A STUDY OF VERBAL CONDITIONING AS A FUNCTION OF EXTRAVERSION AND NEUROTICISM

by

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Abstract

An experiment was designed to test the relative effectiveness of three hypotheses to predict performance in verbal avoidance conditioning. The three hypotheses were: (1) a high level of neuroticism should hinder performance where there are competing response tendencies, irrespective of the level of extraversion present; (2) a high level of extraversion should hinder performance, irrespective of the degree of neuroticism present; (3) performance will depend upon both the level of neuroticism present and the level of extraversion present.

Sixty college students were divided into six experimental groups according to scores on the Maudsley Personality Inventory. The experimental groups comprised three levels of extraversion and two levels of neuroticism. A revised Taffel conditioning technique was employed with evaluative statements as the contingent response class and a loud buzzer as the noxious stimulus.

The results were interpreted as supporting the view that both neuroticism and extraversion are relevant variables in determining the rate at which conditioned responses are acquired. Implications for Eysenck's theory were discussed.
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Introduction

When Ben Johnson wrote, "Language most showeth a man; speak that I may see thee," he emphasized the important role that a person's verbal behavior plays in the description of his personality. The major emphasis in research on verbal behavior, however, has been upon the content of speech—on what is said rather than the way in which it is said. As Sanford (1948) has said,

Language, traditionally, has been regarded as the 'vehicle of thought,' with the thought attracting far more attention than the vehicle. But there are those who object to the traditional distribution of attention on the grounds that the vehicle as well as the freight it carries should be given systematic scrutiny (p. 157).

Early studies on the relation of non-content aspects of verbal behavior to personality have shown individuality to be reflected in a number of objective and quantifiable variables. Besides the conventional grammatical and lexical classifications these variables include various units which have been constructed with an eye towards psychological concepts. Thus, individual differences have been investigated in verbal diversification (Fairbanks, 1944), the use of words indicating discomfort and relief from discomfort (Dollard and Mowrer, 1953) the frequency of "ego" and "empathetic" words (Berg, 1958), and
the relative use of verbs as compared to adjectives (Balken and Masserman, 1940). That these studies have met with a certain degree of success in the descriptive realm is evidenced by a comparative case study by Sanford (1942). He made use of more than 200 grammatical, psychogrammatical, and mechanical variables in analyzing speech samples from two college students. The description of the linguistic traits characterizing these two subjects often appears to be quite descriptive of the persons themselves. For psychiatric disorders, Balken and Masserman (1940) have indicated that more or less specific neurotic syndromes are correlated with more or less characteristic linguistic traits.

The statistical aspects of language that are diagnostic of individual differences in verbal behavior are important, of course, but they yield little in the way of knowledge about how linguistic traits are established and maintained, their effects in interpersonal relations and, what is important to the clinician, how they can be changed.
The Modification of Verbal Behavior

In psychotherapy the primary emphasis is on verbal behavior. One of the main things that the clinician tries to do is to modify a patient's verbal behavior. This is particularly true in reference to important interpersonal situations such as in the patient's relationship to his wife or to his boss. As Shoben (1949), Taffel (1955), and Krasner (1958) have pointed out, this is based on the assumption that certain behavioral techniques on the part of the therapist will influence the behavior of the patient and that, hopefully, this influence will transfer to the important relationships in the patient's life.

It is probably true that "....a man's speech is affected by the structure of the language that he speaks, the situation in which he is placed and by personal reactions that depend upon his own particular past" (Miller, 1951 p. 139). But it should not be assumed that verbal behavior undergoes modification only in psychotherapy. People do seem to 'adapt' as social interaction proceeds and their adaptation may be related to the consequences of their own verbal behavior as mediated by those around them. It seems likely that this kind of adaptation can profitably be considered as a form of learning or conditioning.
Factors which affect the rate of conditioning, as well as a person's past history, could then influence his interpersonal relationships and the description of his personality.

In psychotherapy and, more generally, in interpersonal relations it seems essential that the variables involved in the modification of verbal behavior be more thoroughly understood. The verbal operant paradigm outlined by Skinner (1957), and initially used experimentally by Greenspoon (1955), has come to be a valuable research tool by which to examine important parameters of verbal behavior.

Operant behavior is a class of behavior whose probability of occurrence is related to its consequences. An operant, however, is a tendency or disposition to respond in a certain way to a certain state of affairs. The operant is two term in that it contains an antecedent (or cause) and an effect (the consequent behavior—in this case verbal behavior). The relation between them is one of probability. Probability is the variable. When the term "operant strength" is used it refers to the probability relation between the two terms. The strength of an operant is affected by the past history of reinforcement, i.e., by the number and schedule of reinforcements.
The strength of an operant must be distinguished from the strength of a response. The former is the "resting condition" of the behavior in question while the latter is dependent upon the availability of appropriate antecedents.

The fact that reinforcement is generally not contingent upon exact replication of a response in verbal behavior (except for some common characteristic) has resulted in the concept of a "response class" (Salzinger, 1959). A response class consists of many different responses which are alike in that the occurrence of any one may be substituted for that of any other without changing the status of reinforcement.

The research in verbal conditioning makes use of this paradigm by arbitrarily dividing verbal behavior into response classes and arranging conditions such that reinforcement is contingent upon the emission of verbal responses appropriate to one of these classes. The result should be an increase in the strength of the operant that is reinforced. As Salzinger (1959) has mentioned, there is an unsolved problem here in that the experimentally defined response class may not coincide with the subject's "natural" response class, i.e., one that ordinarily functions as a class for the subject. Experimenters probably too often rely on their own personal knowledge of what constitutes a response class. The discrepancy can be reduced in some
instances, however, by having judges rate predetermined responses or by using factor analyzed response classes.

Although at first blush the operant paradigm seems quite simple and straightforward, with accomplished speakers there are a number of variables which enter into the experimental situation to make adequate controls difficult. Salzinger (1959) has indicated the complexity of the variables underlying verbal behavior by the equation

\[ R = f(a, b, c, d, e, f, \ldots x, y, z) \]

where \( R \) stands for the verbal response, \( f \) is an as yet unspecified function, and the letters in parentheses represent such things as type of reinforcement, amount of reinforcement, type of discriminative stimulus, reinforcement history of the individual, and states of the organism.

In this paper attention will be restricted to studies attempting to relate personality variables to verbal conditioning. The reader interested in other variables is referred to the rather complete reviews by Greenspoon (1962), Krasner (1958), and Salzinger (1959).
Studies Relating Personality Variables to Verbal Conditioning

Investigators who have attempted to account for some of the variance in verbal conditioning research by correlations with personality differences have generally assumed that certain kinds of people are predisposed to react in characteristic ways as a result of increased drive, past reinforcement history, or special susceptibility to certain kinds of reinforcement. Thus, Taffel (1955), on the basis of previous studies relating anxiety as drive to eyelid conditioning, hypothesized that amount of verbal conditioning is a function of anxiety level as measured by the Taylor Manifest Anxiety Scale (MAS). Ninety male psychiatric patients were instructed to select one of six pronouns and to form a sentence with a verb that was also printed on the card. For the first twenty trials the experimenter made no response after a subject made up a sentence. During the remaining trials the experimenter said "Good" at the end of a sentence that began with either "I" or "We" (group I); flashed a small light for the above response (group II); or continued the procedure as in the first twenty trials (group III). Only those subjects in group I showed significant evidence of conditioning.
Subjects scoring high on the MAS showed greater conditioning effects than those with low scores.

Buss and Gerjuoy (1958) replicated Taffel's study using forty-five psychiatric patients of both sexes. Using the same task and the same MAS cut-off scores as did Taffel, they found that only the low anxiety and medium anxiety curves increased while the high anxiety curve remained flat. Their conclusions were that there is no relationship between MAS scores and verbal conditioning and that Taffel's positive findings were a result of chance.

Rosenblum (1960), using the Taylor scale, found that subjects who scored high or medium showed greater conditioning effects than those who scored low on anxiety.

Sarason (1958) studied the interrelations between three variables: subjects' scores on a personality inventory, therapists' ratings of the subjects' behavior in psychotherapy, and performance in verbal conditioning. The personality inventory, devised by Sarason, gave scores in hostility, defensiveness, need achievement and anxiety. Therapists ratings were on degree of compliance, degree of dependence, and degree of hostility shown towards the therapist. Sarason's findings indicated that high anxiety and "lack of protection" scores were related to higher levels of conditioning while defensiveness was related to poor verbal conditioning. Patients rated as compliant by
the therapists performed at significantly higher levels than did non-compliant patients.

Campbell (1960) obtained scores on a personality inventory for a number of nurse-subjects and then used them as experimenters in a verbal conditioning task with psychiatric patients. The patients were rated as to hostility and anxiety. He found no significant differences between high and low anxious nurses and high and low hostile nurses in rate of verbal conditioning. For the patients, however, it was found that high anxious patients made significantly more critical responses than did low anxious patients.

Another variable that has been related to verbal conditioning is need for approval. The assumption here is that persons characterized by this need have past histories such that "approval" from others has come to be highly reinforcing. Thus, in the verbal conditioning situation these subjects should be more sensitive to the reward involved and give the contingent response more readily. Anderson (1959) tested this hypothesis using Edwards Personal Preference Schedule (EPPS) and a Taffel type task. The subjects were fifty male college students and the reinforcing stimulus was either "Good" or "O.K., Good." No significant difference was found between high and low scorers on the need approval scale.
Crowne and Strickland (1961) and Marlowe (1962) found need for social approval positively related to rate of verbal conditioning when the criterion of need approval was a high score on the Marlowe-Crowne Social Desirability Scale.

A positive relationship between hypnotizability and susceptibility to verbal conditioning was found by Weiss, Ullman and Krasner (1960).

Babladelis (1961) assumed that autonomy, as measured by the EFPS, would interfere with susceptibility to verbal conditioning. In a quasi-therapy situation she found that positive reinforcement was effective in producing a significant increase in positive self-reference statements but not for negative self-reference ones. The effect was less for autonomous individuals than for non-autonomous individuals.

Hetrick and Hass (1962), aware of some of the parallels between psychotherapy and verbal conditioning situations, investigated the effects of certain personality variables believed to be important during the course of therapy. Although their subjects were effectively conditioned, no relation between performance and ego-strength, depression, or psychopathy was found to be significant.
Anderson (1959), in the study mentioned previously, also had twenty male and twenty female subjects construct statements from a series of scrambled sentences. Either an aggressive or a neutral statement could be constructed. Reinforcement was contingent upon constructing an aggressive statement. Thematic Apperception Test protocols were scored for three types of aggression and three types of punishment for each subject. Significant differences were found for high and low scorers on Verbal Aggression, Total Punishment and Aggression-minus-Punishment. The results were taken as support for the hypothesis that the level of aggressive impulses and fear of punishment contributed to the availability of aggressive verbal responses and to the rate of learning.

Binder and Salop (1961) used a kind of 'shotgun' approach by comparing scores on the MMPI scales with verbal conditioning rates. The task was a modified Taffel technique in which reinforcement was contingent upon making up sentences containing one of four pronouns and a past tense verb. There were three experimental groups: one in which the experimenter said "Good" after a correct response (group G), one in which the subject received an electric shock (group S), and one in which there was no reinforcement. Only group G showed overall acquisition. Significant differences for subjects high and low on the Mf and Me scales
were found for group G during acquisition and for subjects high and low on the Hs, D, Sc and Si scales for extinction.

Using the scales from Edwards Personal Preference Schedule, Kirman (1958) obtained a significant positive correlation of .33 between deference and verbal conditionability but found autonomy not correlated with rate of conditioning.

By means of generalized reinforcers, most of the studies in verbal conditioning have been able to increase the probability of a verbal response. However, the issue of what personality variables have significant effects on the amount of change of the contingent response is still unresolved. Nevertheless, the impression one gets from the literature is that the more fruitful lines of investigation are those in which the personality variables can be related to concepts shown to have effects on other kinds of conditioning, e.g., drive and amount of reinforcement. Thus, the studies of anxiety and need for social approval suggest something about the way in which these personality variables are mediated in verbal conditioning.

The fact that such stimuli as "um hmm" and "Good" are secondary reinforcers may account for some instances of failure to obtain significant results. Subjects may have to learn the value of certain stimuli as reinforcers from
certain people. For example, Greenspoon (1962) found that some subjects interpreted "um hmm" as disapproval. Campbell's (1960) negative results with nurses as subjects, and positive results with patients as subjects and nurses as experimenters, may reflect differential opportunities to learn the reinforcement value of stimuli presented by the experimenter.

One also wonders about the independence or "purity" of the personality variables that have been investigated. Most of them are logical or hypothetical constructs with little experimental support and their dimensional status is at least questionable. The scales of the MMPI, for example, are known to compound many variables.
Introversion - Extraversion as a Parameter of Conditioning

The present investigation was carried out in the light of experimental evidence suggesting that certain personality dimensions, arrived at through factor analysis, are related to the rate of conditioning.

In *The Dynamics of Anxiety and Hysteria* Eysenck (1957) has outlined a theory to account for certain parts of his taxonomic scheme. Previous studies (Eysenck, 1953) had indicated the existence of at least three orthogonal dimensions of personality: neuroticism, psychoticism and introversion-extraversion.

The dimension that is of primary concern in Eysenck's dynamic theory is that of introversion-extraversion. The typical introvert, i.e., one who scores at one extreme of this dimension, is described as conscientious, quiet and retiring, reserved and distant except to close friends, and fond of books rather than people. His feelings are easily hurt and he tends to keep in the background on social occasions. His impulses are well controlled and seldom does he behave in an aggressive manner. The introvert likes a well ordered life and values ethical standards highly. He has been characterized as oversocialized or "super-ego"
dominated.

The extravert, on the other hand, is described as sociable, carefree, optimistic, easygoing, and not always reliable. He needs to have other people to talk to, likes parties and excitement, and often acts impulsively. The extravert has been characterized as undersocialized or "id" dominated.

The correspondence of factors derived from factor analysis at the level of behavioral traits with those derived from factor analysis at the level of experiments has led Eysenck to propose that there are presumably innate individual differences in the balance of neurological excitation and inhibition and that these differences underlie the factor of introversion-extraversion. The concepts of excitation and inhibition are borrowed Pavlovian notions referring to changes that occur in the neural structures responsible for the transmission of nerve impulses. As used by Eysenck they are hypothetical molar constructs: excitation is the

....type of change responsible for conditioning and learning and makes easier the passage of the neural impulse linking stimulus and response; the latter change (inhibition) is responsible for unlearning and extinction and makes more difficult the passage of the neural impulse linking stimulus and response (Eysenck, 1957, p. 46).

Inhibition, in the sense of Hull's reactive inhibition, is believed to dissipate over time while excitation does not.
Both positive (excitatory) and negative (inhibitory) processes are assumed to go on at the same time. Thus, individual differences in the rate at which they are produced, the degree to which they are produced, and the speed with which inhibition is dissipated are assumed to be reflected in individual differences in performance. A more extended treatment of these concepts is given in Eysenck (1957).

Although at the level of laboratory experiments Eysenck has related the concept of an excitation-inhibition balance to such diverse areas as perception, the effects of drugs, brain damage, motor learning and reminiscence, his main connection between this concept and the personality trait level is through conditioning. Eysenck assumes that socialization (in the sense of learning cultural prohibitions) is mediated by "...conditioned reactions of an autonomic kind (anxiety)" (Eysenck, 1957, p. 210). That is, the situations in which socialized activities are performed have been conditioned to fear responses and thus have acquired drive properties. The socialized activities themselves do not extinguish easily because performance of them provides their own reinforcement, i.e., the responses themselves reduce the conditioned fear drive or anxiety.

Assuming, then, the existence of individual differences in the rate at which conditioned responses are
formed, one would expect from this theory that

....under equal environmental pressure, individuals with strong excitatory and weak inhibitory potentials, who would be expected on that basis to form strong and stable conditioned responses, would also tend to be strongly socialized, while individuals with weak excitatory and strong inhibitory potentials, who would be expected on that basis to form weak and unstable conditioned responses, would also tend to be weakly socialized. The former group would thus tend to develop introverted behavior traits (persistence, high level of aspiration, reliability, etc.), while the latter group would tend to develop extraverted behavior traits. Groups intermediate with respect to the excitation-inhibition balance would also be expected to be intermediate with respect to conditionability, and consequently with respect to socializability and extraversion-introversion (Eysenck, 1961, p. 27).

One other point that should be mentioned is Eysenck's position with respect to drive. In several places he and his collaborators (Eysenck, 1957; Franks, 1961) refer to neuroticism as a factor reflecting

....the balance or lack of balance of the autonomic nervous system, i.e., its speed of response, its strength of response and its persistence of response. The individual high on neuroticism is conceived to be a person with an over-reactive, labile type of nervous system, a person who reacts too strongly, and too persistently to strong external stimuli (Eysenck, 1961, p. 28).

And with respect to the inclusion of differences in drive arousal into theory

....we must therefore add the third dimension of drive arousability or of emotionality; this dimension would be predicted to act in the same way as that of strength of drive (Eysenck, 1957, p. 98).

In learning theory terms a high score on the factor of neuroticism would clearly seem to indicate a high level of
drive, at least in avoidance situations, and this is the way it is conceived by most of his co-workers (Furneaux, 1961; Inglis, 1961; Martin, 1961; Jones, 1961; Willett, 1960). Yet, much space is given to the discussion of Spence's theory relating individual differences in anxiety level (also conceived of as a drive variable) to individual differences in the rate of conditioning. Both Eysenck and Franks appear to oppose it on the grounds that irrelevant drive is irrelevant to conditioning. However, it has been argued (Champion, 1961) that, in any conditioning study using a noxious unconditioned stimulus, anxiety would be a relevant drive since such a stimulus is assumed to induce anxiety and its offset to reduce anxiety. Eysenck as well as Spence would then predict that highly anxious subjects would perform more efficiently in conditioning situations than would subjects with low levels of anxiety. But when making predictions as to differential rates of conditioning Eysenck and Franks hypothesize that conditionability is related to the postulated excitation-inhibition balance and not to neuroticism. Their position is further obscured when they cite an experiment by Lykken (1957) as confirmatory evidence. Using an avoidance learning task, in which anxiety is a relevant drive, Lykken found results which fit better with an interaction hypothesis than with a single effect of extraversion. Adding to the
confusion about drive is Eysenck's statement that the fears, phobias and anxieties of the dysthymic (introverted neurotic) are the result of very high drive and very high conditionability. This problem will be returned to after some of the experimental evidence has been examined.
Eysenck's primary source of support for the claim that introverts condition more easily than extraverts has been two experiments conducted by Franks (1956, 1957). The first of these compared the performance of twenty dysthymics (introverted neurotics), twenty hysterics (extraverted neurotics) and twenty normals in an eyeblink conditioning situation. A double criterion was used for the selection of the neurotic groups, i.e., their diagnosis was confirmed by three psychiatrists and they also had to have certain scores on a test of extraversion (Guilford's \( R \) scale). The unconditioned stimulus was a puff of air to the eye and the conditioned stimulus was a tone. Concomitant GSR measures were also recorded. The results showed dysthymics to give significantly more conditioned responses than hysterics for both acquisition and extinction trials. The normals gave fewer conditioned responses than the dysthymics but were not significantly different from the hysterics. No differences were found to be significant between the normals and the combined neurotic groups. The correlation of Guilford's \( R \) scale with conditioning of the eyeblink was \(-.48\) and for conditioning of the GSR \(-.25\).
The correlations of conditioning with neuroticism were .08 (eyeblink) and .20 (GSR).

In the second study (Franks, 1957) fifty-five normal paid undergraduates were used as subjects in the eyeblink situation. The Maudsley Personality Inventory (MPI) was used to estimate extraversion and neuroticism. The correlation between conditioning and extraversion was found to be -.46 (acquisition) and -.34 (extinction). For neuroticism the correlations were .04 and .15 respectively. The correlations for the extraversion scale were significant at the .01 level while those for neuroticism were not significant. Eysenck concluded from this study that conditionability is also related to extraversion in normal subjects and "...not to neuroticism - emotionality - anxiety." (Eysenck, 1957, p. 120).

The study by Lykken (1957) mentioned earlier, although conceived in a different framework, is of interest in that psychopaths were used as subjects. The forty-nine subjects were divided into two groups on the basis of Cleckley's criterion that the "primary sociopath" lacks the normal affective component of experience. The remainder were labeled "neurotic sociopaths." A battery of tests including the MAS, Welsh Anxiety Index and the MMPI Pd scale were given to these two groups and to fifteen normal controls. The primary sociopaths and the normal controls both scored
significantly lower than the neurotic sociopaths on the MAS and on the Anxiety Index. On the MMPI Ed scale (which is partly a measure of extraversion) both sociopathic groups scored significantly higher than the normals. By Eysenck's criteria the primary sociopaths would be extraverted and non-neurotic; the neurotic sociopaths would be extraverted and neurotic; and the normals would be ambiverted and non-neurotic.

On a GSR conditioning task and on an avoidance learning task which involved a mental maze and electric shock, the normals performed best, primary sociopaths poorest, and neurotic sociopaths inbetween. Neurotic sociopaths showed most stimulus generalization when an alternative stimulus was presented during the GSR conditioning procedure while primary sociopaths showed the least. These results are interesting in view of the finding that extraverts are "....more likely than introverts and ambiverts to commit not only juvenile delinquent acts but also crimes in adult life" (Michael, 1956).

Becker and Matteson (1961) chose subjects scoring on the extremes of an anxiety scale and of an extraversion scale to test the hypotheses of Eysenck and of Spence. Using the GSR and a conditioned response amplitude measure, they found a significant positive relation between anxiety and conditioning but no significant relationship between
extraversion and conditioning. However, using GSR criterion scores, they found no significant differences for either the extraversion or anxiety groups. Unfortunately the mean level of shock was considerably higher for the introverted than the extraverted subjects and this could well have destroyed any real relationship between conditioning and extraversion. The validity of using an amplitude measure is also questionable since anxious subjects would be expected to respond more strongly to shock even without a conditioning task.

In an exploratory study with alcoholics Vogel (1960) found a significant difference in the rate of GSR conditioning between eleven introverted and eight extraverted subjects as distinguished by the Maudsley Personality Inventory (MPI). A significant correlation was also found between neuroticism and GSR conditioning. In a follow-up study, (Vogel, 1961) using forty-eight alcoholics and forty-one non-alcoholics and the same GSR task, similar results were found. Alcoholics and normals did not differ in the number of acquisition and extinction trials. Introverts in both groups reached the criterion of three consecutive GSR reactions to the conditioned stimulus in an average of 6.12 trials while extraverts in both groups averaged 13.05 trials. For extinction only extraversion showed a significant effect and this was for
both the number of conditioned responses prior to extinction and the number of conditioned responses to the first ten unreinforced presentations of the conditioned stimulus. The previous finding of a correlation between neuroticism and conditioning was not found in the replication study.

In a GSR conditioning study on hysterics, psychasthenics (dysthymics) and normal controls, Halberstam (1961) found hysterics to require twice as many conditioning trials as psychasthenics to reach criterion (40.94 vs. 19.61). The normal controls were inbetween but quite similar to hysterics in the number of trials to criterion (23.33). Hysterics also extinguished more quickly than psychasthenics.

Using an eyelid conditioning task, Sweetbaum (1960) attempted to vary extraversion as measured by the Guilford R scale independently of anxiety. Subjects were selected from a normal hospital population, one group about to undergo major surgery within 48 hours and another group which had successfully recovered from surgery. Each of the surgery groups was divided into high and low extraversion subgroups. The pre-operative groups were found to be superior in amount of conditioning while there was no significant relation found between extraversion and rate of conditioning in either of the surgery groups. The degree of neuroticism was not controlled for, however, and
thus the individual differences in the amount of drive
aroused or present is hard to assess. It is possible that
this could obscure differences as a result of the
extraversion factor.

Field and Brengelman (1961) investigated eyelid
conditioning as a function of rigidity, extraversion, and
neuroticism in seventy-five prison inmates. Twelve
personality scales were used but only the Dogmatism scale
correlated significantly ($r = .43$) with conditioning.
Three of the four extraversion scales correlated in the
predicted direction with conditioning but these were low
and insignificant. An objection that has been raised
(Eysenck, 1962) is that extraversion scales, with their
stress on sociability questions, do not apply very well
to a prison population.

Willett (1960) attempted to assess how
consistently different conditioning measures related to
extraversion and neuroticism. Eighty student subjects were
given a number of personality questionnaires and then
subjected to eyelid conditioning, salivary conditioning,
spatial conditioning, and a probability learning task.
None of the questionnaires correlated significantly with
eyeblink conditioning but a significant correlation was
found between the extraversion scale of the MPI and spatial
conditioning. The probability learning task was not found
to be a true conditioning task and in salivary conditioning the acquisition that took place appeared to be an artifact of the stimuli used. When the obtained measures were factor analyzed along with measures of perceptual functioning three factors appeared (Eysenck, 1960a). One of these seemed to be an artifact due to salivary conditioning and the probability learning tasks and the other two were identified as extraversion and neuroticism. The loadings of the questionnaires suggested caution in their use as criteria of the factors.

In one of two experiments using an inverted alphabet printing task, Bendig and Vaughan (1959) found extraversion and neuroticism to interact in their effect upon performance. The interaction was significant only at the .10 level, however. In the second experiment with ninety-nine different subjects the interaction did not appear. Sex was found to have a significant effect in both experiments. The authors suggested several possible reasons for their failure to obtain consistent results: a low reliability was found in one of their measures of learning rate; only ten minutes of practice may not have been long enough to generate sufficient reactive inhibition; and the groups may not have been extreme enough to demonstrate significant relationships. It might be added that the experiments were done in a classroom situation and
thus many uncontrolled variables could have entered in to obscure the results.

The results of these experiments are inconsistent and far from conclusive. Many of the studies are of limited value because of inadequate controls and poor design. In some the operational definitions bear only a tenuous relation to the theoretical constructs. At any rate, they have been sufficiently suggestive that a few investigations have been made relating the dimension of introversion-extraversion to verbal conditioning.

The first of the studies relating differences in extraversion to verbal conditioning was by Eysenck (1959). The MPI was used as a criterion of extraversion. Nineteen extraverts and twenty-eight introverts were given a series of 100 cards containing the pronoun "they" and three verbs of approximately equal frequency of occurrence in the English language. The contingent response was a verb which referred to a muscular activity and reinforcement was an "um-mm" delivered by the experimenter. The increase from the first set of 50 cards to the second set was over twice as great for introverts as compared to extraverts and was significant at the .05 level of confidence. An interesting observation was that extraverts used significantly more activity verbs throughout the test than did introverts.
Blaylock (1960) used a Taffel technique to condition the verbal behavior of forty-five hospitalized normals with MMPI Pd scores of 69 or below, forty-five control prison subjects with Pd scores of 69 or below and forty-five psychopathic prisoners with Pd scores of 79 or above. Each major group was divided into a reward group ("Good"), a punishment group ("Not so good") and a neutral group (no response). No significant differences were found between the groups or between the reward and punishment conditions. Blaylock concluded, however, that the experiment was not crucial to Eysenck's theory since the psychopathic group was slightly higher on the MMPI Psychasthenia Scale than the other groups and thus were probably more introverted (or neurotic) than he had assumed.

Johns and Quay (1962) had military offenders classified as either psychopathic or neurotic make up sentences from words printed on cards. Reinforcement was "Good" for a sentence starting with "I" or "We." The twenty-three neurotics showed a significantly greater increase in the reinforced category than did a control group of thirty normals or the eleven psychopathic subjects. Relative positions as to extraversion and neuroticism were not measured, however.

McDonell and Inglis (1961) chose sixty-five student-subjects on the basis of the MPI so that they would
approximate a normal distribution. Using a Taffel task and "Good" as reinforcement, significant increase over operant level occurred. The correlation with extraversion was not significant (r = .134). The decrease during extinction was also not related significantly to extraversion.

Unfortunately, neuroticism was not controlled in the study.

Gelfand and Winder (1961) conditioned ten dysthymics and sixteen hysterics in a Taffel type procedure. In the 60 trial acquisition phase dysthymics produced significantly more first person pronouns than did hysterics and they also continued to give more during extinction (both significant at the .05 level). The groups did not differ with respect to scores on the MAS, MMPI or Guilford R scales so that these results are difficult to interpret. The diagnostic groups could really be representative of different levels of extraversion and the questionnaires inadequate measures or the groups could have differed on some other factor related to conditioning such as neuroticism. Or, considering the unreliability of psychiatric diagnosis, the groups could have been improperly diagnosed.

Although this last point continues to be debated (Eysenck, 1958, 1959; Eysenck and Claridge, 1962; Sigal, Star and Franks, 1958a, 1958b; Foulds, 1961; Eysenck, Foulds
and Ingham, 1962) the best available evidence seems to indicate that on the Maudsley Personality Inventory dysthymics score lower than hysterics and hysterics score slightly lower than normals on the extraversion scale. Psychopaths generally score higher than do normals. On the neuroticism scale dysthymics score higher than hysterics who in turn are higher than normals. The psychopaths tend to score higher on neuroticism than do normals but this relationship is somewhat confused by the inclusion of both primary and neurotic sociopaths in the psychopathic groups (Knapp, 1962). These findings and also logical considerations (Foulds, 1961) seem to prohibit the use of dysthymics and hysterics as criterion groups in the study of introversion-extraversion. Although dysthymics seem to be the most introverted and psychopaths the most extraverted of the diagnostic groups, the position of hysterics is questionable. The difference in neuroticism between hysterics and dysthymics, if it is real, could also obscure findings that are due to the extraversion factor.

It will be recalled that Eysenck did not clearly state the expected effects of differences in neuroticism on conditionability. Jones (1961), favoring a two-factor learning theory, suggests (although not explicitly) that neuroticism is an irrelevant factor in classical conditioning but that it interacts with extraversion in
instrumental conditioning, at least in avoidance situations. Neuroticism is considered by Jones to be a drive arousal factor, i.e., a person scoring high on this factor would be characterized by a high level of avoidance drive. Furthermore, it is postulated that as the "degree of stress" is increased, individual differences in the amount of avoidance drive aroused will become greater. Thus, there would be greater difference between neurotics and normals at high stress values than at low stress values.

With respect to avoidance behavior, Jones takes the position that there are two components: a classically conditioned avoidance drive (anxiety or C.A.D.) and instrumental responses which reduce the C.A.D.. The strength of the C.A.D. appears to be a joint function of both extraversion and neuroticism. That is, the strength of the drive that is conditioned (the unconditioned avoidance drive) is dependent upon the degree of neuroticism present. The strength of the conditioning, however, is dependent upon the degree of extraversion present. Thus, for the total effective strength of the C.A.D. it would be

*This is not exactly as it is stated by Jones. He proposed that the unconditioned avoidance drive of neurotics would allow them to condition this drive faster than normals. Since this is a departure from his two-factor theory of learning and is inconsistent with the results reported by Franks and Vogel, the proposition was stated in the above manner. The predictions in terms of C.A.D. strength do not differ from his even with this change.
expected that neurotic introverts would be highest and stable extraverts the lowest. No precise predictions as to the comparative conditionability of stable introverts and neurotic extraverts can be made, however, unless the degree of stress is known. Unfortunately, no measure of "stress" is yet available.

The second component of avoidance learning, i.e., the instrumental conditioning of responses which reduce the C.A.D., is a function of the strength of the C.A.D. and also of the degree of extraversion present (assuming, as Jones does, that extraversion is also a factor in instrumental conditioning). Here, also, one would expect the neurotic introverts to condition best and the stable extraverts poorest. The relative positions of stable introverts and neurotic extraverts still cannot be predicted since their relative C.A.D. strengths are not known. It would be expected, however, that the additional factor of extraversion during the instrumental phase would favor the stable introverts.

Predictions are further complicated when the nature of the task is taken into consideration. Where the task is comparatively simple, increasing drive strength seems to aid performance. However, in complex tasks there seems to be an optimal drive strength beyond which increases in drive result in decrements in performance. A number of
theories have been proposed to account for this phenomenon. Spence (Spence, Taylor, and Ketchel, 1950) assumes that in a situation where only a single habit is evoked an increase in drive improves performance, but where there are competing response tendencies, and only one of them is scored correct, the effect of increased drive depends upon the number and strength of the competing response tendencies. Other writers have proposed that a high drive state increases task irrelevant tendencies of an emotional nature which interfere with performance; or that, with high drive, drive stimuli occupy more of the stimulus complex thus making positive and negative stimuli more alike and consequently hindering discrimination. Jones does not commit himself to any of these theories but assumes that they all may contribute to the interaction between drive and performance.

This formulation, as Jones himself has said, is altogether too flexible for clear predictions to be made and tested. Nevertheless, he does achieve some degree of support for his views, albeit by a post hoc location of experimental situations on a stress-difficulty dimension. For example, Lykken's study, if placed at "moderate stress," supports his theory. The ambivert and non-neurotic group performed best on the avoidance task, primary sociopaths least well and neurotic sociopaths inbetween.
Problem

The purpose of the present experiment was to investigate the factors of extraversion and neuroticism as they may affect the rate of verbal avoidance conditioning when the conditioning situation involves competing response tendencies. More specifically, the alternative hypotheses were stated as follows.

1. A high level of neuroticism should hinder performance where there are competing response tendencies, irrespective of the level of extraversion (vis. Spence).

2. A high level of extraversion should hinder performance, irrespective of the degree of neuroticism. (This will be referred to as the Eysenck/Franks position even though it can not be directly traced to their statements).

3. Performance where there are competing response tendencies will depend upon both the level of neuroticism and the level of extraversion present. Although no more specific predictions can be made from Jones' theory, his curves of learning efficiency (1961, Fig. 13.5 and Fig. 13.6, p. 496) suggest that, except for extremely high
degrees of stress, neurotic introverts and stable introverts have the greatest probability of being most efficient and stable extraverts the greatest probability of being least efficient.
Method

Subjects

The subjects for this experiment were selected from a pool of 192 volunteers who had been given the Maudsley Personality Inventory. Volunteers were asked to answer the questions as truthfully as possible since the results were going to be used for standardization of the test. All persons answering the questionnaire were registered for an introductory psychology course at the University of Arizona. Previous testing on a different group of 100 subjects indicated no significant differences in mean scores or standard deviations for students at this university as compared to the American norm group of university students (Knapp, 1962).

Subjects were assigned to experimental groups on the basis of their scores on the neuroticism (N) and extraversion (E) scales of the Maudsley. The six experimental groups comprised a two by three factorial design having three levels of extraversion and two levels of neuroticism. The middle level of extraversion was included in order to explore further the relationship of this scale to experimental variables. Each cell of the design contained five male and five female subjects.
The experimental groups with their respective mean scores and standard deviations are shown in Table 1.

Table 1. Means and standard deviations of subjects' scores on the MPI. The number before the semicolon is the mean and that after the semicolon is the standard deviation.

<table>
<thead>
<tr>
<th>Extraversion</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td>N 31.9;6.6</td>
<td>32.6;5.7</td>
<td>34.1;7.4</td>
</tr>
<tr>
<td></td>
<td>E 16.0;7.9</td>
<td>30.9;2.7</td>
<td>38.3;2.7</td>
</tr>
<tr>
<td><strong>Neuroticism</strong></td>
<td>N 14.8;5.6</td>
<td>12.2;7.0</td>
<td>15.0;8.5</td>
</tr>
<tr>
<td>Low</td>
<td>E 18.1;4.7</td>
<td>30.4;2.2</td>
<td>38.8;2.0</td>
</tr>
</tbody>
</table>

All except four subjects were known to the experimenter by virtue of his teaching position. Two subjects were eliminated because of unfamiliarity with the English language and one was eliminated because he was considerably older than the rest of the subjects. All three subjects were replaced by others with comparable scores on the MPI.

Apparatus

Subjects sat at a table opposite the experimenter in a small sound-deadened room. Between subject and
experimenter was a cardboard partition fastened to the table by two brackets. This prevented visual contact between subject and examiner during the acquisition trials. At the base of the partition and five inches from either end were two slots. Through one of these stimulus cards were presented to the subject and through the other they were returned to the experimenter.

Stimulus cards consisted of a series of 80 three by five cards on which were typed two pronouns and three verbs. The same two pronouns ("I" and "They") appeared on each card in the same position but the three verbs were different for each card.

The verbs had previously been selected from 357 verbs rated by fourteen judges (introductory psychology students) as to their degree of evaluative content. The 80 most evaluative verbs were designated as "correct" and each was matched with two verbs of approximately the same frequency of occurrence in the English language (Thorndike and Lorge, 1944), but rated as least evaluative. The correct verb appeared about the same number of times in each position on the card but the position of it was randomized for the sequence of 80 cards.

The noxious stimulus was emitted by a six volt motorcycle horn operated by a 24 volt Transpac. The horn was mounted beneath the table, facing and on the side of the
subject. The experimenter actuated the buzzer by closing a circuit with a plunger type switch.

Procedure

The subject entered the room and was seated in front of the table. The experimenter closed the door and took his place behind the cardboard partition. Subjects were instructed in the following terms:

You will be given, through this slot, some cards on which there are printed two pronouns and three verbs. I want you to make up a sentence aloud using one of the pronouns and one of the verbs. Then put the card into this slot.

After any further explanations that were necessary the experiment began. The first block of ten trials was taken as operant level during which the experimenter made no response to the subject. After the first block of ten trials the subject was then instructed:

Now you will be given the cards with words on them, the same as before, but a loud buzzer will sound after you make up some sentences. You can avoid the buzzer by making up the right sentence.

Preliminary investigation had shown that subjects in this kind of situation would respond to a wide variety of possible reinforcement contingencies if not told they could avoid the noxious stimulus. These instructions were intended to limit to some degree these kinds of responses.

After the final set of instructions the subject received approximately a five second blast of the buzzer.
whenever his sentence did not contain both an evaluative verb and the pronoun "I".

The experimenter was provided with record sheets on which the schedule of correct verbs was laid out. The pronoun used as well as the verb used was recorded along side the correct response.

No response was made to side remarks or nervous responses of the subject during the trials.

After the last block of ten trials the subject was given a standardized interview by the experimenter to determine his subjective estimate of the reinforcement contingency and how he tried to solve the problem. Subjects were also asked to rate the buzzer on a four point scale from "a little annoying" to "very upsetting."
Results

The frequency of correct responses for each group appears in Table 2. No significant differences in operant level were found between the groups.

Table 2. Frequency of correct responses in verbal avoidance conditioning for each group.

<table>
<thead>
<tr>
<th>Extraversion</th>
<th>low</th>
<th>medium</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>low</td>
<td>399</td>
<td>304</td>
</tr>
<tr>
<td></td>
<td>high</td>
<td>321</td>
<td>271</td>
</tr>
</tbody>
</table>

A five-way analysis of variance (neuroticism by extraversion by sex by trials by persons) was performed on an electronic computer under the direction of Dr. Roger Weldon. The results of this analysis appear in Table 3. As can be seen, only extraversion and trials were found to have significant effects. Scheffe' tests showed low extraversion to be significantly different from high extraversion but the medium level of extraversion was not significantly different from either of the two extremes. The acquisition curves for the different levels of
Table 3. Analysis of variance for all levels of extraversion.

<table>
<thead>
<tr>
<th>Source</th>
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<th>Sum of Squares</th>
<th>Mean Square</th>
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</thead>
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<tr>
<td>Trials (T)</td>
<td>7</td>
<td>824.23</td>
<td>117.75</td>
<td>32.1**</td>
</tr>
<tr>
<td>Neuroticism (N)</td>
<td>1</td>
<td>0.41</td>
<td>0.41</td>
<td>-</td>
</tr>
<tr>
<td>Persons (P)</td>
<td>4</td>
<td>144.90</td>
<td>36.22</td>
<td></td>
</tr>
<tr>
<td>Sex (S)</td>
<td>1</td>
<td>6.08</td>
<td>6.08</td>
<td>-</td>
</tr>
<tr>
<td>Extraversion (E)</td>
<td>2</td>
<td>175.73</td>
<td>87.86</td>
<td>3.29*</td>
</tr>
<tr>
<td>T by N</td>
<td>7</td>
<td>34.13</td>
<td>4.88</td>
<td>-</td>
</tr>
<tr>
<td>T by P</td>
<td>28</td>
<td>88.37</td>
<td>3.16</td>
<td></td>
</tr>
<tr>
<td>T by S</td>
<td>7</td>
<td>24.72</td>
<td>3.53</td>
<td>-</td>
</tr>
<tr>
<td>T by E</td>
<td>14</td>
<td>42.40</td>
<td>3.03</td>
<td>-</td>
</tr>
<tr>
<td>N by P</td>
<td>4</td>
<td>73.49</td>
<td>18.37</td>
<td></td>
</tr>
<tr>
<td>N by S</td>
<td>1</td>
<td>0.13</td>
<td>0.13</td>
<td>-</td>
</tr>
<tr>
<td>N by E</td>
<td>2</td>
<td>103.23</td>
<td>51.61</td>
<td>2.18</td>
</tr>
<tr>
<td>P by S</td>
<td>4</td>
<td>66.32</td>
<td>16.58</td>
<td></td>
</tr>
<tr>
<td>P by E</td>
<td>8</td>
<td>338.35</td>
<td>42.29</td>
<td></td>
</tr>
<tr>
<td>S by E</td>
<td>2</td>
<td>12.41</td>
<td>6.21</td>
<td>-</td>
</tr>
<tr>
<td>T by N by P</td>
<td>28</td>
<td>52.31</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>T by N by S</td>
<td>7</td>
<td>9.07</td>
<td>1.30</td>
<td>-</td>
</tr>
<tr>
<td>T by N by E</td>
<td>14</td>
<td>51.84</td>
<td>3.70</td>
<td>-</td>
</tr>
</tbody>
</table>

*Significant at .05 level.

**Significant at .01 level.
Table 3.—Continued

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>T by P by S</td>
<td>28</td>
<td>96.21</td>
<td>3.44</td>
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<tr>
<td>T by P by E</td>
<td>56</td>
<td>221.18</td>
<td>3.95</td>
<td>-</td>
</tr>
<tr>
<td>T by S by E</td>
<td>14</td>
<td>31.99</td>
<td>2.28</td>
<td>-</td>
</tr>
<tr>
<td>N by P by S</td>
<td>4</td>
<td>122.85</td>
<td>30.71</td>
<td></td>
</tr>
<tr>
<td>N by P by E</td>
<td>8</td>
<td>216.56</td>
<td>27.07</td>
<td></td>
</tr>
<tr>
<td>N by S by E</td>
<td>2</td>
<td>37.83</td>
<td>18.91</td>
<td>-</td>
</tr>
<tr>
<td>P by S by E</td>
<td>8</td>
<td>136.25</td>
<td>17.03</td>
<td></td>
</tr>
<tr>
<td>T by N by P by S</td>
<td>28</td>
<td>201.95</td>
<td>7.21</td>
<td></td>
</tr>
<tr>
<td>T by N by P by E</td>
<td>56</td>
<td>221.04</td>
<td>3.95</td>
<td>-</td>
</tr>
<tr>
<td>T by N by S by E</td>
<td>14</td>
<td>48.57</td>
<td>3.47</td>
<td>-</td>
</tr>
<tr>
<td>T by P by S by E</td>
<td>56</td>
<td>139.01</td>
<td>2.48</td>
<td></td>
</tr>
<tr>
<td>N by P by S by E</td>
<td>8</td>
<td>37.13</td>
<td>4.64</td>
<td></td>
</tr>
<tr>
<td>T by N by P by S by E</td>
<td>56</td>
<td>212.47</td>
<td>3.79</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>479</td>
<td><strong>3771.17</strong></td>
<td></td>
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</tr>
<tr>
<td>Comb. 1 (error)</td>
<td>48</td>
<td>1135.85</td>
<td>23.66</td>
<td></td>
</tr>
<tr>
<td>Comb. 2 (error)</td>
<td>336</td>
<td>1232.55</td>
<td>3.67</td>
<td></td>
</tr>
</tbody>
</table>
extraversion (high and low levels of neuroticism combined) appear in Fig. 1.

In order to make the results more comparable to previous studies which used only extreme values of extraversion and neuroticism, a two-way analysis of variance was performed on the four groups comprising high and low extraversion. The results of this analysis appear in Table 4.

Table 4. Analysis of variance for the extreme levels of extraversion.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism (N) 1</td>
<td>10.0</td>
<td>10.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extraversion (E) 1</td>
<td>1392.4</td>
<td>1392.4</td>
<td>8.1**</td>
<td></td>
</tr>
<tr>
<td>N by E 1</td>
<td>774.4</td>
<td>774.4</td>
<td>4.5*</td>
<td></td>
</tr>
<tr>
<td>Within 36</td>
<td>6168.8</td>
<td>171.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>8345.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
**Significant at the .01 level.

Both extraversion and the interaction of extraversion and neuroticism were significant. Scheffe' tests indicated that
Fig. 1. Acquisition curves for high, medium, and low extraverts.
high and low extraverts were significantly different at low neuroticism (.05 level) but not at high neuroticism. The high and low levels of neuroticism were significantly different at high extraversion (.05 level) but not at low extraversion. This relationship is shown in Fig. 2. The points that are off the lines are mean values for the medium extraversion groups. The acquisition curves for the four extreme groups appear in Fig. 3.

Questionnaire responses were not analysed for statistical significance because of the inadequate measurement and scaling techniques used. The data were inspected for any possible trends, however. One indicator that suggested a difference in the groups was the buzzer ratings. High neuroticism subjects tended to rate the buzzer as more noxious than the low neuroticism subjects (56 vs 44 for sums of the ratings). When subjects were rated as to degree of awareness, only the low neuroticism-low extraversion group differed from the other groups, tending to be slightly more aware. The groups did not differ greatly in the relative use of position, content, sequence or other response tendencies when attacking the problem.

It was possible to obtain scores on the verbal part of the College Qualifying Tests for 37 of the subjects. When correlated with total correct responses minus operant
Fig. 2. The interaction of extraversion and neuroticism.
Fig. 3. Acquisition curves for the extreme levels of extraversion and neuroticism.
level an insignificant coefficient of .169 was obtained.

The grades of the subjects used in the experiment were also available. Subjects who withdrew or received incompletes were eliminated and an analysis of variance performed on the grades of those remaining. The results of this analysis appear in Table 5. No significant differences were found.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>1</td>
<td>3.56</td>
<td>3.56</td>
<td>3.18</td>
</tr>
<tr>
<td>Extraversion</td>
<td>2</td>
<td>1.88</td>
<td>.94</td>
<td>-</td>
</tr>
<tr>
<td>N by E</td>
<td>2</td>
<td>4.41</td>
<td>2.21</td>
<td>-</td>
</tr>
<tr>
<td>Within</td>
<td>47</td>
<td>52.43</td>
<td>1.12</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>62.30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

On the basis of the computer analysis of variance alone, it might be reasonable to conclude that the results of this experiment support the Eysenck/Franks position, i.e., that conditioning is a function of extraversion and not neuroticism. However, the inclusion of the medium level of extraversion seems to obscure the statistical significance of the interaction of extraversion and neuroticism which was found when only the extreme levels were taken into consideration. As in the first experiment by Bendig and Vaughan, the interaction F ratio obtained in the three-level analysis was relatively large but not statistically significant. Why this should be is problematical. It has been suggested (Franks, 1961) that individuals who condition quickly yet give questionnaire scores in the extraverted range may, in fact, be "constitutional" introverts. That is, a person who conditions quickly and who also lives in a culture where extraversion is the socially desirable behavior, may learn that it is advantageous to appear an extravert and hence he may respond in such a manner on questionnaires. One would expect that this may be particularly true of persons who are also high on neuroticism. They may more strongly experience a need to
appear "normal"—to camouflage their true behavior—in order that they may escape social censure. It is possible, then, that the medium level of extraversion may have included a few introverts. Support, of a kind, is given to this notion in that two of the subjects who scored as medium extraverts but conditioned quickly displayed quiet and reserved behavior in the classroom. The variance in the medium level of extraversion was only slightly greater than in the extreme levels, however, so that this effect, if present, probably was not great.

A more plausible reason that the interaction did not appear as significant in the computer analysis is that the noxious stimulus may not have been sufficiently noxious to produce large enough differences in drive arousal so that they would appear in only 80 trials. This seems possible considering the ratings that were given as to the noxiousness of the buzzer. Although persons high on neuroticism did tend to rate the buzzer as more noxious than did persons low on neuroticism, the difference was small and buzzer ratings in general were low. For a good test of differences between medium and extreme levels it may be necessary to use a more noxious stimulus or to extend the number of trials. Since people are generally subjected to extensive conditioning in "real life," it may not be reasonable to expect large and statistically significant differences to appear in
a relatively short experimental arrangement.

Whatever the reasons for the lack of statistical significance of the interaction, the results are still in line with a dualistic hypothesis, i.e., that both neuroticism and extraversion are involved in the rate of conditioning. Almost all of the other investigators (e.g., Bendig and Vaughan, 1959; Field and Brengelman, 1961; Becker and Matteson, 1961) have used extreme scorers on questionnaire measures as subjects in order to maximize the likelihood of obtaining people actually characterized by the trait in question. This is also true of the research involving anxiety as measured by the Taylor Manifest Anxiety Scale. Jones himself hypothesizes only about individuals at extreme levels of neuroticism and introversion-extraversion. It seems legitimate, therefore, to consider the results obtained using extreme groups separately from those in which the medium level of extraversion was included.

The significant interaction obtained with extreme groups, when further analysed, shows introverts to be superior to extraverts at low levels of neuroticism but not at high levels. High neuroticism subjects were superior to low neuroticism subjects at high levels of extraversion but not at low levels. Assuming a certain comparability of tasks, these results correspond quite closely to those found by Lykken in his avoidance situation. The neurotic
sociopaths, scoring high on the MAS and the MMPI PD scale, would presumably correspond to the subjects characterized by high neuroticism and high extraversion. The primary sociopaths, scoring high on the PD scale but low on the MAS, would presumably correspond to the subjects characterized by high extraversion and low neuroticism.

Lykken found similar results to those found in the present experiment, i.e., neurotic sociopaths learned better than did primary sociopaths and normals did better than either of these groups.

The experiment by Lykken is the only one reported which is comparable to the present one in the sense that an instrumental avoidance conditioning task was used and measures were obtained that related to both neuroticism and extraversion. Most other studies that have obtained measures of extraversion and neuroticism (or anxiety) have used the presentation of a positive stimulus rather than the withholding of a negative one as reinforcement. While it can be assumed that neuroticism is a relevant drive even in these experiments by virtue of ego threats and so on, the degree to which it is aroused may not be sufficient to produce significant results. It is possible, in fact, that small differences in drive arousal would serve only to obscure the significance of any effects due to extraversion. A similar argument can be made concerning correlational
studies. If an interaction is the real state of affairs, linear correlations between conditioning and extraversion and between conditioning and neuroticism would be expected to be low and probably insignificant.

The results also suggest some reasons for the discrepant findings when certain diagnostic groups are used. Almost all of the studies which have compared psychopaths with normals or dysthymics have found results consistent with the proposition that high extraversion interferes with conditioning. But when hysterics are compared to normals or to dysthymics the differences found are often insignificant. Providing the relative positions of these groups with respect to extraversion are as they appear in normative studies of the MPI (Knapp, 1962) and not as Eysenck has proposed (1958), this is not too surprising. Differences in extraversion between normals and hysterics and hysterics and dysthymics do not appear to be very great. In terms of the present experiment, hysterics would be someplace between the medium and low levels of extraversion. Since significant differences were not found between the medium and low levels in verbal conditioning, it would not be expected that hysterics would differ significantly from dysthymics. The difference in neuroticism between hysterics and dysthymics, if it is real, may account for some of the positive findings.
It seems unlikely that the results of this experiment can be explained by differences in intelligence, at least as it is estimated by the verbal part of the College Qualifying Test. The correlation between the CQT and conditioning was found to be low and insignificant. The possibility remains, however, that the experimental groups differed with respect to the strength of "thematic" as opposed to "formal" response tendencies and that these, rather than differences in the ease of conditioning, are responsible for the observed differences. That is, one group may be prone to respond to the content of the stimulus words while another is prone to respond to physical properties such as length or position of the words. Within either of these larger categories, some subjects may be more likely to respond to certain characteristics of the stimulus rather than others. An example is Eysenck's (1959) finding that extraverts used more "activity" verbs in making up sentences than did introverts. No evidence for this was apparent in the present experiment from either operant level performance or responses to the interview questions. An experiment in which more than one characteristic of the stimulus was correlated with reinforcement would probably give better answers to this question.

The results of the present investigation tend to
support, in part, Eysenck's hypothesis concerning
differential socialization in normal introverts and
eextraverts. For persons high on the neuroticism dimension,
however, the implications are not so clear. If neurotic
extraverts condition as well as neurotic introverts, it is
difficult to see why they are not themselves introverted.
It may be that the assumption of equal environmental press
does not hold when persons are divided into normal and
neurotic groups. It is possible that differences in
extraversion largely reflect differences in rate of
conditioning only for normal subjects. At high levels of
neuroticism, differences in extraversion may reflect
differences in socialization training more strongly than
differences in rate of conditioning.

Another possible explanation for these results
is that the learning situations which are involved in
socialization are of a quite different nature from that
involved in the present experiment. It is possible that at
another level of task difficulty or another degree of stress
the relative positions of the experimental groups with
respect to amount of conditioning would be quite different.

Although the results show general agreement with
Jones' views, a considerable amount of work will have to be
done before more adequate confirmation is even possible.
In particular, the relation between noxiousness of the
stimulus and strength of the unconditioned avoidance drive must be studied for the normal-neurotic dimension. Experimentation on the relation of different levels of extraversion and neuroticism to C.A.D. strength is necessary. A more general operational meaning must be given to the concept of "task difficulty" in order that different experimental situations may be more easily compared and in order to allow systematic variation of this factor within the same experiment. The possible interaction of task difficulty with C.A.D. strength will have to be investigated over a wide range of values of both variables. Until more is known about these variables and interactions, specific predictions for any given situation are virtually impossible.
Summary

An experiment was designed to test the relative effectiveness of three hypotheses to predict performance in verbal avoidance conditioning. The three hypotheses were: (1) a high level of neuroticism should hinder performance where there are competing response tendencies, irrespective of the level of extraversion present; (2) a high level of extraversion should hinder performance, irrespective of the degree of neuroticism present; (3) performance will depend upon both the level of neuroticism present and the level of extraversion present.

Sixty college students were divided into six experimental groups according to scores on the Maudsley Personality Inventory. The experimental groups comprised three levels of extraversion and two levels of neuroticism. A revised Taffel conditioning technique was employed with evaluative statements as the contingent response class and a loud buzzer as the noxious stimulus.

The results were interpreted as supporting the view that both neuroticism and extraversion are relevant variables in determining the rate at which conditioned responses are acquired. Implications for Eysenck's theory were discussed.
References


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