a line, centered one-third the way down from the top was printed a single verb in the past tense. The verbs used were selected from the study by Dixon and Dixon (1964). Each verb had a neutral or a positive impression value, and there were 120 different verbs used (see Appendix B for the list of verbs used). On a line, centered two-thirds the way down from the top were the pronouns I, We, He, She, You, They. These six pronouns were arranged in a randomized order from card to card so that no two cards had the same order of pronouns. These cards were presented, one at a time, in a random order to each S, the cards being shuffled before presentation to the next S.

After each S entered the experimental room and was seated, the E read the following instructions:

> I am interested in how high school students make up sentences. In front of you in this card holder you will be shown different cards, one at a time. On each card on the bottom line there are six pronouns. Above the pronouns is a single verb. I want you to make up a sentence as quickly as you can, aloud, using one of the pronouns as the first word in your sentence and the verb as the second word in your sentence. It does not matter if your sentence is long or short. I just want you to make up a complete sentence as quickly as you can, without thinking about it. Do you have any questions? /If there were any questions, the pertinent part of the instructions were reread./

After the first 20 cards had been presented, the following instructions were given (changed as shown with parenthesis where appropriate to the particular reward condition):

> That was fine. Now, each time you are right, I will indicate it by saying "good." (indicate it by dropping pennies into the cup which you may keep.) Remember, you are to say each complete sentence as quickly as you can after I present each card.

After each card was presented the appropriate reward was administered during the conditioning phase if the S started his sentence with "I" or "We" and all the responses were recorded. The next card was presented either after the reward was given or, if another pronoun was used, after the sentence ended. This continued until the next 60 cards were given. After that, all rewards were withheld for the rest of the experiment. Each card was presented in order, with no apparent distinction between the trial blocks except where it was noted in the second part of the instructions.

After the 120 cards were given, several questions were asked each S to make sure they did not see the reward as having an effect opposite to that anticipated. After the answers were recorded, the purpose of the experiment was explained, all questions answered, and the S was

dismissed with the request that he not discuss the experiment with anyone. As far as it could be ascertained, none of the students knew what was going to happen in the experiment before hand. All the Ss reported that they either found the reinforcement rewarding or claimed they felt neutral about it.

Experimental Design

This experiment was a three factor or 2 x 2 x 2 design, with two levels of extraversion, two types of reward, and two social conditions in which the reward was administered. A fourth factor, that of the effect of blocks was also considered, but as a repeated measure of each subject. The blocks were divided into three parts, the initial operant level, the acquisition stage, and the extinction stage.

Hypotheses

The following hypotheses were formulated for testing:

1. All Ss will condition.
2. Introverts will condition more than will extraverts, regardless of the rewards used or the social situation.
3. Introverts will extinguish less than will extraverts, regardless of the rewards used or the social situation.
4. Extraverts will condition better to verbal reward than to monetary reward.
5. Extraverts will condition better when E is present than when E is absent.
6. Introverts will not differ in the number of conditioned responses formed depending upon the type of reward or the social condition.

CHAPTER IV

RESULTS

The Experimental Groups and Their Basal Response

There were four groups of introverts and four groups of extraverts: E present, verbal reward; E present, monetary reward; E absent, verbal reward; and E absent, monetary reward. Each group had 12 Ss. The introverts and the extraverts were chosen by taking the highest and lowest 48 Ss on Eysenck's extraversion dimension, and deleting those Ss who scored higher than 16 on the neuroticism scale or who scored higher than four on the lie scale.

Each S was randomly assigned to one of the four treatment groups of the extraverts and of the introverts. An analysis of variance (AOV) was performed on all eight groups on their neuroticism scores and is reported in Table I. This AOV shows that the neuroticism scores were not significantly different from each other from experimental group to experimental group. Significance in this report means occuring at a chance probability of 0.05 or less.

As was stated in the Methods chapter, six scores were obtained from each S, corresponding to the block scores. The first block score was a measure of the initial operant level of each S for starting his sentences with "I" or "We." The next three block scores constituted, respectively, the first, second, and third conditioning blocks, where

each S was given the appropriate reward each time his sentence was started with "I" or "We." The final two block scores represented, respectively, the first and second extinction blocks, during which all reinforcement was withheld. The average scores of all eight of the experimental groups over all six of the blocks is found in Figure 1, page 24.

TABLE I

AOV ON NEUROTICISM SCORES FOR ALL EIGHT GROUPS

Source	d.f.	Sum of Squares	Mean Square	F
Between Groups	7	86.49	12.36	1.058 *
Error	88	1027.92	11.68	
Total	95	1114.41		

* P>.05

An AOV was performed on the block scores of the initial operant level for all the Ss and is found in Table II. As this AOV shows, the initial operant level was not significantly different for the extraverts and the introverts. It also did not differ depending upon whether the E was present or absent. Finally, there were no interaction effects between the extraversion dimension and the social conditions of the experiment. Thus it can be assumed that all eight groups started at the same basal operant level in the conditioning

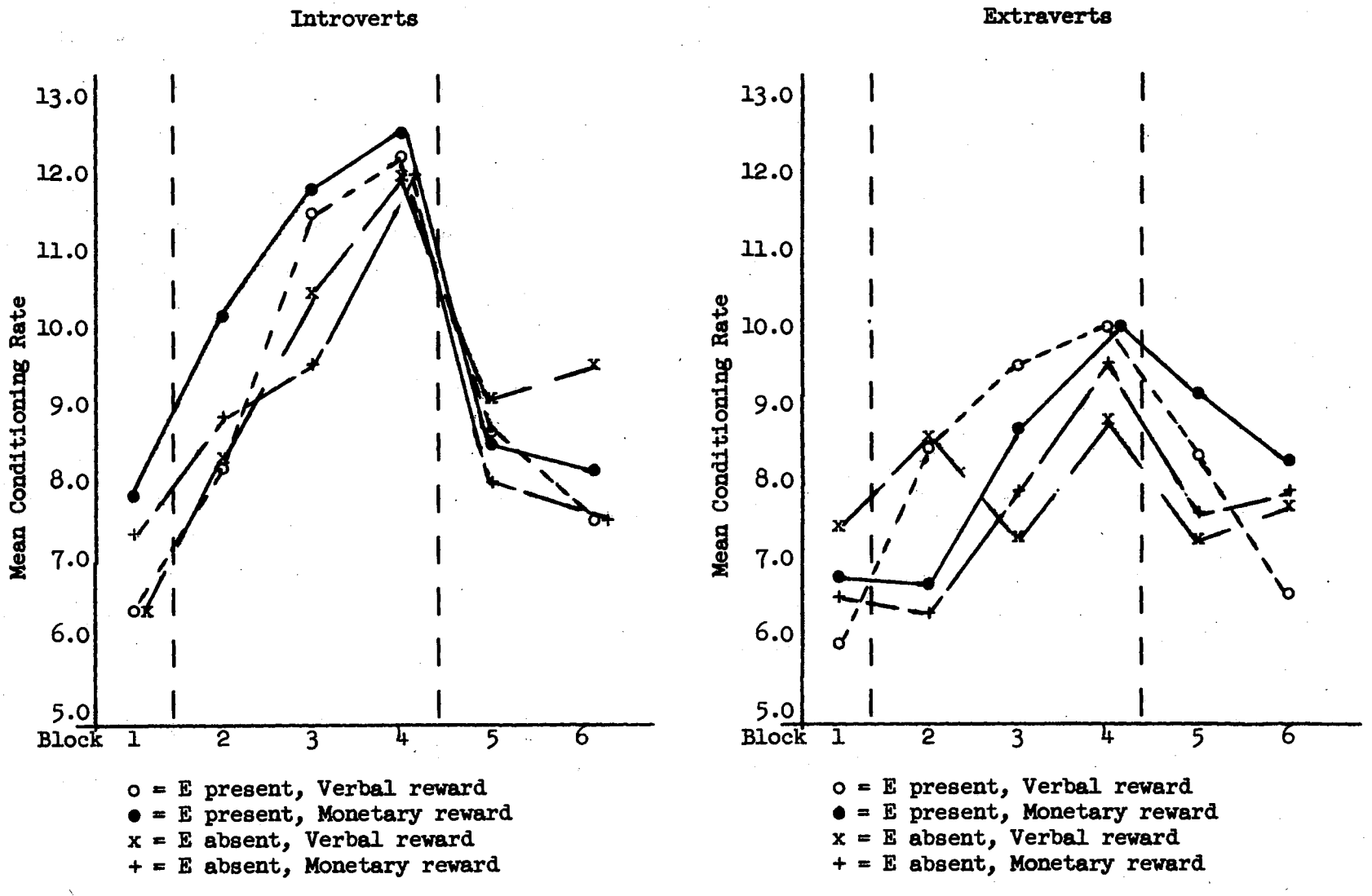

Figure 1. Group Data over the Six Blocks

experiment.

TABLE II

AOV ON INITIAL OPERANT LEVEL SCORES

Source	d.f.	Sum of Squares	Mean Square	F
A (extraversion)	1	2.66	2.66	<1
B (social condition)	1	.66	.66	<1
A x B	1	5.04	5.04	1.068 *
Error	92	434.25	4.27	
Total	95	442.61		

* P>.05

The Conditioning Phase

The conditioning data was analyzed by an AOV design for a four factor mixed with repeated measures on one (Kirk, 1968, p. 296). This design allowed for three factors between subjects and one factor, repeated, within subjects to be analyzed simultaneously.

The AOV on the conditioning blocks is presented in Table III, on page 26. The significant sources of variation as shown by this AOV are accounted for by the extraversion factor, the block factor, and the interaction effect between extraversion, blocks, and type of reward. All other sources of variation were not significantly different

TABLE III

AOV ON CONDITIONING BLOCKS

Source	d.f.	Sum of Squares	Mean Square	F
A (extraversion)	1	351.12	351.12	13.035 **
C (social conditions)	1	53.39	53.39	2.023
D (reward type)	1	.89	.89	<1
AC	1	.02	.02	<1
AD	1	17.02	17.02	<1
CD	1	.89	.89	<1
ACD	1	10.11	10.11	<1
Ss within groups	88	2322.34	26.39	
B (blocks)	2	346.80	173.40	28.996 **
AB	2	21.52	10.76	1.799
BC	2	19.80	9.90	1.656
BD	2	5.67	2.84	<1
ABC	2	2.54	1.27	<1
ABD	2	48.42	24.21	4.048 *
BCD	2	4.95	2.48	<1
ABCD	2	3.17	1.59	<1
B x Ss within groups	176	1052.50	5.98	
Total	287	4261.15		

* $P < .05$

** $P < .01$

from chance.

The significant main factor of extraversion indicated that when all the scores of all the reward and social condition groups were pooled under the extraverts and the introverts, there was a significant difference ($P<.01$) between the number of conditioned responses the introverts gave and the extraverts gave. A Newman-Keuls test of means (Kirk, 1968) showed that as a whole the introverts gave significantly more conditioned responses than did the extraverts. The mean of the introverts was 10.66 over the three conditioning blocks while the mean for the extraverts was 8.45 over the three conditioning blocks ($P<.01$ for this difference).

The significant block effects shown in Figure 2 was also analyzed by the Newman-Keuls multiple comparison of means. This block effect combines all the Ss' scores together within each block. The Newman-Keuls test showed that the number of conditioned responses emitted during the first conditioning block (8.20) was significantly less than ($P<.01$) those in the second conditioning block (9.58). Further, the conditioned responses emitted in the second conditioning block were significantly less than ($P<.01$) the number of conditioned responses given in the third conditioning block (10.88).

Finally, there was a significant interaction between extraversion, blocks, and type of reward which is shown in Figure 3. Each of the means compared with this interaction combined all the Ss together who were originally grouped separately according to the social conditions of the administration of the reward. This left 24 Ss in the following groups: introverts with verbal reward; introverts with monetary reward; extraverts with verbal reward; and extraverts with monetary re-

ward. Each of these groups were looked at over each of the three conditioning blocks. The significance of this interaction only said that at least one of the means was different from the others. Therefore, a Newman-Keuls multiple comparison of means was done on the 12 means in this interaction. The results of this comparison are found in Table IV, on page 30.

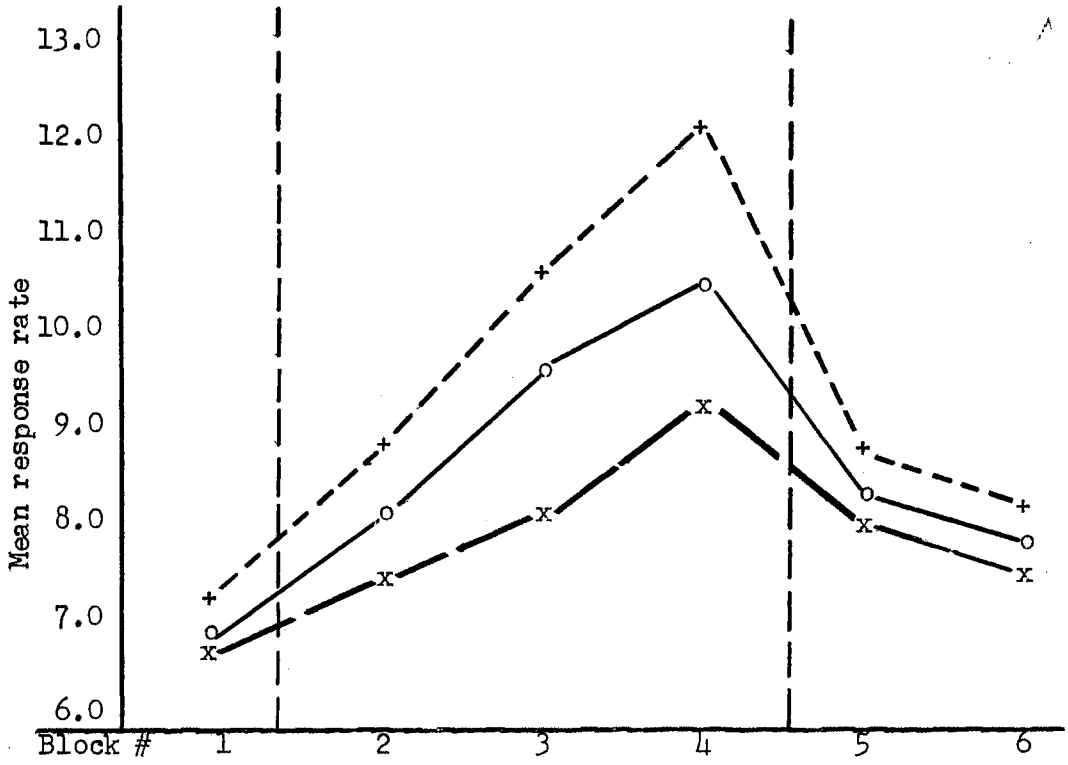

Figure 2. Mean Data for Extraverts, Introverts, and Total Sample

There were no significant differences in conditioning between the introverts and the type of reward they were given in the first, second, or third conditioning blocks. The introverts did show significant increases in conditioned responses from the first conditioning block to the third one.

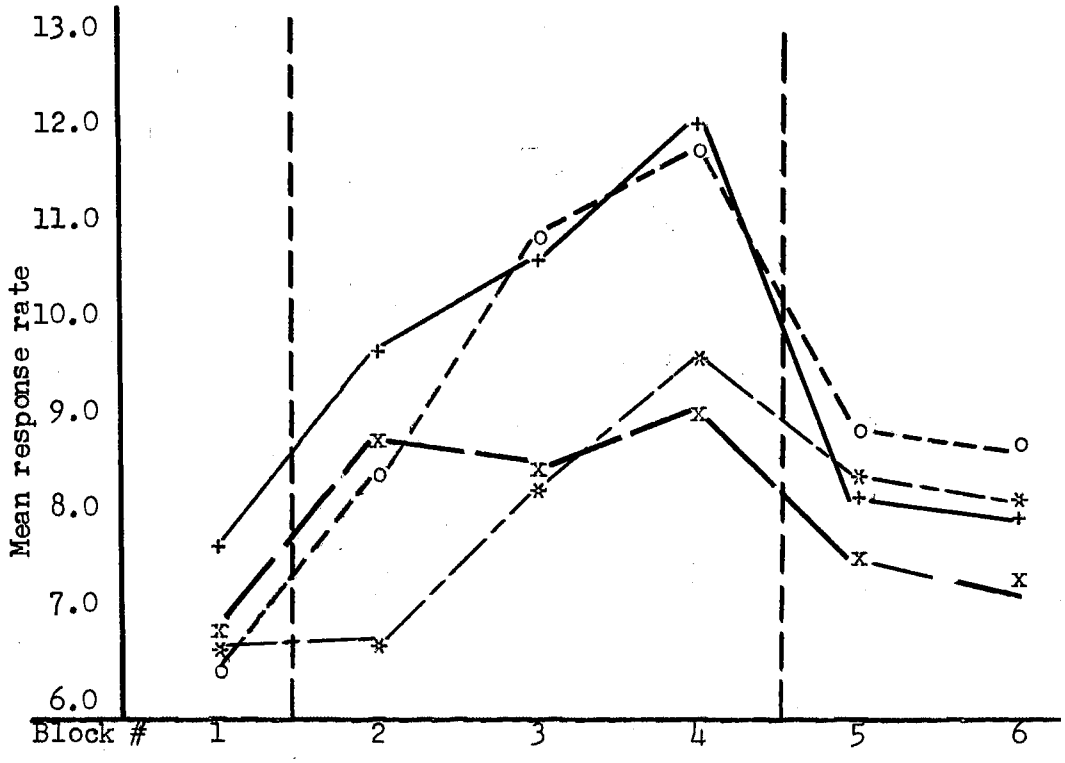

Figure 3. Mean Data for the Extraversion x Block x Reward Interaction

TABLE IV

NEWMAN-KEULS TEST ON THE INTERACTION BETWEEN EXTRAVERSION, BLOCKS, AND REWARD

ijk	111	112	113	211	212	213	221	222	223	121	122	123
111	--											
112	*	--										
113	*		--									
211		*	*	--								
212		*	*		--							
213			*			--						
221	*	*	*	*	*	*	--					
222		*	*				*	--				
223			*				*		--			
121			*				*			--		
122	*			*	*		*	*			--	
123	*			*	*	*	*	*	*	*		--

Key: ijk = Mean of group ijk

i = Extraversion: 1 = introvert; 2 = extravert

j = Reward: 1 = verbal; 2 = monetary

k = Blocks: 1 = 1st condition block; 2 = 2nd condition block; 3 = 3rd condition block

* Shows that the two means are significantly different from each other at or beyond the 0.05 level. Numerical scores for the means can be found in Appendix C.

In the first conditioning block for the extraverts, the extraverts who were under monetary reinforcement produced significantly fewer conditioned responses than the extraverts under verbal reward. There were no significant differences between the rest of the extravert groups.

This interaction between extraversion, blocks, and reward also reveals that in the first conditioning block there were no significant differences as a whole between the introverts and the extraverts in the frequency of conditioned responses emitted. However, by the second conditioning block as well as in the third conditioning block the introverts, no matter what type of reward they were being given, were producing a significantly greater number of conditioned responses than were the extraverts. And even though all the groups continued to give more conditioned responses from the second to the third conditioning block, none of these increases for either the introverts or for the extraverts were statistically significant.

The Extinction Phase

An analysis of covariance (AOC) (Winer, 1962) was used to analyze the extinction data. In this AOC the scores in the last conditioning block were used as the covariate. In the last block of the conditioning phase only the extraversion main effect accounted for significant differences in the number of conditioned responses emitted by the 96 Ss. Therefore, all the scores previously grouped under the two types of reward and the two social conditions were pooled under each of the extraversion groups. The results of this AOC are shown in Table V, page 32. As this AOC shows, the main effect of extraversion did not

account for a significant part of the covariance. Neither was there a significant block effect nor a significant interaction between extraversion and blocks.

TABLE V

AOC ON THE EXTINCTION PHASE

Source	d.f.	Sum of Squares	Mean Square	F
A (extraversion)	1	11.43	11.43	<1
Ss within groups	93	1019.17	11.72	
B (blocks)	1	10.08	10.08	2.84
AB	1	.19	.19	<1
B x Ss within groups	93	330.73	3.55	
Total	189	1442.60		

CHAPTER V

DISCUSSION OF THE RESULTS

Introduction

This chapter is divided into two sections. The first section deals with the results of the experiment as they relate to the six hypotheses presented at the end of Chapter III. In the second section other conclusions that this data might suggest are presented along with possibilities for further research.

The Hypotheses

Hypothesis 1: All Ss will Condition

This hypothesis was well supported by the data. The block factor in the conditioning AOV was significant, showing significant increases for the pooled Ss from the first to the second to the third conditioning blocks. Further, the significant interaction factor of extraversion by block by type of reward showed that for three of the four groups, the third conditioning block was significantly higher than the first one, again indicating that conditioning took place. The only group for which this was not true was the extraverts under verbal reward. Yet their higher level of response (greater than 2.5 average responses per block) from their initial operant level to the third conditioning block indicates a great increase of conditioned responses

for this group also. The reason that this was not picked up in the interaction effect was, then, because their initial high response to verbal reward was not carried on with an even higher level of responding later.

Hypothesis 2: Introverts will Condition more than will Extraverts, Regardless of the Rewards Used or the Social Condition

This hypothesis was confirmed in the statistical analysis. The significant main effect of extraversion showed that, as a group, the introverts gave significantly greater number of total conditioned responses than did the extraverts. The interaction between extraversion, blocks, and type of reward allowed further delineation of this significant result. In the first conditioning block both of the introvert groups and the extraverts who were given verbal reward were not significantly different from each other, while all three gave significantly greater conditioned responses than the extraverts who were given monetary reward.

By the second conditioning block the picture had changed somewhat. The introverts were not responding differentially to the reward conditions, nor were the extraverts. This equality of response to the type of reward carried on into the third conditioning block for both the introverts and the extraverts. Further, in both the second and the third conditioning blocks, the introverts were giving significantly greater conditioned responses than were the extraverts. This is dramatically shown in Figure 3.

Hypothesis 3: Introverts will Extinguish less than will the Extraverts, Regardless of the Rewards used or the Social Conditions

This hypothesis was not confirmed at the .05 level as Table V indicated. As Figure 2 showed, the introverts did give more conditioned responses during both blocks of extinction. Yet Figure 3 partially explains why this was not a significant difference. While the introvert with verbal reward group gave a larger number of conditioned responses during extinction than did the extravert with verbal reward group, the introvert and extravert with monetary reward group were almost identical in their extinction responses in both blocks of the extinction phase.

Hypothesis 4: Extraverts will Condition Better to Verbal Reward than to Monetary Reward

The graphical representation of this hypothesis is found in Figure 3. The Newman-Keuls multiple comparison of means showed that this hypothesis was confirmed at the .05 level for the first conditioning block. In this block the extraverts with verbal reward showed significant conditioning effects while the extraverts with monetary reward did not. However, by the second and third conditioning blocks, these differences were negligible.

Hypothesis 5: Extraverts will Condition Better when E is Present than when E is Absent

Figure 4, page 37, depicts this hypothesis. Although this hypothesis was not supported at the .05 level of significance, Figure 4

shows that extraverts did give more conditioned responses when the E was present than when the E was absent. However, the introverts also showed more conditioning, though not significantly more, with E present than with E absent. The striking aspect about Figure 4 is that all the mean conditioning scores for the extravert by E absent by block groups are less than those for the extravert by E present by block groups. These are also less than the mean conditioning scores for the introverts by E absent by block groups, and these are less than the introverts by E present by block groups. The possible significance of this interaction will be discussed in the Discussion section.

Hypothesis 6: Introverts will not Differ in the Number of Conditioned Responses Formed, Depending Upon the Type of Reward or the Social Conditions

This hypothesis was supported. Figure 3 clearly shows that introverts did not differ significantly in the number of conditioned responses formed depending upon the type of reward they received. Figure 4, however, shows that the introverts reacted much like the extraverts to the difference in social conditions. They formed more conditioned reactions, but not significantly more, when the E was present than when the E was absent. This occurred in all three of the conditioning blocks.

Discussion

This experiment thus shows that part of Eysenck's hypotheses were substantiated, i.e. the introverts did condition better than did the extraverts. However, the introverts did not show a greater resistance

to extinction than did the extraverts. Eysenck bases his theoretical framework on a biological duality of cortical excitatory and inhibitory mechanisms. He hypothesizes that extraverts have a stronger inhibitory mechanism and/or a weaker excitatory one than do the introverts. While the extinction data does not bear out this duality hypothesis, the conditioning data might.

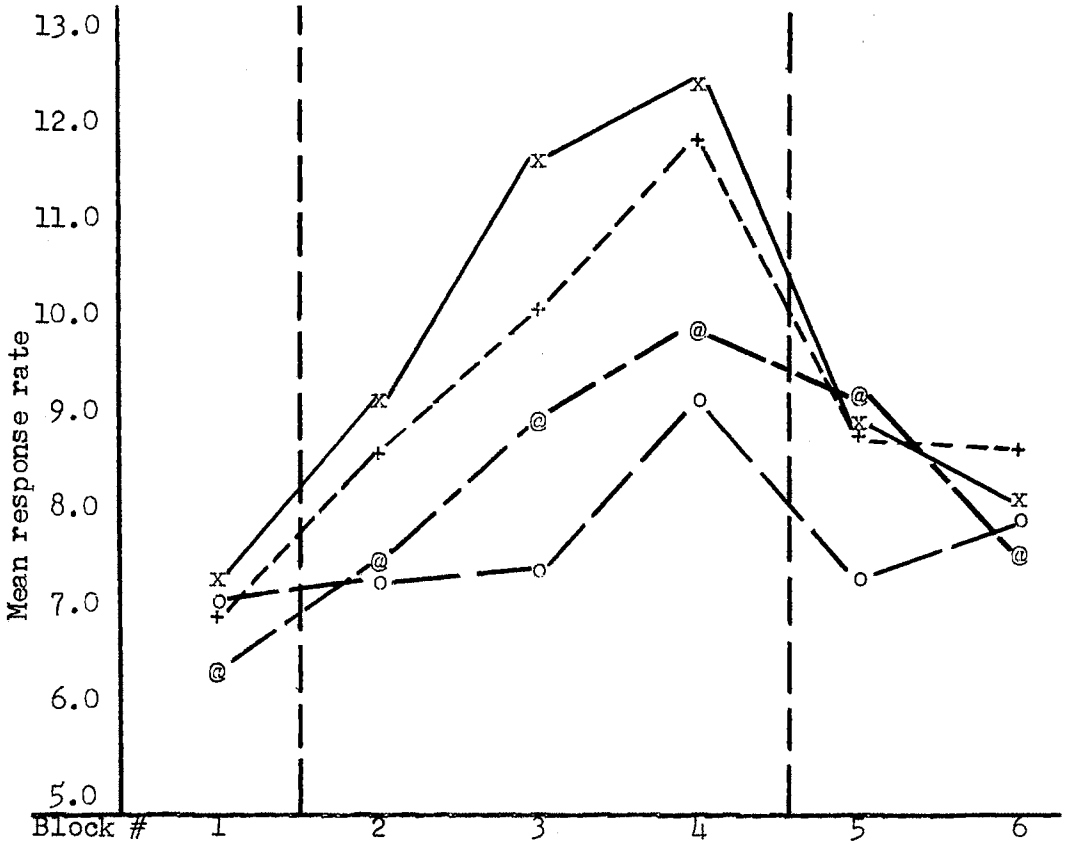

Figure 4. Mean Data for the Social Condition by Block Interaction

The significant interaction effect between extraversion, blocks, and type of reward shows a steady increase of conditioned responses for the introverts. Thus no major accumulation of inhibition appears to be at work in this group, the introverts do seem to have a strong level of excitation. For the extraverts, however, the major part of their conditioning seems to take place within the first block of conditioning trials to which they respond (the first conditioning block for the verbal reward group and the second conditioning block for the monetary reward group). After this initial response, the extraverts do not seem to continue their increase of conditioned responses to the same degree as the introverts do. One explanation for this would be that an inhibitory mechanism did come into play that retarded the already weaker excitatory process. Just such an explanation (Eysenck, 1967) is used to account for fewer conditioned responses being formed in extraverts and is also used to explain involuntary rest pauses in vigilance tasks as a consequence of an accumulation of inhibition. However, it is difficult to tell from this data whether the extraverts reacted less strongly because of an increase in inhibition, a decrease in excitation, or both. Thus while this study supports Eysenck's hypothesis, it does not help delineate between his notion of excitation and inhibition.

A three factor with repeated measures AOV was run on only the extinction data. The results of this AOV are found in Appendix D. The only significant source of variation was accounted for by the social conditions by block interaction. This interaction pooled together all those Ss who were extinguished with the E present and compared them with those Ss who were extinguished with the E absent. A Newman-Keuls multiple comparison of means showed that there were no significant dif-

ferences within each extinction block between these two groups. However, it was shown that those Ss for whom the E was present showed a significant decline in responses from the first to the second extinction block (a mean decline of 1.06 responses, $P<.05$). Those Ss for whom the E was absent during the extinction phase increased their mean response rate by 0.14 responses ($P>.05$) from the first to the second extinction block. The conditioning data reveals that, although the extraversion by blocks by social conditions interaction is not significant, for both the introverts and the extraverts greater conditioning was obtained when the E was present. Eysenck (1967) is unable to adequately deal with these findings. He suggests that if the E being present caused an increase in the overall stimulation of the Ss, then the extravert's performance would be enhanced by this stimulation while the introvert's performance would remain the same or be reduced. If, however, the E being present is viewed as a generalized reinforcer, then the extravert's performance should be enhanced while the introvert's performance would remain relatively unaltered.

One possible way to interpret both the conditioning and the extinction data in respect to the social conditions of the experiment is to look at the social psychology of the psychological experiment. Sherif (Sherif and Sherif, 1969) discusses this phenomena and emphasizes that psychological experiments need to be viewed in their social context. These results might indicate that during conditioning the S had a better opportunity to judge the 'demands' of this particular social situation and comply to them when the E was present. When the E was absent, the S was left with fewer external criteria as to what was expected. Thus it would be expected that the Ss in the E present condition would show

more responses that E wanted (similar to the Rosenthal effect, Rosenthal, 1964), while those with the E absent would have fewer criteria as to the 'expectations of the situation' and would be more likely to misjudge the situation.

This same rationale would then be applied to the extinction phase of the experiment. Here, those Ss in the E present condition would be more likely to judge correctly that the experimental conditions had changed and would be able to alter their reactions accordingly. Yet the Ss in the E absent condition, having fewer cues to go on, would be less likely to know if the situation had changed and what was expected of them and therefore would be less likely to change their approach to the task.

This extrapolation of the data could possibly have some direct implications for many of the fields of psychology. Not only would it be directly relevant to many experimental situations as a variable that would need controlling, but it could also have relevance for psychotherapy. A psychotherapist would need to be aware of the ways he was influencing his patients by his own physical presence, and that his choice of approach (e.g. analytic passivity and being out of the patient's view versus active behavioristic styles) would possibly change the 'demands' of the situation, and thus the patient's responses.

This gives an interesting idea for further research. To what extent does the E being present constitute additional reinforcement of those rewards already being administered and to what extent does he constitute a social demand for productivity of a certain specific type in the psychological experiment?

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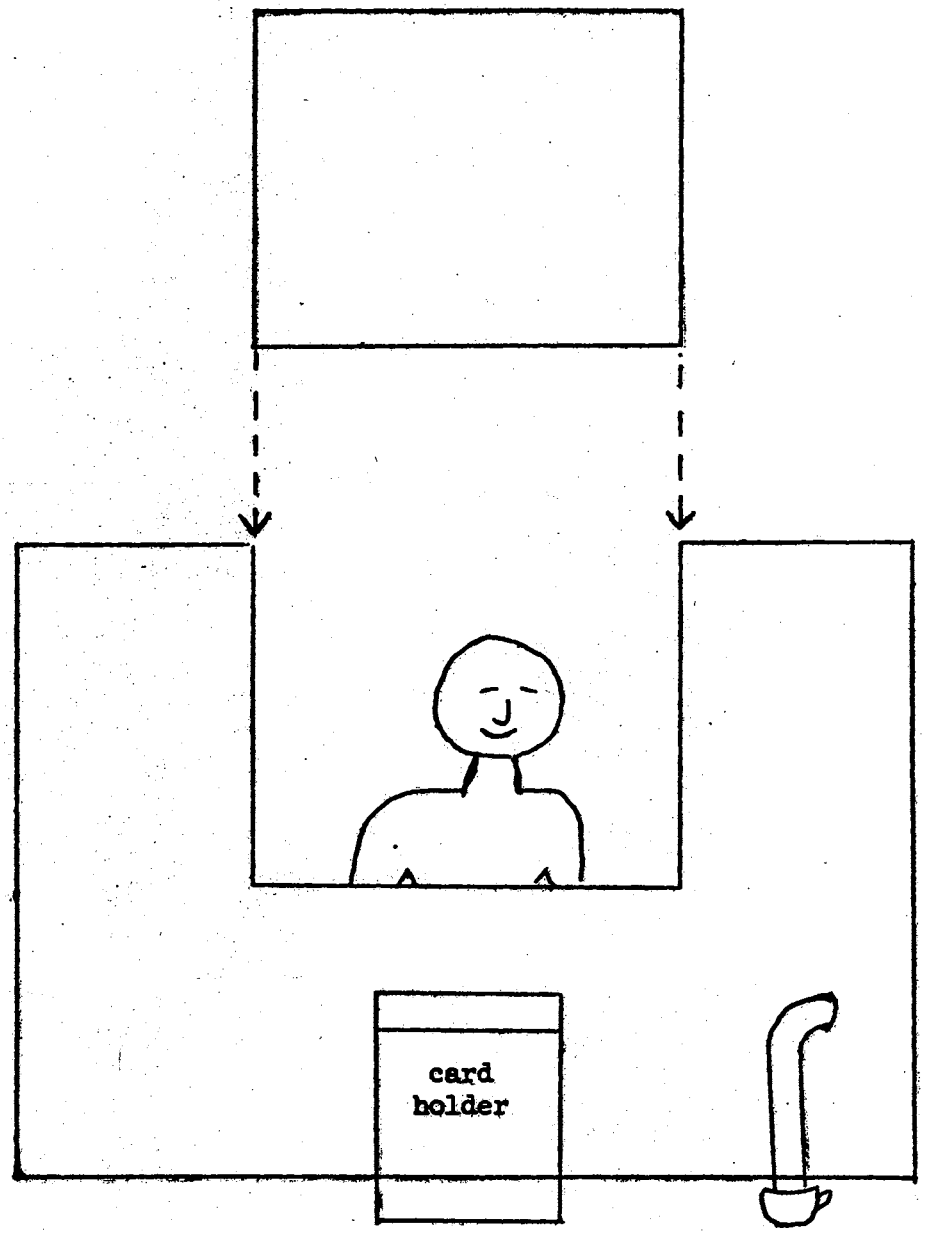
APPENDIX

APPENDIX A

DIAGRAM OF EXPERIMENTAL APPARATUS



APPENDIX B

VERB LIST (DIXON AND DIXON, 1964)

DEVOTED
COMPLIMENTED
PRAISED
CREATED
ASPIRED
ASSISTED
SYMPATHIZED
LIKED
REASSURED
CONGRATULATED
WELCOMED
EXPRESSED
APPROVED
CONSOLED
PLANNED
FINISHED
ENTERTAINED
SUPPORTED
ADMIRED
FREED
PLEASED
RESTORED
RECONCILED
REJOICED
OBEYED
RELIEVED
SURPASSED
REMEMBERED
TRAVELED
THOUGHT
ADMIRED
CHERISHED
RELAXED
DECIDED
CHEERED
READ
HOPED
EXPLAINED
APPLAUDED
OBSERVED

LISTENED
INQUIRED
COMMEMORATED
BEHAVED
DECORATED
DANCED
LIVED
HEEDED
ASKED
PRESERVED
KNEW
RETURNED
SWAM
CHUCKLED
PRESENTED
PLAYED
SHOWED
ACCEPTED
SUSTAINED
WROTE
ATTENDED
VISITED
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OBTAINED
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WATCHED
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TALKED
DELIVERED
INDICATED
STATED
FOUND
CONTINUED
DESCRIBED
BOUGHT

STAYED
JOINED
SENT
COLLECTED
SAW
SOLD
WALKED
LOOKED
RECEIVED
REPORTED
ARRIVED
CARRIED
STOOD
OPENED
PICKED
TURNED
HELPED
REMAINED
BEFRIENDED
BROUGHT
FANCY
MENTIONED
ENTERED
BEGAN
MAILED
SAID
CAME
WAITED
ANSWERED
MOVED
CALLED
RAN
HURRIED
TOLD
DROVE
WENT
STOPPED
RUSHED
FOLLOWED
CLOSED

APPENDIX C

GROUP MEANS OF THE DIFFERENT FACTORS IN THE EXPERIMENT

Key: I = Introvert P = E Present V = Verbal Reward
E = Extravert A = E Absent M = Monetary Reward

A. Means of the Eight Experimental Groups

Group	E	N	1	2	3	4	5	6
I-P-V	7.50	10.83	6.33	8.25	11.50	12.25	8.67	7.50
E-P-V	18.58	8.42	5.92	8.42	9.50	10.00	8.33	6.50
I-A-V	7.38	10.25	6.33	8.33	10.50	12.00	9.08	9.58
E-A-V	18.17	9.92	7.42	8.58	7.25	8.75	7.25	7.67
I-P-M	8.58	8.92	7.92	10.17	11.83	12.58	8.58	8.17
E-P-M	18.67	11.17	6.75	6.67	8.67	10.00	9.08	8.25
I-A-M	7.42	9.83	7.33	8.92	9.58	12.00	8.00	7.50
E-A-M	17.83	9.67	6.50	6.25	7.83	9.50	7.58	7.75

B. Means of all Eight Groups Combined on Each Block

	1	2	3	4	5	6
All	6.81	8.20	9.58	10.88	8.52	7.86

C. Means of the Groups in the Extraversion by Blocks by Type of Reward

	1	2	3	4	5	6
I-V	6.33	8.29	11.00	12.12	8.87	8.54
I-M	7.62	9.54	10.71	12.29	8.29	7.83
E-V	6.67	8.50	8.38	9.37	7.79	7.08
E-M	6.62	6.46	8.25	9.75	8.33	8.00

D. Means of the Groups Combined Under E Present and E Absent

	1	2	3	4	5	6
E Present	6.73	8.37	10.37	11.21	8.67	7.60
E Absent	6.90	8.02	8.79	10.56	7.98	8.12

E. Means of the Extraversion by Block by Social Condition Groups

	1	2	3	4	5	6
E-P	6.33	7.54	9.08	10.00	8.71	7.37
E-A	6.96	7.43	7.46	9.12	7.46	7.71
I-P	7.12	9.21	11.67	12.46	8.63	7.83
I-A	6.83	8.62	10.04	12.00	8.54	8.54

F. Means of the Extraversion by Block Groups

	1	2	3	4	5	6
E	6.64	7.48	8.27	9.56	8.08	7.54
I	6.98	8.92	10.86	12.23	8.58	8.18

APPENDIX D

AOV ON EXTINCTION BLOCKS

Source	d.f.	Sum of Squares	Mean Square	F
A (extraversion)	1	16.33	16.33	1.13
C (social condition)	1	.33	.33	<1
D (reward)	1	.09	.09	<1
AC	1	7.53	7.53	<1
AD	1	22.68	22.68	1.57
CD	1	25.52	25.52	1.77
ACD	1	2.08	2.08	<1
Ss within groups	88	1270.75	14.44	
B (blocks)	1	10.08	10.08	2.93
AB	1	.19	.19	<1
BC	1	17.53	17.53	5.10 *
BD	1	.18	.18	<1
ABC	1	2.07	2.07	<1
ABD	1	.76	.76	<1
BCD	1	6.75	6.75	1.96
ABCD	1	.19	.19	<1
B x Ss within groups	88	303.25	3.44	
Total	191	1686.31		

* P<.05

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Candidate for the Degree of

Doctor of Philosophy

Thesis: THE EFFECT OF TYPE OF REWARD ON THE OPERANT CONDITIONING OF EXTRAVERTS

Major Field: Psychology

Biographical:

Personal Data: Born in Bartlesville, Oklahoma, November 6, 1943, the son of Jean Paul and Meta Jones.

Education: Graduated from Bartlesville College High School in May, 1961; attended Oberlin College, Oberlin, Ohio, from September, 1961 to May, 1963; attended Oklahoma State University from September, 1964 to May, 1966, and received the Bachelor of Science degree from Oklahoma State University in May, 1966; attended Oklahoma State University from September, 1966 to July, 1968, and received the Master of Science degree in July, 1968; attended Oklahoma State University from June, 1969 to July, 1972, and completed the requirements for the Doctor of Philosophy degree in July, 1972.

Professional Experience: Employed as Psychology Intern for the Department of Criminology of the State of Illinois from June to September, 1967 at the Diagnostic Depot, Joliet, Illinois; served as graduate assistant in the University Counseling Service, Oklahoma State University from November, 1967 to May, 1968; employed as a psychologist for the Bi-State Mental Health Foundation, OSU Mental Health Center, from September, 1968 to August, 1971; employed as a Psychology Intern, Topeka State Hospital, Topeka, Kansas from September, 1971 to August, 1972; attended seminars at The Menninger Foundation from October, 1971 to May, 1972.