

PERFORMANCE SPEED AS A FUNCTION

OF ~~COGNITIVE SPEED~~

*Achievement, Motivation, Personality*

by Merlin W. Donald

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## CURRICULUM STUDIORUM

Merlin W. Donald was born November 17, 1939, in Montreal, Quebec. He received the Bachelor of Arts degree from Loyola College, Montreal, in 1960.

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## INTRODUCTION

Performance speed constitutes an unusually productive field of research because it straddles the worlds of clinical and experimental psychology. On the one hand, discoveries related to speed have a direct bearing on the meaning of certain intelligence test items, such as those of the digit symbol or clerical variety; on the other, the theorist finds in this field an excellent medium for the testing and construction of hypotheses related to functional efficiency.

Much previous research in this area has dealt with the instructional and task correlates of performance speed, whereas reviews of the literature by Tate (1950) and Payne (1961) lead one to conclude that study of subject correlates has been scant and inconclusive. The concern of this thesis lies in the latter realm: four subject variables, thought relevant to performance speed, are studied: approach drive (need for achievement), avoidance drive (test anxiety), extraversion, and neuroticism. They are related to performance speed in combination, rather than in isolation, because the unintelligible results of some earlier studies have been ascribed to oversimplification of real processes.

The general plan of this study is as follows: the remainder of the introduction deals with the required



definitions of terms and a brief sketch of the motivational theory underlying the design; the first chapter, with a review of the literature, and presentation in detail of the problem and hypothesis; the second chapter, with details of design, procedure, administration, scoring, and analysis; the third chapter, with a presentation and interpretation of results. The main body of the thesis is followed by a summary and conclusions, an annotated bibliography, and several appendices.

Two terms require immediate definition: "drive" and "performance speed". To deal with the latter term first, "performance speed" is operationally defined as a score on a timed test of visual-motor interaction. By visual-motor interaction is meant a specific stimulus-response-stimulus sequence in which the subject performs some motor task in response to an appropriate visual stimulus, involving speed of perception, the imprinting of certain conditioned responses or sets, and motor delay within the organism's effector systems. Because a time limit is imposed on the subject, the visual-motor test becomes a speed test, and may be regarded as a sample of the subject's functional efficiency.

The word "drive", used without qualification, means simply that which incites to action, or the dynamic force behind the behavior of organisms. Here it refers specifically

to the complex networks and patterns of adult human motivation, as described in McClelland's two-factor theory of motivation, which may be stated thus: all adult human motives are anticipatory goal states learned through the association of certain affective states with various situational stimuli. According to the pleasantness or unpleasantness of these remembered affective states, the associated stimuli cause reactions of attraction or repulsion in the organism. A motive of attraction, or positive valence, is called an "approach" motive, or appetite; one of repulsion, or negative valence, an "avoidance" motive, or anxiety. All adult drives may be regarded as specific instances of the two prototypal or master motives, appetite and anxiety.

Because of the relatively strong experimental standing of McClelland's theory, it was decided to avoid the use of isolated or instructional measures of drive, and to attempt to measure drive in terms of its components, or polar opposites, approach and avoidance.

To recapitulate briefly: performance speed is defined as a score on a timed test of visual-motor interaction, and drive as an anticipatory goal state specified according to the direction of its motive power.

The basic task and intended purpose of this paper is to explore some of the relationships between these two

## INTRODUCTION

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factors, in the context of the extraversion-neuroticism personality dimension of Eysenck.

## CHAPTER 1

### REVIEW OF THE LITERATURE

Studies relevant to this experiment fall into three categories: those dealing with the measurement of performance speed; those dealing with direction of drive and its effect on performance speed; and those dealing with personality factors thought to be related to the interaction of drive and performance speed.

#### 1. Performance Speed.

The measurement of performance speed has always been a difficult problem for psychologists; indeed, the very need for separate measures of speed has been denied by some writers, pointing to the high correlations between scores on timed and untimed tests in support of their contention.<sup>1</sup> However, as Tate points out in a review of the literature up to 1950, the majority of these early studies employed rather unrefined measures of speed, usually intelligence test items which confounded factors of error and difficulty with the factor of speed.<sup>2</sup> With few exceptions, Furneaux points out,

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1 H.J. Eysenck, Handbook of Abnormal Psychology, New York, Basic Books, Inc., 1961, p. 170.

2 M.W. Tate, "Notes on the Measurement of Mental Speed", in Journal of Educational Psychology, Vol. 41, 1950, p. 219-236.

"studies have suffered from an astonishing degree of technical inadequacy".<sup>3</sup>

In today's literature on performance speed, two important trends may be noted. The first may be called a statistical approach, characteristic of such researchers as Tate, Furneaux, and Rimoldi, the purpose of which is to abstract speed factors from human motor, cognitive, and perceptual behavior by means of deductive hypotheses and factor analysis. The second approach is characterized by a search for the correlatives of performance speed, and has a less strictly determined methodology, as found in the work of Babcock, Shapiro, and Nelson.

The main contribution of the first group has been to provide ample rational and factor analytic evidence for inferring the existence of theoretically "pure" speed factors in human performance.<sup>4</sup> However, there have been few attempts to create tests which measure these pure factors. Perhaps the most refined battery of tests produced by this group are Furneaux's Nufferno Speed Tests,<sup>5</sup> designed to measure speed of problem-solving independent of power and level

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<sup>3</sup> Eysenck, Op. Cit., p. 170.

<sup>4</sup> H.J.A. Rimoldi, "Personal Tempo", in Journal of Abnormal and Social Psychology, Vol. 46, 1951, p. 283-303.

<sup>5</sup> W.D. Furneaux, The Nufferno Manual of Speed Tests, London, The Institute of Psychiatry, 1956, distributed by the National Foundation for Educational Research.

factors. Although it has been used widely in recent experimentations in England, it was rejected for use in this experiment because it has been shown to differentiate between clinical groups less effectively than tests involving motor as well as mental effort,<sup>6</sup> and hence would probably be equally less effective in differentiating the experimental groups in this study.

The contribution of the second group referred to has been the establishment of certain "leads" regarding probable correlatives of speed. A very wide variety of tests has been used by these experimenters, including such commercially available tests as the Otis Digit Symbol Test (presently the Digit Symbol Subtest of the Wechsler scales of intelligence), the Clerical Speed and Accuracy section of the Differential Aptitude Tests, and the General Clerical Test. The first of these involves an error factor, the last two lack the face validity needed for use in this study, hence all three must be rejected.

Before considering the applicability of any other tests it would be well to consider certain criteria proposed by Turneaux: 1) tests used should be of an equal and easy

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6 Eysenck, Op. Cit., p. 226.

difficulty level; and, b) only correctly solved problems should be used in the estimation of performance speed.<sup>7</sup>

Tate also forwards several criteria: a) typical intelligence test items, of the completion rather than the multiple choice type, should be used; and, b) the individuals being measured must respond with the same degree of accuracy; that is, the error factor must be controlled, either by controlling the difficulty level of the items, or by timing each individual item, and using only correctly solved problems in scoring.<sup>8</sup>

In 1957, O'Connor used in a study of work decrement in schizophrenics a very simple test of underlining even numbers and cancelling odd numbers in lists of random numbers.<sup>9</sup> As indicated by Jones, this test was practically error-free, hence essentially a speed test.<sup>10</sup> It fulfills the conditions set by Tate and Furneaux, having an easy and consistent level of difficulty and relative freedom from the error factor. Furthermore, it involves a motor factor,

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7 W.D. Furneaux, "Some Speed and Error Difficulty Relationships Within a Problem-Solving Situation", in Nature, Vol. 170, 1952, p. 37-81.

8 Tate, Op. Cit., p. 221.

9 N O'Connor, "Reminiscence and Work Decrement in Catatonic and Paranoid Schizophrenics", in Bulletin of the British Psychological Society, Vol. 32, 1957, p. 3.

10 Eysenck, Op. Cit., p. 518.

as did the Babcock tests, hence should be quite effective in differentiating groups; and it is easy to administer in group form, not requiring timing of individual items, allowing greater control of experimental conditions.

For the above reasons, this test, in a slightly modified form, was adopted for this study. As mentioned in the introduction, it is a measure of speed of visual-motor interaction, considered here as a sampling of the "performance speed" of the individual. For purposes of theoretical interpretation, performance speed will in turn be considered a partial indication of the functional efficiency of the organism.

The test used is described in detail in the chapter "Experimental Design", and reproduced in Appendix 4.

## 2. Direction of Drive.

In the Introduction, a brief account was given of McClelland's two-factor theory of drive. It was observed that any consideration of the relationship of drive to performance speed should differentiate approach from avoidance drive, since it is possible that each has its own specific effect on behavior. In the following section, McClelland's rationale and methodology for the measurement of such a bipolar dimension of drive will be exposed.



One outstanding characteristic of human motives is that they consist of essentially imaginal data.<sup>11</sup> In other words, the S-R-S sequences associated with certain patterns of affective arousal are represented in the imagination; environmental stimuli which arouse these images arouse the corresponding affect, this affect in turn bringing to mind more relevant images, so that a motivational circuit is established. Hence a dominant motive should directly influence the imaginal content available to consciousness at a given moment, and it follows that a sample of a person's fantasy should give some indication of his motive state, providing the observer knows what categories of images to look for.<sup>12</sup>

It was with this in mind that McClelland adopted the Thematic Apperception Technique as a means of measuring motivation; by manipulating the experimental conditions under which subjects produced imaginative stories, he found that significant differences appeared from one condition to

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11 John W. Atkinson, "Exploration Using Imaginative Thought to Assess the Strength of Human Motives", in Nebraska Symposium on Motivation, University of Nebraska Press, 1954, p. 56-112.

12 D.C. McClelland, (ed.), Studies in Motivation, New York, Appleton-Century Crofts, 1955, p. 401.

another, in the content of the stories.<sup>13</sup> For instance, one group was administered the stimulus pictures under relaxed conditions, a second under pressure to do well. The author reasoned that the subjects under the relaxed experimental conditions would manifest less need to do well, to succeed, than would the pressured group, and that, therefore, they would produce less achievement-oriented imagery than the second group.

Using a scoring system based on Murray's TAT technique, the author found that his predictions were fulfilled: in twelve scoring categories, all related to need for achievement, there were significant differences between the groups. Taking these scoring categories, and ascribing to them values, he devised a scale and norms by which to score the intensity of need for achievement. Similar experiments were carried out with measures of the power, affiliation, and sex motives; the results have consistently shown that, as strength of experimentally-induced motives increases, imaginative stories are increasingly dominated by thoughts corresponding to the overt action or problem-solving sequence one would normally expect from a motivated person.<sup>14</sup>

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<sup>13</sup> D.C. McClelland, R.A. Clark, T.B. Roby, and J.W. Atkinson, "The Projective Expression of Needs: IV. The Effect of Need in Thematic Apperception", in Journal of Experimental Psychology, Vol. 39, 1949, p. 242-255.

<sup>14</sup> Atkinson, Op. Cit., 1954, p. 62.

The achievement motive, symbolized "n Ach" is said to be indicative of the strength of the individual's desire to succeed, to master a situation. In other words, it is a manifestation of appetite, and may be designated an approach motive.<sup>15</sup> As used in this thesis, the need for achievement is defined operationally in terms of McClelland's original experimental conditions. Since it has been shown that high n Ach groups learn faster than low n Ach groups, and that performance in moderate n Ach groups is even lower,<sup>16</sup> it would seem reasonable to expect the performance speeds of the same groups to fall into the same hierarchy.

Having outlined an approach for measuring the approach end of the drive dimension, its polar opposite, avoidance drive, or anxiety, must be examined.

Two anxiety scales were considered for use in this study: the Taylor Manifest Anxiety Scale, and the Mandler-Sarason Test Anxiety Questionnaire.<sup>17</sup> The first of these measures "manifest" anxiety, a basic or relatively permanent motivational predisposition which may or may not

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15 McClelland, Op. Cit., 1955, p. 403.

16 Ibid., p. 420.

17 G. Mandler and S.B. Sarason, "A Study of Anxiety and Learning", in Journal of Abnormal and Social Psychology, Vol. 47, 1952, p. 166-173.

be aroused by the experimental conditions.<sup>18</sup> Because it has no proven relevance to the experimental conditions,<sup>19</sup> it was judged unacceptable for this study.

The second measure, the "TAQ" concerns "test" anxiety, a more specific predisposition to react anxiously to test situations.<sup>20</sup> This second technique deals with exactly the motivational factors under study in this experiment; namely, a tendency towards an avoidance reaction in situations similar to the experimental conditions. It has been used by McClelland and his associates for similar purposes.<sup>21</sup>

Mandler and Sarason consider test anxiety to be "a learned drive with the characteristics of a strong stimulus".<sup>22</sup> They reason that this measured avoidance drive should be related to speed of performance because:

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18 A.W. Seigman, "Cognitive, Affective and Psychopathological Correlates of the Taylor Manifest Anxiety Scale", in Journal of Consulting Psychology, Vol. 20, 1956, p. 37-141.

19 Ibid., p. 37-141.

20 S.B. Sarason, G. Mandler, and P.G. Craighill, "The Effects of Differential Instructions on Anxiety and Learning", in Journal of Abnormal and Social Psychology, Vol. 47, 1952, p. 561.

21 John w. Atkinson, "The Achievement Motive and Test Anxiety", in Journal of Abnormal and Social Psychology, Vol. 60, p. 52-63.

22 Mandler and Sarason, Op. Cit., 1952, p. 166.

When anxiety has been learned as a response to situations involving intellectual achievement (e.g. test situations), two types of responses will tend to be evoked:

(a) Responses which are not task relevant: self-centred feelings of inadequacy, attempts at leaving the situation, etc.;

(b) Task relevant responses which reduce the anxiety by leading to completion of the task. These are identical with other task-relevant responses evoked by the testing situation.<sup>23</sup>

Non-relevant responses in very anxious subjects are expected to reduce performance efficiency, whereas relevant responses, which remain dominant in cases of moderate anxiety, raise efficiency.<sup>24</sup> Therefore one should expect a curvilinear relationship between performance speed and anxiety, with low anxiety subjects getting the low scores one would expect from poorly-motivated persons; medium anxiety subjects higher scores, since their avoidance reaction is of such an intensity that the task-relevant responses are not paralysed by irrelevant ones; and high anxiety subjects lower scores, since their anxiety has confounded their efficiency level.<sup>25</sup>

Of course, experimental results may not always or even usually agree with the predictions above, for the reason that motivation involves the interaction of both approach and avoidance tendencies, and most motivational

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<sup>23</sup> Mandler and Sarason, Op. cit., 1952, p. 167.

<sup>24</sup> Ibid., p. 167.

<sup>25</sup> Ibid., p. 168.

states are "conflict" states rather than purely at one extreme or the other of the continuum.<sup>26</sup>

The two approaches to measuring drive have been briefly explained. It remains to clarify the way in which the unitary dimension called "drive" shall be defined.

Drive will be defined in terms of a three-point dimension, the three points being "approach" (high need for achievement plus low anxiety), "conflict" (either high anxiety with middle or high n Ach, or low anxiety with middle or low n Ach), and "avoidance" (high anxiety plus low n Ach). This method of scaling has been used by Raphelson, whose results gave indications that the scale might have some experimental usefulness.<sup>27</sup> Detailed discussion of the two tools used for measuring drive, i.e., the questionnaire and the TAT technique, will be found in the chapter entitled "Experimental Design"; reproductions, in Appendices 1 and 2.

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26 J.W. Atkinson, (ed.), Motives in Fantasy, Action and Society, Princeton, Van Nostrand, 1958, p. 340.

27 Ibid., p. 340.

### 3. Personality Correlates of Performance Speed.

Eysenck, in his factor analytic studies of human behavior, has isolated a "neuroticism" factor, indicative of vulnerability to neurosis, an over-reactive, labile type of autonomic nervous system, and in general a tendency to maladjustment.<sup>28</sup> He suggests that a high neuroticism score (N) on the Maudsley Personality Inventory is obtained by persons who react too strongly and too persistently to strong external stimuli, and that therefore it is a general factor in human motivation.<sup>29</sup>

In McClelland's terms, Eysenck's scale would be said to measure a propensity to avoidance reactions in threatening situations. It would not be said to measure the strength of the avoidance reaction itself; this is done with another tool, the TAQ; but merely to indicate the vulnerability of a person to such a reaction. In the light of past research, a small but significant correlation should occur between the N scale and the TAQ: (the correlation between N and the Taylor scale has on one occasion

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28 H.J. Eysenck, Manual of the Maudsley Personality Inventory, London, University of London Press, 1959, p. 3.

29 H.J. Eysenck, The Structure of Human Personality, London, Methuen, 1959, p. 137.

been .92; the correlation of the Taylor scale with the TAQ is reported as .53).<sup>30</sup>

It has been demonstrated that the drive level of a high N population rises in avoidance situations.<sup>31</sup> Hence this scale should have a direct bearing on our expectancies on the visual-motor test.

Furthermore, Furneaux and Payne (1961) hypothesize that speed of performance on perceptual tests has a curvilinear relationship to the neuroticism (N) factor.<sup>32</sup> In other words, low N, indicating a very stable drive level, is correlated with low speed, as expected in unmotivated performance. Medium N, indicating usually a tendency to react strongly to avoidance situations, is correlated with faster performance speed. Finally, high N is correlated with a drop in performance speed; it has been hypothesized that this drop is due to the fact that the subject's very high anxiety produces conditioned responses of its own which interfere with the task at hand. This explanation is quite in agreement with the hypotheses of Mandler and Sarason, quoted above, referring lowered performance speed under high

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<sup>30</sup> Atkinson, Op. Cit., 1958, p. 347.

<sup>31</sup> H.J. Eysenck, (ed.), Handbook of Abnormal Psychology, New York, Basic Books Inc., 1961, p. 282.

<sup>32</sup> Ibid., p. 283.



anxiety to non-relevant responses interfering with task performance.

Since there is a strong possibility that neuroticism may be one of the personality variables intervening between drive and performance speed, it will be controlled in the experimental population. A discussion of the measure used for this dimension is found in Chapter II.

Another finding of Eysenck and his associates is relevant to this study; namely, that highly introverted people (as measured by the Maudsley Personality Inventory) are more conditionable than extraverted people.<sup>33</sup> Hence, since the introvert is more conditionable, the conditioned responses associated with his anxiety (i.e., those irrelevant to the task) are both stronger and more numerous than those of the extravert.<sup>34</sup>

Combining this factor, of extraversion, with that of neuroticism, Payne predicts that the performance speed of neurotic introverts will be the slowest of the four obtained groups, since these people are both susceptible to paralysing anxiety, and slowed down by strong interfering conditioned responses. Stable introverts, stable extraverts, and

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<sup>33</sup> Eysenck, (ed.) Handbook of Abnormal Psychology, Op.Cit., p. 283.

<sup>34</sup> Ibid., p. 283.

neurotic extraverts should perform faster, in that ascending order.<sup>35</sup> These predictions were in part supported by Furneaux's analysis of the speed test results in normal students.<sup>36</sup>

A brief summary of the last three sections is in order before stating the hypotheses for the experiment proper. Five experimentally supported findings have contributed to the approach of this study.

The first is that for the present purposes, the simplest and most effective measure of performance speed would probably be a visual-motor task, of an easy and consistent difficulty level, of the completion, rather than the multiple-choice type.

The second is that methods of established validity do exist for the measurement of bipolar drive as defined in McClelland's theory.

The third is that approach drive, as measured by these instruments, appears to have a positive effect on performance speed, whereas high levels of avoidance drive appear to have a lowering effect on the same.

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<sup>35</sup> Eysenck, (ed.), Handbook of Abnormal Psychology, Op. Cit., p. 284.

<sup>36</sup> Ibid., p. 283.

The fourth is that neuroticism, or an openness to high levels of affective disturbance in avoidance situations, appears to be a general factor in human motivation, and to have a curvilinear relationship to performance speed.

The fifth is that conditionability, as measured by the E scale of the Maudsley Personality Inventory, appears to be related to performance speed in that irrelevant conditioned responses are stronger and more detrimental to the performance of introverted, or conditionable, people.

#### 4. Problem and General Hypothesis.

The problem with which this thesis deals may be stated in the form of two questions: (a) what are the differential effects, on performance speed, of two opposing directional tendencies of drive? and, (b) how do the personality variables of neuroticism and conditionability serve as intervening variables in these effects?

In attempting to answer these questions, of course, there will be incidental agreement or disagreement with the hypotheses of Payne, Furneaux, Atkinson, and Mandler and Sarason, stated above.

The following is the general null hypothesis of this study: performance speed is a function of neither drive direction nor personality type.

## CHAPTER II

### EXPERIMENTAL DESIGN

This chapter deals with details of design, procedure, administration, scoring, and analysis, and is divided into six sections treating, respectively, the tools of measurement, the sample, details of the administrative procedure, scoring and scoring reliability, the statistical procedures to be used for analysis of the results of the experiment, and the operational hypotheses.

The aim of the design about to be presented is the collection of the greatest possible amount of information relevant to the problem with, at the same time, maximum economy of time and expense. In general terms, the experimental procedure is as follows: four tests, in two administrations, are given to one hundred subjects, yielding five sets of information on each subject: a speed score, an approach drive score, an avoidance drive score, an extraversion score, and a neuroticism score. According to his scores on the drive measures, each subject is allotted a position on a "drive" dimension; according to his scores on the last two measures, each is allotted a position on a "personality" dimension. Then the mean speed scores in each category of drive are computed, controlling for the four

personality types. The resulting trends are tested for statistical significance.

### 1. The Tools.

Performance speed is measured by means of a test consisting of a series of vowels and consonants randomly selected from a pool of five vowels and five consonants, printed in twenty lines of forty letters each. The subject is required to cancel vowels with a horizontal line, and consonants with a vertical line, without skipping any letters. A time limit of four and one-half minutes is imposed on the subjects to encourage maximum variability without noticeable fatigue effects, and to prevent completion of the test. Scores on this test are expressed in terms of the total number of letters cancelled. Tests are scored for errors as well, but this factor is not included in the total score because the factor was found to be of no importance: out of the total population of ninety-nine, none had more than two errors, and over ninety per cent of the tests were error-free.

Two administrations of the test, spaced exactly one week apart, were given to the same population to determine the test-retest reliability of the instrument. The Pearson product-moment coefficient of stability was .80, significant at the .001 level of confidence. The

distribution obtained from the first administration was almost perfectly normal, with a mean of 306.7, standard deviation of 66, and a range from 123 to 473. The second distribution was slightly positively skewed, with a mean of 424.9, standard deviation of 85.5, and a range from 201 to 675. The smallness of the mean of the first administration is due to the fact that subjects were allowed only three and one-half minutes to complete the test; in the week following it was decided to extend the limit to four and one-half minutes for the reasons mentioned above. Despite the change in timing, the reliability coefficient was satisfactory. Only the data of the second administration was used in the analysis and interpretation.

Approach drive, or need for achievement, is measured by means of McClelland's adapted TAT technique,<sup>1</sup> in which the experimental population is exposed to ambiguous picture stimuli and asked to write stories about them. Four pictures were used to elicit the stories: numbers 2, 8, 1, and 7, in that order, as recommended and listed by Atkinson.<sup>2</sup> (See Appendix 3). This particular set of pictures was

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1 D.C. McClelland, J.W. Atkinson, R.A. Clark, and E.L. Lowell, The Achievement Motive, New York, Appleton-Century Crofts, 1953, p. 158.

2 J.W. Atkinson, (ed.), Motives in Fantasy, Action and Society, Princeton, Van Nostrand, 1958, p. 803.

selected for two reasons: first, it has been widely used in past literature on achievement imagery in college populations; and, second, it has been shown to be the most productive of achievement imagery of all the sets listed.<sup>3</sup>

During the testing session, each picture was projected on a screen for twenty seconds; immediately after each projection the subjects were given four minutes to write their stories on sheets of paper 8½" by 14" on which there were four sets of questions:<sup>4</sup>

What is happening here? Who are the people in the picture? What are they doing?

What led up to the situation? What went on before?

What is being thought or felt? What is being wanted?

What will happen? What will take place in the future?

McClelland used these questions to ensure stories possessing enough structure to enable scoring them according to his system. The pictures were not exposed more than twenty seconds because it was found that longer exposure led to more literal description and considerably less personal fantasy.<sup>5</sup>

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<sup>3</sup> Atkinson, Op. Cit., 1958, p. 803.

<sup>4</sup> D.C. McClelland, (ed.), Studies in Motivation, New York, Appleton-Century Crofts, 1955, p. 407.

<sup>5</sup> Ibid., p. 407.

The validity of this method is testified, first of all, by the method used to derive it: significant differences did occur from one experimental condition to another, and the cause of the changes in imaginal content was inferred to be the change in motive state caused by the conditions.<sup>6</sup> It is further testified by a large number of studies relating need for achievement to level of aspiration, learning, recall of incomplete tasks, risk-taking, perception, and memory, in which the measure was shown to have considerable relational fertility. McClelland argues:

Subsequent chapters present ample evidence that fantasy is easily influenced by induced motivational states and that measures based on such alternations in fantasy (...) are responsible for the creation of a larger body of empirically-based knowledge about human motivation than any other method. (...) this superiority is not accidental, measuring motivation in fantasy has certain intrinsic methodological advantages over self-descriptions or judgments by others (...).<sup>7</sup>

As to the reliability of the method, Atkinson reports a corrected Spearman-Brown reliability coefficient of .78 between two equivalent sets of three pictures.<sup>8</sup> Other split-half and test-retest reliabilities have been

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6 D.C. McClelland, R.A. Clark, T.B. Roby, and J.W. Atkinson, "The Projective Expression of Needs: IV. The effect of Need in Thematic Apperception", in Journal of Experimental Psychology, Vol. 39, 1949, p. 249.

7 Atkinson, Op. Cit., 1958, p. 37.

8 McClelland, et al., Op. Cit., 1953, p. 191.



somewhat lower.<sup>9</sup> McClelland suggests that low correlations reported after two administrations of the same picture stimuli may result from the subject's avoidance of response repetition in successive performances, and that the apparently low test-retest reliability of scores derived from such measures is a function of "a set of response variability".<sup>10</sup> McClelland indicates that "fantasy is intrinsically less stable" than other techniques of measuring motivation such as self-ratings because its very sensitivity causes it to be influenced by variables such as apparent intent of the test, or the relationship of the subject to the administrator. But, he adds:

(...) its advantages in terms of other criteria are so great that the extra effort needed to attain stable results by controlling the extraneous factors that influence it seems eminently worthwhile.<sup>11</sup>

In an attempt to control the possible effect of extraneous variables, the following aspects of the administration were copied from past literature: age and sex of the administrator, selection and serial order of slides, all time limits, size of writing paper, locale of testing

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9 McClelland, et al., Op. Cit., 1953, p. 191.

10 D.C. McClelland, Note on Cyclical Effects in Successive Administrations of the TAT to the Same Persons, unpublished paper, Wesleyan University, 1956.

11 Ibid.

sessions, question-headings for the stories, pretest verbal instructions, including the intent of the test, and the age, sex, and education of the subjects. These factors are treated in detail in later sections, as are the scoring norms and procedures.

The third measuring instrument used in this experiment, the Mandler-Sarason Test Anxiety Questionnaire,<sup>12</sup> consists of fifteen questions about the student's subjective experiences in the group testing situation such as uneasiness, accelerated heartbeat, perspiration, emotional interference, and worry before and during a testing session. Subjects were requested to mark their answers for each question along a 7<sup>1</sup>/<sub>8</sub> " graphic scale with endpoints and midpoint indicated. Although the original questionnaire consisted of thirty-seven questions in three rather similar sections, Atkinson reported that the three sections had intercorrelations of better than .90, hence any one of the three sections could be used as a measure.<sup>13</sup> Section I, fifteen questions on group tests, was used here.

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<sup>12</sup> G. Mandler and S.B. Sarason, "A Study of Anxiety and Learning", in Journal of Abnormal and Social Psychology, Vol. 47, 1952, p. 166-173.

<sup>13</sup> John W. Atkinson, Personal Communication to the Author, March 11, 1962.

The split-half reliability (odd vs. even questions) as calculated by the Spearman-Brown prophecy estimate, is reported to be .91, and test-retest reliability is .82.<sup>14</sup> In an attempt to establish the face validity of the questionnaire, Mandler, without knowledge of the subject's questionnaire standing, rated each subject's behavior according to five criteria of overt anxiety manifestations (perspiration, excessive movements, inappropriate laughter and exclamations, questioning of instructions, hand movement). These ratings were dichotomized into a high anxiety and low anxiety group and compared with questionnaire ratings. The agreement was significant at better than the .001 level of confidence with a point of correlation ( $\phi$ ) of .59.<sup>15</sup> As estimates of concurrent validity, Raphelson found the following correlations with tools supposedly sensitive to the same general factor of drive: TAQ - Taylor scale, .53 (significant at the .01 level of confidence); and TAQ - n Ach., -.43 (significant at the .05 level of confidence).<sup>16</sup> Perhaps the strongest indications of validity are found in the studies reported in Chapter I.

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14 Mandler and Sarason, Op. Cit., 1952, p. 167-169.

15 Ibid., p. 169.

16 J.W. Atkinson, Op. Cit., 1958, p. 343.

One measure remains to be discussed: the Maudsley Personality Inventory.<sup>17</sup> This scale measures each of two traits, neuroticism and extraversion, by means of forty-eight questions selected by Eysenck after lengthy item and factor analyses. (See Appendix 3) The validity of the scale is supported by the results of seven standardization groups; in accord with the theory underlying the construction of the scale, all neurotic groups are higher on neuroticism than normal groups, and hysterics and psychopaths are more extraverted than the dysthymics, all at the .01 level of confidence.<sup>18</sup> Furthermore, the Heron neuroticism and Sociability scales correlate .64 and .80 with the corresponding MPI scales.<sup>19</sup>

Regarding the reliability of the MPI, Eysenck states:

Both split-half and Kuder-Richardson reliability coefficients have been calculated on many samples. For the neuroticism scale, these values nearly all lie between .85 and .90; for the Extraversion scale, they lie between .75 and .85 with the majority above .80. Retest reliabilities are available only on about 100 cases; they are .83 and .81 respectively.<sup>20</sup>

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17 H.J. Eysenck, Manual of the Maudsley Personality Inventory, London, University of London Press, 1959, 8 p.

18 Ibid., p. 5.

19 Ibid., p. 4.

20 Ibid., p. 4.

## 2. The Sample.

The experimental population consisted of one hundred male undergraduates at Loyola College, Montreal, taken from Freshman Science and Arts classes. The tests were administered to them in regular classsessions, no warning having been given before hand on either administration, to avoid a so-called "volunteer bias" in the population. Ages of the subjects ranged from sixteen years four months to twenty-three years. Mean age was eighteen years six months. Ten per cent of the sample were of European origin; ten per cent of Chinese origin; and eighty per cent were native-born Canadians.

Regarding the distribution of the subject variables under study, only test anxiety was normally distributed, with scores ranging from 3 to 11, a median of 7.75 and a mean of 7.30; n achievement scores were distributed multimodally and positively skewed, with scores ranging from -3 to 20, a median of 2.5 and a mean of 3.59; neuroticism scores formed a bimodal mesokurtic distribution ranging from 2 to 45 with a median of 26 and a mean of 25.6; extraversion, a bimodal, negatively skewed distribution ranging from 4 to 46 with a median of 29, and a mean of 28.03. The n Ach mean is slightly, but not significantly higher than the mean reported by McClelland for his neutral groups. Similarly,

the E mean is slightly, but not significantly, higher than Eysenck's reported mean for American students. On the other hand, the N mean is 4.7 points higher than Eysenck's American students, approaching significance, which may indicate an atypical population regarding emotional vulnerability to stress.

### 3. Details of Administration.

The tests were administered in two regular classroom periods to Freshman Science and Arts students at Loyola College, Montreal. During the first fifty-minute session, the Maudsley Personality Inventory, the TAT measure of need for achievement, and the performance speed test were administered; during a second twenty-minute period one week after the first, the same students were given the Mandler-Sarason TAQ, and the performance speed test. The following factors were constant for both administration: the administrator and five proctors were male, in their early twenties, and not associated with the faculty of the college; the subjects were given no warning and all attending students were required to take the tests to avoid a "volunteer bias" in the population; and the sessions were held in the students regular classroom.

The atmosphere of the first administration was serious but not coercive or particularly stressful; the main

purpose was to obtain TAT and MPI scores under motivationally neutral conditions; speed scores from this administration were used only in the test-retest reliability of the instrument.

The following verbal instructions preceded the first test:

Because you represent a good cross-section of our college populations, you have been chosen as victims for a psychological study I have been asked to conduct. During the next hour you will be given a series of tasks and questionnaires and I would ask you to carry them out as honestly and as well as possible. At the end of the hour I will give you a clearer idea of what you have gone through; meanwhile, however, I would ask your cooperation. I can assure you of only two things: you will be studied only as a group, not personally as individuals; and you will probably find the next hour an interesting experience.

At this point the MPI was administered, adhering closely to the procedure outlined by Eysenck.<sup>21</sup> Following this, the TAT measure was administered; subjects were given four minutes to write a story after each slide was projected. All procedures here conformed to McClelland's recommendations.<sup>22</sup>

Finally, the speed test was administered, preceded by the following introduction:

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21 Eysenck, Op. Cit., 1959, p. 7.

22 McClelland, Op. Cit., 1955, p. 420.

This last phase of the experiment looks de-ceivingly short and simple. However, as you will find out, this little test is very sensitive to emotional fluctuations and disorders. This test will be timed. Do as well as you can, for the results of this test will be compared with results from other colleges. Go as fast as you can and please stop at the exact moment I tell you.

The above preamble served a double purpose: 1) it gave face validity to an otherwise unimpressive test; 2) it duplicated to some extent the stressful atmosphere of the second administration without affecting the previously administered TAT or MPI.

The atmosphere of the second administration resembled fairly closely McClelland's stressful "failure" or "achievement-oriented" conditions.<sup>23</sup> General procedure differed from the first session only inasmuch as the students were told that their scores on the first speed tests were much lower than the other colleges of the study, and lower than the experimenter expected. They were urged to listen carefully to the instructions and to work as fast as possible. The speed test was then given, and the subjects appeared to be quite engrossed with this task. The TAQ was administered immediately afterwards, to close the testing.

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23 McClelland, et al., Op. Cit., 1949, p. 245.



Because no control was possible on attendance, only ninety-nine of the 131 students were present at both sessions. Out of this ninety-nine, several students had incomplete, hence useless, TAQ's, and others had to be eliminated from some calculations because of tests of doubtful validity, hence the total number of subjects employed in the statistical analysis varied from eighty-nine to ninety-six.

#### 4. Details of Scoring.

The MPI, TAQ, and speed tests were scored with hand keys, and rescored by another person to minimize error. The scoring of the TAT responses was a more complex procedure.

McClelland's method for scoring n achievement<sup>24</sup> imagery consists of counting the frequency with which certain need-press combinations occur in the responses of subjects to TAT pictures. The following need-press categories are looked for:

- Achievement Imagery (AI)
- Stated need to achieve (N)
- Expectancy of success (Ga+)
- Expectancy of failure (Ga-)
- Activity instrumental to achievement
  - Successful (I+)
  - Doubtful Outcome (I?)
  - Failure (I-)

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24 McClelland, et al., Op. Cit., 1949, p. 245.

Obstacles or past failures  
   In subject (Bp)  
   In environment (Bw)  
 Affect associated with a goal of attainment  
   Pleasant (G+)
   Unpleasant (G-)  
 Nurturant Press (Nup)  
 Achievement thema dominant in story (Ach Th)

When achievement imagery is scored (AI), the other categories are also scored, each category having a score value of one (1). A subject's total n achievement score is calculated simply by adding up the total number of categories manifesting themselves in his four stories; when a story has imagery only indirectly or doubtfully related to achievement, it is scored 0; a story completely unrelated to achievement is scored -1. Thus the theoretical range of n achievement scores is from -4 to 44; in this population, scores ranged from -3 to 20.

Following Atkinson's recommendations for training scorers in this method,<sup>25</sup> two scorers practised for one week until the rank order correlation of their joint judgment with that of the "expert" scorers in the practice exercises was .87. An index of intrascorer reliability was obtained in the following way: an index of consistency was calculated for each of the scoring categories by means of the formula:

$$\frac{J_a - J_b}{2(J_{ab})}$$

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25 Atkinson, Op. Cit., 1958, p. 800.

where  $J_a - J_b$  is the total number of times the category appears on the scoresheets of both judges, and  $2J_{ab}$  is twice the number of times there is mutual agreement on this occurrence. Then each category index was weighted in proportion to the frequency of occurrence of the category, the resulting weighted indices were totalled, and this total was divided by the sum of the category weights, giving a reliability index of .85.

#### 5. Statistical Procedures.

Following the scoring of the tests, and the elimination of incomplete and invalid tests, all raw scores were tabulated on a single sheet, and the distributions, means, and medians of the scores from each measuring instrument were computed. Then the raw scores were transformed into categories in the following manner: for the neuroticism, extraversion, and anxiety scales, the medians were used as cutoff points to divide the population into "high" and "low" groups; for the TAT scale, the distribution was divided into three approximately equal groups: "High", "moderate" and "low". Further details are given in Table I.

From these obtained categories, the "personality" and "drive" dimensions were created as explained in Chapter I, and clarified in Table II.

Table I.-  
Cut-off Scores and Symbols for Subcategories of  
Measurement Scales.

| Measure | Group    | Cut-off<br>Score | Symbol | Meaning       |
|---------|----------|------------------|--------|---------------|
| TAQ     | High     | 8                | H      | High Anxiety  |
|         | Low      |                  | L      | Low Anxiety   |
| MPI (E) | High     | 29               | E      | Extraverted   |
|         | Low      |                  | I      | Introverted   |
| MPI (N) | High     | 26               | N      | Neurotic      |
|         | Low      |                  | S      | Stable        |
| TAT     | High     | 5                | +      | High n Ach.   |
|         | Moderate | 1                | 0      | Medium n Ach. |
|         | Low      |                  | -      | Low n Ach.    |

Table II.-

Personality and Drive Dimension Subcategories Obtained  
from Scale Interaction.

| Dimension   | Symbol | Meaning            |
|-------------|--------|--------------------|
| Drive       | +L     | Approach           |
|             | -L     | Neutral            |
|             | OL     | Conflict           |
|             | OH     | Conflict           |
|             | +H     | Conflict           |
|             | -H     | Avoidance          |
| Personality | NI     | Neurotic Introvert |
|             | SI     | Stable Introvert   |
|             | SE     | Stable Extravert   |
|             | NE     | Neurotic Extravert |

The chi-square method<sup>26</sup> was then used to determine the homogeneity and independence of the scale categories and the personality and drive dimensions.

Three steps remained: first, calculation of the mean speed scores for each of the obtained categories; second, testing by means of the t technique,<sup>27</sup> the statistical significance of differences between these means; and, finally, the construction of graphs to illustrate the trends discovered.

#### 6. Predictions and Operational Hypotheses.

The theoretical background given in Chapter I leads to the following predictions:

1) regarding the relationship of direction of drive to performance speed: taking the (-L) group as a motivational neutral group (low scores on both tests), the following groups should have higher mean scores: (-H) and (-L); and the following groups lower mean scores (OH), (OL), and (-H).

2) regarding the relationship of personality to performance speed: mean speed scores of the personality

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26 L.-T. Dayhaw, Manuel de Statistique, Ottawa, Editions de l'Universite d'Ottawa, 1958, p. 373-404.

27 Ibid., p. 355-372.

groups should fall in the following ascending order: NI, SI, NE, SE. It will be remarked that in predicting that stable extraverts will score highest, the writer disagrees with Payne's position, stated in Chapter 1. The reason for this is quite simple: the writer believes that there is not sufficient evidence to assume that a high score on the E scale indicates a conditionability level so low as to be unaffected by anxiety or emotional stress in general. It would therefore seem reasonable to expect neurotic extraverts to score lower than stable extraverts in a stressful situation, rather than higher, as Payne predicts.

3) regarding the combined interactions of drive and personality with speed, it would be inadvisable to make predictions because less is known about the intensity than about the nature of the subject variables being measured, and prediction in this case would assume a more complete knowledge of their intensities.

Keeping in mind the stated operational definitions of terms, the following operational null hypotheses have been formulated:

1) There will be no statistically significant differences between the mean speed scores of any of the personality groups.

2) There will be no significant differences between the mean speed scores of any of the drive groups.

3) There will be no significant differences between the mean speed scores of any of the groups formed from the interaction of personality with drive.



## CHAPTER III

### RESULTS

The results of this experiment are presented in the following four subsections, discussing respectively the independence of the scales of measurement, the interaction of drive and performance speed, the interaction of personality variables and performance speed, and the combined interactions of all the variables in the study.

#### 1. Independence of Scales of Measurement.

The chi-square method<sup>1</sup> was used to determine the extent to which the four measures of subject variables were independently variable. Results (Table III) indicate no statistically significant interactions between any two measuring instruments.

The same method was applied to the measures combined into the two dimensions "drive" and "personality" as described in the previous chapter. Results (Table IV) of this analysis indicate that the two dimensions vary independently of one another. Although it may be objected that the theoretical frequencies of the latter analysis were too small to permit the use of chi-square, the method was

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<sup>1</sup> L.-T. Dayhaw, Manuel de Statistique, Ottawa, Editions de l'Universite d'Ottawa, 1958, p. 373-404.

Table III.-

Frequencies and Chi-Squares of the Interactions Between Four Measures of Subject Variables in the Experimental Population.

| Factor  | Group | Neuroticism |    |    |          | Extraversion |    |    |          | n Achievement |     |     |    |          |
|---------|-------|-------------|----|----|----------|--------------|----|----|----------|---------------|-----|-----|----|----------|
|         |       | S           | N  | df | $\chi^2$ | I            | E  | df | $\chi^2$ | (-)           | (0) | (-) | df | $\chi^2$ |
| Anxiety | H     | 21          | 20 | 1  | .013     | 23           | 18 | 1  | 2.27     | 12            | 12  | 17  | 2  | 1.22     |
|         | L     | 26          | 26 |    |          | 21           | 31 |    |          | 17            | 19  | 16  |    |          |
| n Ach.  | (+)   | 19          | 15 | 2  | .56      |              |    |    |          |               |     |     |    |          |
|         | (0)   | 15          | 17 |    |          |              |    |    |          |               |     |     |    |          |
|         | (+)   | 17          | 16 |    |          |              |    |    |          |               |     |     |    |          |
| Extrav. | E     | 25          | 27 | 1  | .52      |              |    |    |          |               |     |     |    |          |
|         | L     | 26          | 21 |    |          | 19           | 18 | 15 | 2        | 1.48          |     |     |    |          |

at one degree of freedom, (df), the chi-square ( $\chi^2$ ) must equal or exceed 6.64 to be significant at the .01 level of confidence, and 3.84 at the .05 level of confidence; at two degrees of freedom, 9.21 at the .01 level, and 5.99 at the .05 level of confidence.

Table IV.-

Frequencies and Chi-Square of the Interaction Between the Personality and Drive Dimensions in the Experimental Population.

| Class of Subject Variable |    | $f_o$  | $f_t$ | $\frac{(f_o - f_t)^2}{f_t}$ |
|---------------------------|----|--------|-------|-----------------------------|
| <hr/>                     |    |        |       |                             |
| Drive Personality         |    |        |       |                             |
| -H                        | NI | 1      | 2.56  | .9506                       |
|                           | SI | 3      | 2.97  | .0003                       |
|                           | SE | 4      | 3.10  | .2613                       |
|                           | NE | 4      | 3.37  | .1178                       |
| +H                        | NI | 4      | 2.99  | .3412                       |
|                           | SI | 5      | 3.45  | .6964                       |
|                           | SE | 3      | 3.63  | .1093                       |
|                           | NE | 2      | 3.93  | .9478                       |
| OH                        | NI | 2      | 2.56  | .1225                       |
|                           | SI | 5      | 2.97  | 1.3875                      |
|                           | SE | 0      | 3.10  | 3.3100                      |
|                           | NE | 5      | 3.37  | .7884                       |
| OL                        | NI | 4      | 4.05  | .0006                       |
|                           | SI | 3      | 4.69  | .6090                       |
|                           | SE | 6      | 4.91  | .2420                       |
|                           | NE | 6      | 5.35  | .0790                       |
| -L                        | NI | 4      | 3.42  | .0984                       |
|                           | SI | 4      | 3.96  | .0004                       |
|                           | SE | 3      | 4.13  | .3092                       |
|                           | NE | 5      | 4.49  | .0579                       |
| +L                        | NI | 4      | 3.42  | .0984                       |
|                           | SI | 2      | 3.96  | .9701                       |
|                           | SE | 7      | 4.13  | 1.9944                      |
|                           | NE | 3      | 4.49  | .4945                       |
|                           |    | N = 89 | 89.00 | $\chi^2$ : 13.9870          |

With 15 degrees of freedom, at the .05 level of confidence, chi-square equals 25.00.

employed nevertheless because the distribution of the deviations ( $f_o - f_t$ ) did not appear flagrantly different from normal. Furthermore, small theoretical frequencies are expected to exaggerate the chi-square, so that the failure of this one to reach significance is more, rather than less, meaningful than if the  $f_t$  had been larger than five.

Consequent to these results, all further statistical treatment of the data assumes the independence of the measuring instruments and the dimensions of "drive" and "personality".

## 2. Direction of Drive and Performance Speed.

It will be recalled that direction of drive was operationally defined in terms of scores on two independently variable tests, McClelland's adapted TAT (measuring approach drive or need for achievement), and the Mandler-Sarason Test Questionnaire or TAQ (measuring avoidance drive or test anxiety). The TAT scores were broken down into low (-), moderate (0), and high (+) n achievement groups, and the TAQ scores into high anxiety (H) and low anxiety (L) groups. From this information a six-point approach-avoidance "drive" dimension was constructed: subjects with high n ach. and low anxiety (+L) were placed into the approach drive group; those with low n ach. and high anxiety (-H) into the avoidance

drive group; and the other four combinations (OL, -L, OH, -H) comprised the conflict group, in which ambivalent motivational forces were variously at loggerheads in the subject.

Table V presents the mean speed scores for each of the six motivational groups, and Table VI presents the *t* tests of significance of differences between these means. Figure 1 is a graphic presentation of the same information.

Two statistically significant trends are worthy of interpretation. First, the mean speed scores of the (-L) group were significantly higher than those of the (OH) group: (D: 53.81, *t*:2.1034); second, the "avoidance" group (-H) speed scores were also significantly higher than those of the (OH) group (D: 67.4, *t*: 2.4734).

The first finding is very interesting because the (-L) group is, theoretically, a type of control group in which there is an absence or near absence of both approach and avoidance drive as defined. According to the operational hypotheses, any significant deviation above or below the mean of the (-L) group should indicate performance speed changes due to motivational rather than instructional or task factors. The deviation of the (OH) group is both significant and negative, indicating that the presence of moderate approach drive with high avoidance drive reduces

Table V.-  
Means and Standard Deviations of the Speed Scores  
of Six Drive Groups.

| Group | N  | Mean   | $\sum x^2$ | $\sigma$ | $\sigma^2$ |
|-------|----|--------|------------|----------|------------|
| -H    | 12 | 454.90 | 67961      | 75.2     | 22.67      |
| +H    | 14 | 432.28 | 68882      | 70.1     | 19.20      |
| OH    | 12 | 387.50 | 30300      | 50.2     | 15.13      |
| OL    | 19 | 429.40 | 137110     | 84.9     | 20.01      |
| -L    | 16 | 441.31 | 86853      | 73.7     | 19.03      |
| +L    | 16 | 425.60 | 102796     | 80.2     | 20.71      |

Table VI.-

Differences Between the Means of Six Drive Groups  
Expressed in Terms of t Values.

| Group | +L     | OL     | -L     | OH     | +H    |
|-------|--------|--------|--------|--------|-------|
| OL    | .1316  |        |        |        |       |
| -L    | .5599  | .4264  |        |        |       |
| OH    | 1.3951 | 1.4943 | 2.1034 |        |       |
| +H    | .2331  | .1004  | .3308  | 1.7721 |       |
| -H    | .9458  | .8073  | .4608  | 2.4734 | .7624 |

At 26 df,  $p = .05$  if  $t = 2.056$ .

At 22 df,  $p = .05$  if  $t = 2.074$ .

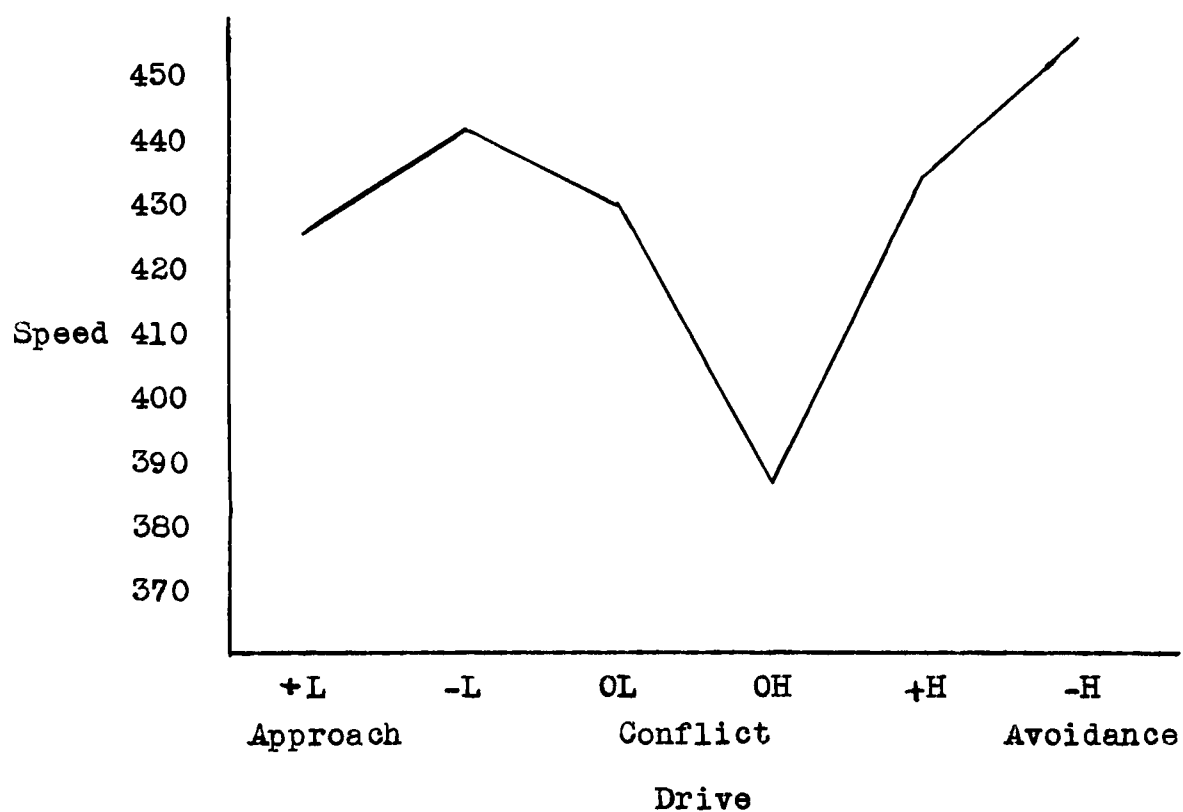


Figure 1.- Performance Speed Means of Subjects Grouped According to Direction of Drive.



the functional efficiency of the organism; this finding rejects null hypothesis number two stated in Chapter II.

None of the other drive groups deviates significantly from the "neutral" (-L) group. This may be because they are in fact unrelated to functional efficiency, or because the stress applied during the second administration was not sufficient to emphasize the differences that might have existed. More probably, it is because this experiment is too much an oversimplification of real processes, omitting from consideration other vital subject variables, such as those discussed in the next subsection.

The second significant difference (-H) - (OH) supports the contention that high anxiety is more incapacitating in an ambiguous motivational situation than in the case of a clear-cut avoidance reaction. Both the (OH) and the (-H) groups possess a similar level of anxiety (H), but this anxiety becomes detrimental to performance speed only in the (OH) group, presumably because the moderate need for achievement (O) combined with the avoidance reaction of the subject instigates interfering conditioned responses which cut down functional efficiency. This adds a new dimension to Mandler's theory, stated earlier in this thesis. It also complements Atkinson's discovery that moderate n achievement groups, probably because of the tension of conflicting motivational tendencies, learn more slowly and are more

cautious than either high or low n achievement groups;<sup>2</sup> it now appears that this slowing of the moderate n ach. group occurs only when the subject has a simultaneous avoidance reaction.

### 3. Personality Variables and Performance Speed.

It was explained in an earlier chapter that Eysenck's four categories, neurotic introvert (NI), stable introvert (SI), stable extravert (SE), and neurotic extravert (NE) comprised the "personality" dimension of this study. Table VII presents the mean speed scores of subjects in each category, and Table VIII, the t tests of significance of differences. Figure 2 is a graphic presentation of the same data.

The results are largely in agreement with the operational predictions made in Chapter II: neurotic introverts have the lowest mean speed score, followed by neurotic extraverts, stable introverts, and stable extraverts in that order. The difference between the highest (SE) and lowest (NI) groups is significant at the .05 level of confidence, (D:53.76, t:2.3517) allowing rejection of the first

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<sup>2</sup> J.W. Atkinson, J.R. Bastian, R.W. Earl, and G.H. Litwin, "The Achievement Motive, Goal Setting, and Probability Preferences", in Journal of Abnormal and Social Psychology, Vol. 60, No. 1, 1960, p. 27-36.

Table VII.-

Means and Standard Deviations of the Speed Scores of  
Four Personality Type Groups.

| Group | N  | Mean   | $x^2$  | $\sigma$ | $\sigma M$ |
|-------|----|--------|--------|----------|------------|
| NI    | 21 | 394.28 | 35818  | 41.30    | 9.23       |
| SI    | 25 | 427.04 | 135619 | 73.65    | 15.04      |
| SE    | 23 | 448.04 | 205293 | 94.47    | 20.15      |
| NE    | 27 | 414.40 | 173649 | 80.18    | 15.71      |

Table VIII.-

Differences Between the Means of Four Personality  
Groups Expressed in Terms of t Values.

| Groups | SE     | SI    | NI     |
|--------|--------|-------|--------|
| NE     | 1.3521 | .6068 | 1.0623 |
| SE     |        | .8471 | 2.3517 |
| SI     |        |       | 1.8741 |

At forty degrees of freedom,  $p = .05$  if  
t equals 2.021; and  $p = .02$  if t equals 2.423.

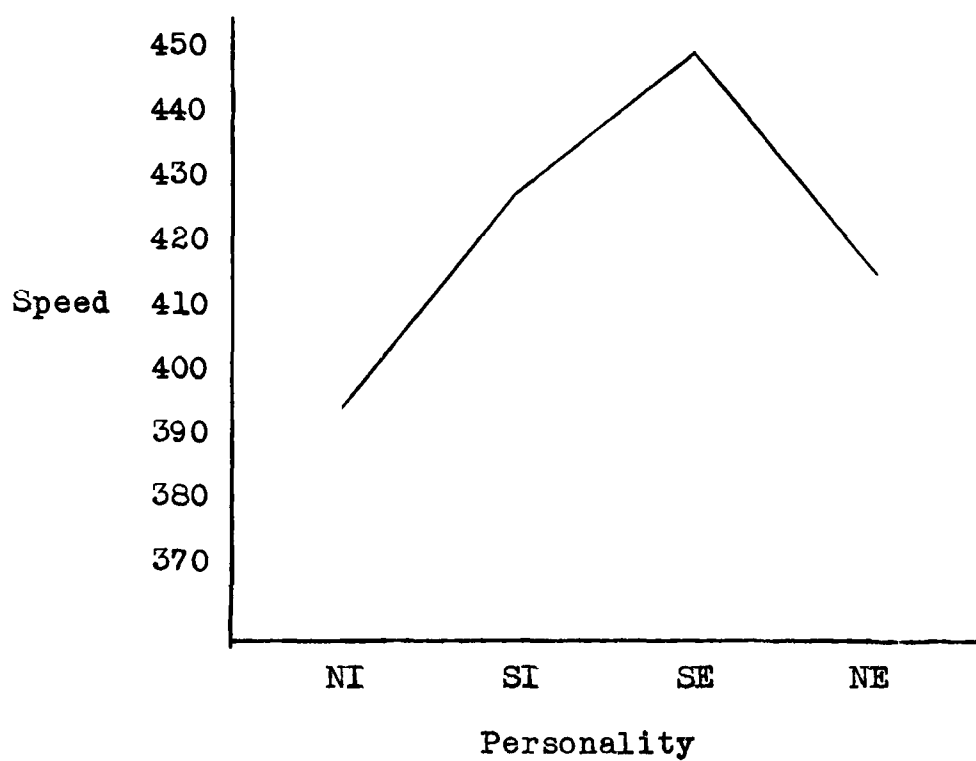


Figure 2.- Performance Speed Means of Subjects Grouped According to Personality Type.

null hypothesis. The lack of significance in most of the differences might be ascribed to the wide variability within groups, combined with the smallness of the population.

If the curve shown in Figure 2 is to be regarded as meaningful, it might be interpreted as a confirmation of Payne's general hypothesis; neurotics, being more vulnerable to stress, perform at a lower level of efficiency than their more stable confreres; and extraverts, having fewer interfering conditioned responses, function more efficiently than introverts. It contradicts part of Payne's prediction, inasmuch as he expected neurotic extraverts to have the highest mean scores, whereas they had the second lowest. This writer holds the opinion that the trend indicated by these results is probably closer to the truth than Payne's prediction, for his prediction was based on the unproven assumption that the low conditionability of extraverts (as measured by the M.P.I.) is sufficient to reduce completely the inhibitory effect of anxiety.

#### 4. Combined Interactions.

Because of the smallness, irregularity, and wide variability of the twenty-four groups of subjects to be considered in a discussion of the combined interactions of drive and personality with performance speed, there will be no attempt to interpret the data reported in this section.

It is included in the thesis in the hope that it will prove of interest to future researchers in this field.

The mean speed scores of the various subgroups in question (Table IX, Figure 3) indicate several patterns worthy of mention. First, stable extraverts appear to differ considerably from the other three personality groups in the way various drive conditions affect their performance speed.

Second, there is much more variability between personality groups in the low anxiety (OL, +L, -L) than in the high anxiety (OH, +H, -H) drive conditions.

Third, the speed score hierarchy of the different personality types which fall in the (-L) or "neutral" drive category (NE, NI, SI, SE in that ascending order) might imply that stable, relatively unmotivated subjects function more efficiently under slight stress than do neurotic subjects in the same drive category.

Table IX.-

Frequencies and Speed Means of Subjects Grouped by Both Personality and Direction of Drive.

| Group          | NI    |    | SI    |    | SE    |    | NE    |    | N <sub>t</sub> |
|----------------|-------|----|-------|----|-------|----|-------|----|----------------|
|                | M     | N  | M     | N  | M     | N  | M     | N  |                |
| -H             | 398.0 | 1  | 440.6 | 3  | 469.2 | 4  | 465.5 | 4  | 12             |
| +H             | 393.0 | 4  | 467.8 | 5  | 408.6 | 3  | 457.5 | 2  | 14             |
| OH             | 384.5 | 2  | 397.2 | 5  | -     | 0  | 379.4 | 5  | 12             |
| OL             | 370.5 | 4  | 472.0 | 3  | 465.0 | 6  | 411.8 | 6  | 19             |
| -L             | 415.7 | 4  | 450.7 | 4  | 525.3 | 3  | 403.8 | 5  | 16             |
| +L             | 416.7 | 4  | 374.0 | 2  | 426.0 | 7  | 471.0 | 3  | 16             |
| N <sub>t</sub> |       | 19 |       | 22 |       | 23 |       | 25 | 89             |



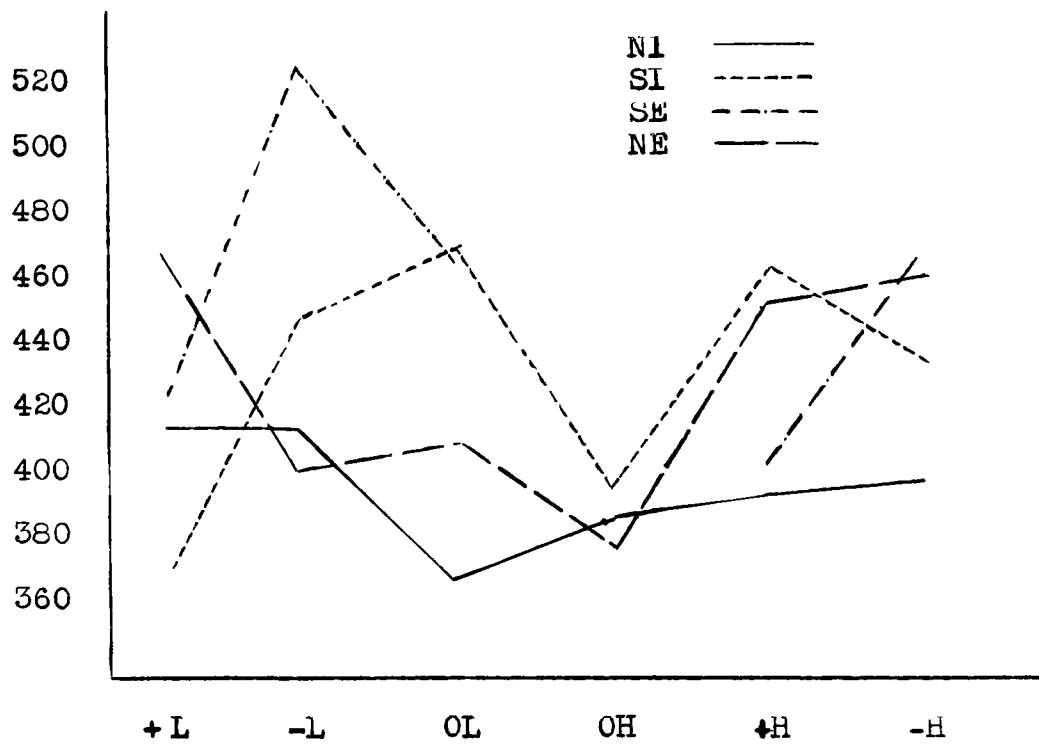


Figure 3.- Performance Speed Means of Subjects Groups according to both direction of drive and Personality Type.

## SUMMARY AND CONCLUSIONS

The aim of this paper has been to examine performance speed as a function of personality type and direction of drive. Results indicate that it is a function of both, but the details of these relationships have been discovered only in part. It has been suggested that test anxiety (avoidance drive) reduces functional efficiency in a subject whose motives are both opposed and indefinite, and that neurotic introverts have significantly lower performance speed than stable extraverts because, according to Payne's theory, the former are more vulnerable to stress and are hampered by stronger interfering conditioned responses than the latter group.

In further research involving a purpose and design similar to this one, it is to be recommended that a larger population be employed. It is further recommended that, if the experimenter has the necessary time and resources, full-scale pilot studies be carried out beforehand on the personality and drive measures to be used.

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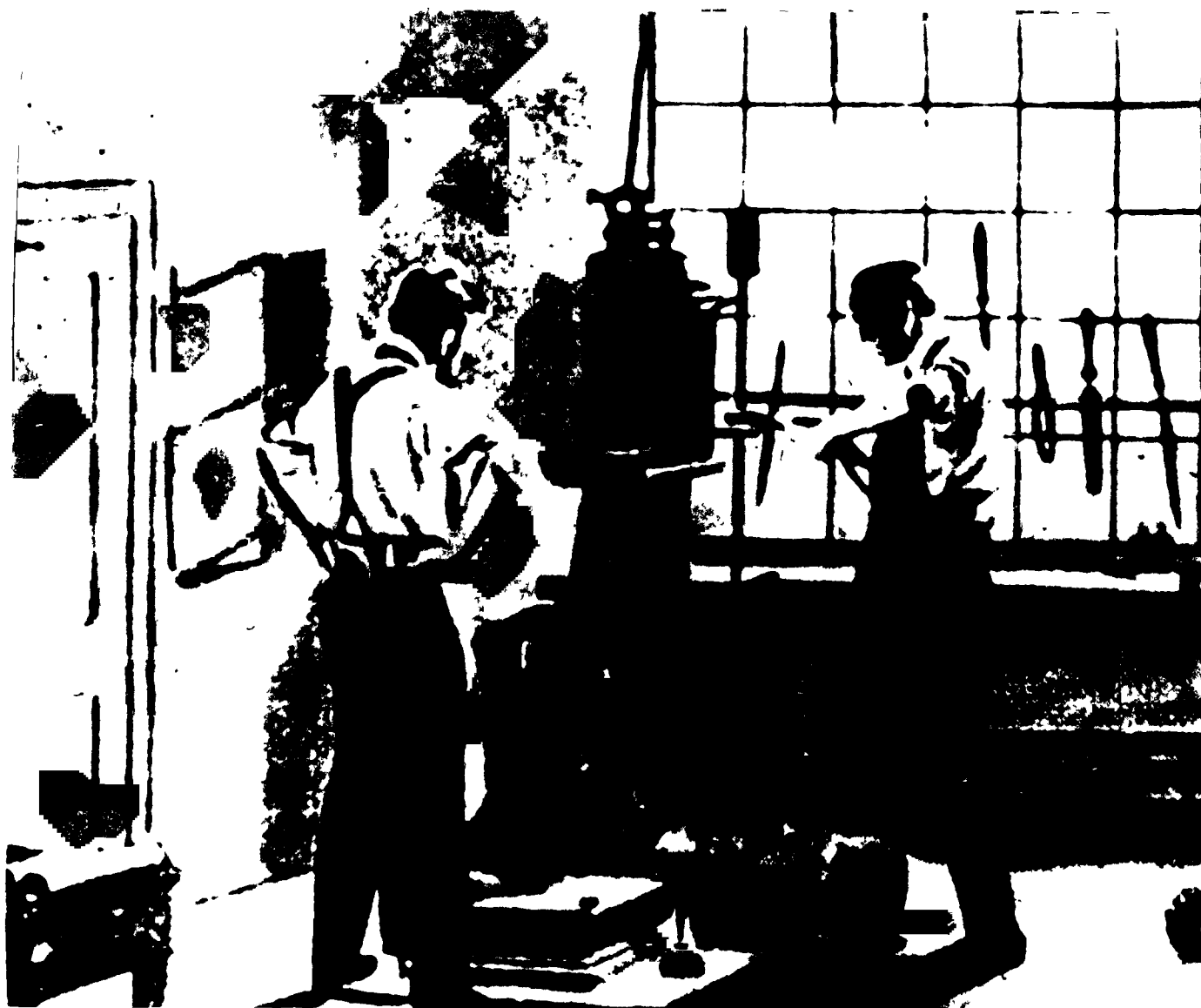
Valuable reference. Contains a review of the literature, a comprehensive examination of problems related to experimentation with performance speed, and recommendations.

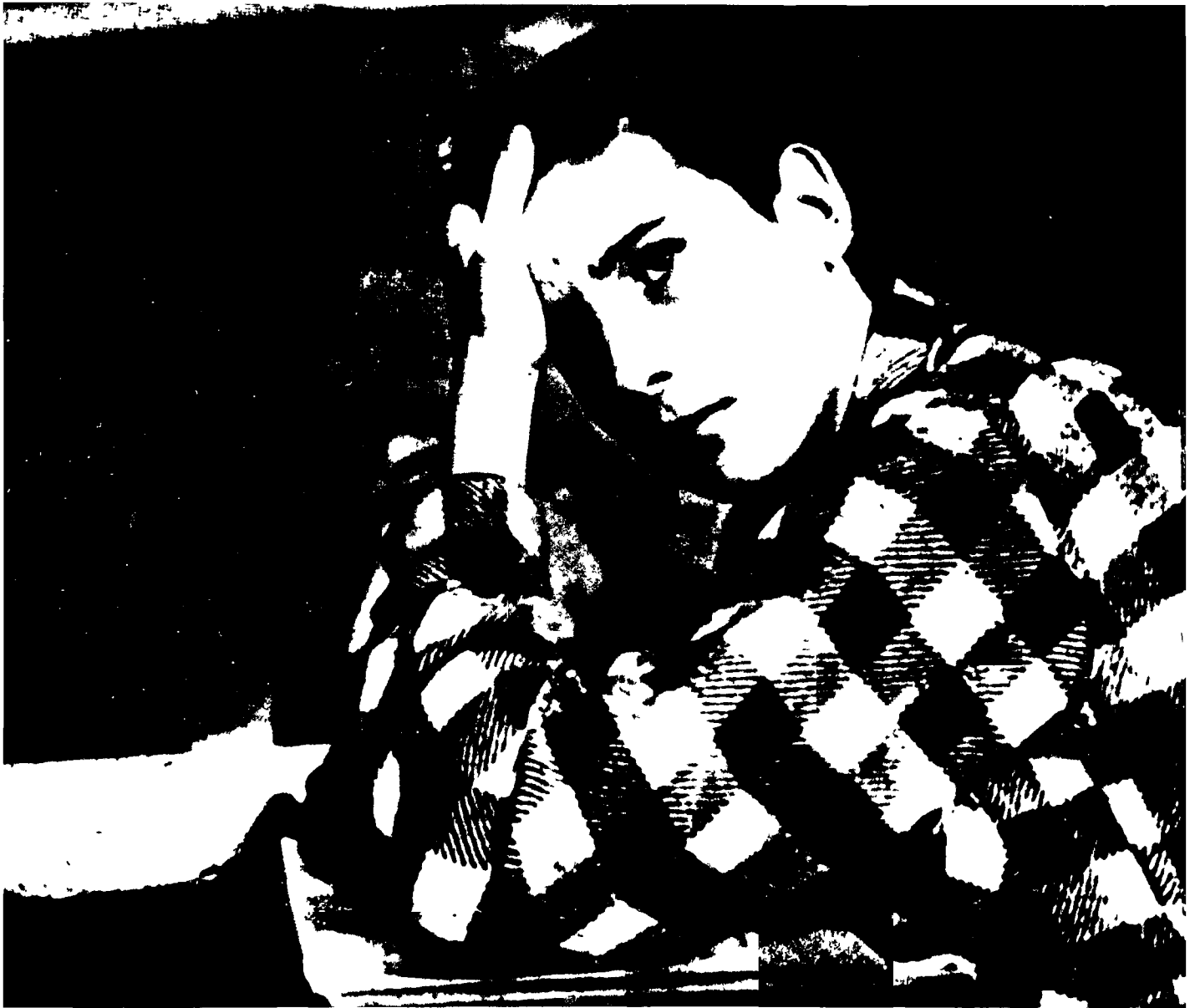
**APPENDIX 1**

**THEMATIC APPERCEPTION PICTURE STIMULI**

APPENDIX 1

THEMATIC APPERCEPTION PICTURE STIMULI











APPENDIX 2

THE MANDLER-SARASON TEST ANXIETY  
QUESTIONNAIRE

**APPENDIX 2**  
**THE MANDLER-SARASON TEST ANXIETY QUESTIONNAIRE**  
**QUESTIONNAIRE ON ATTITUDES TOWARD TESTING SITUATIONS**  
**( Preliminary Form )**

NAME: (Please Print) \_\_\_\_\_

BIRTHDATE: Month \_\_\_\_\_ Day \_\_\_\_\_ Year \_\_\_\_\_

NATIVE LANGUAGE \_\_\_\_\_

EXPECTED YEAR OF DEGREE \_\_\_\_\_ CLASS \_\_\_\_\_

MAJOR FIELD: ( If already decided ) \_\_\_\_\_

This questionnaire is designed to give you an opportunity to indicate how and what you feel in regard to group testing situations :

One of the main reasons for constructing this questionnaire is the fact that very little is known about people's feelings toward the taking of various kinds of tests. We can assume that people differ in the degree to which they are affected by the fact that they are going to take a test or by the fact that they have taken a test. What we are particularly interested in here is how widely people differ in their opinions of and reactions to testing situations.

The value of this questionnaire will in a large part depend on how frank you are in stating your opinions, feelings, and attitudes. Needless to say, your answers to the questions will be kept strictly confidential; they will under no circumstances be made known to any instructor or official of the University.

We are requesting you to give name, class, etc. , only because it may be necessary for reserch purposes.

For each question there is a line or scale on the ends of which are statements of opposing feelings or attitudes. In the middle of the line you will find either the word "Midpoint" or a phrase, both of which are intended to reflect a feeling or attitude which is in-between the statements of opposing feelings described above. You are required to put a mark (X) on that point on the line which you think best indicates the strength of your feeling or attitude about the particular question. The midpoint is only for your guidance. Do not hesitate to put a mark on any point on the line as long as that mark reflects the strength of your feeling or attitude.

The following questions ( see other side of page ) relate to your attitude toward and experience with group intelligence or aptitude tests. By group intelligence tests we refer to tests which are administered to several individuals at a time. These tests contain different types of items and are usually paper and pencil tests with answers requiring either fill-ins or choices of several possible answers. Scores on these tests are given with reference to the standing of the individual within the group tested or within specific age and educational norms. Please try to remember how you usually reacted toward these tests and how you felt while taking them.

If you have any questions at this time, please ask the person who has passed out the questionnaire.

**There are no "CATCH" questions in this questionnaire. Please read each question and each scale very carefully THERE IS NO TIME LIMIT.**

THE MIDPOINT IS ONLY FOR YOUR GUIDANCE. DO NOT HESITATE TO PUT A MARK (X) ON ANY POINT ON THE LINE AS LONG AS THAT MARK REFLECTS THE STRENGTH OF YOUR FEELING OR ATTITUDE.

1. How valuable do you think group intelligence tests are in determining a person's ability?  
 |-----|-----|-----|  
 Very Valuable                      Valuable in some respects and valueless in others                      Valueless
2. Do you think that group intelligence tests should be used more widely than at present to classify students?  
 |-----|-----|-----|  
 Should be used less widely                      Should be used as at present                      Should be used more widely
3. Would you be willing to stake your continuance in college on the outcome of a group intelligence test which has previously predicted success in a highly reliable fashion?  
 |-----|-----|-----|  
 Very willing                      Uncertain                      Not willing
4. If you know that you are going to take a group intelligence test, how do you feel beforehand?  
 |-----|-----|-----|  
 Feel very unconfident                      Midpoint                      Feel very confident
5. After you have taken group intelligence test, how confident do you feel that you have done your best?  
 |-----|-----|-----|  
 Feel very unconfident                      Midpoint                      Feel very confident
6. When you are taking a group intelligence test, to what extent do your emotional feelings interfere with or lower your performance?  
 |-----|-----|-----|  
 Do not interfere at all                      Midpoint                      Interfere a great deal
7. Before taking a group intelligence test, to what extent are you aware of an "uneasy feeling"?  
 |-----|-----|-----|  
 Am very much aware of it                      Midpoint                      Am not aware of it at all
8. While taking a group intelligence test to what extent do you experience an accelerated heartbeat?  
 |-----|-----|-----|  
 Heartbeat does not accelerate at all                      Midpoint                      Heartbeat noticeably accelerated
9. Before taking a group intelligence test to what extent do you experience an accelerated heartbeat?  
 |-----|-----|-----|  
 Heartbeat does not accelerate at all                      Midpoint                      Heartbeat noticeably accelerated
10. While taking a group intelligence test to what extent do you worry?  
 |-----|-----|-----|  
 Worry a lot                      Midpoint                      Worry not at all
11. Before taking a group intelligence test to what extent do you worry?  
 |-----|-----|-----|  
 Worry a lot                      Midpoint                      Worry not at all
12. While taking a group intelligence test to what extent do you perspire?  
 |-----|-----|-----|  
 Perspire not at all                      Midpoint                      Perspire a lot
13. Before taking a group intelligence test to what extent do you perspire?  
 |-----|-----|-----|  
 Perspire not at all                      Midpoint                      Perspire a lot
14. In comparison with other students how often do you think of ways of avoiding a group intelligence test?  
 |-----|-----|-----|  
 Less often than other students                      Midpoint                      More often than other students
15. To what extent do you feel that your performance on the College Entrance Test (or a similar test) was affected by your emotional feelings at the time?

APPENDIX 3

THE MAUDSLEY PERSONALITY INVENTORY

## MAUDSLEY PERSONALITY INVENTORY

Copyright © 1959 by H. J. Eysenck.

NAME . . . . . CHRISTIAN NAMES . . . . .

AGE . . . . . SEX . . . . . OCCUPATION . . . . .

N =                      E =                      ? =

**Instructions**

Here are some questions regarding the way you behave, feel and act. After each question there is a "Yes," a "?" and a "No".

Try and decide whether "Yes" or "No" represents your usual way of acting or feeling; then put a circle round the "Yes" or "No." If you find it absolutely impossible to decide, put a circle round the "?", but do not use this answer except very occasionally. Work quickly, and don't spend too much time over any question; we want your first reaction, not a long drawn-out thought process! The whole questionnaire shouldn't take more than a few minutes. Be sure not to omit any questions. Now go ahead, work quickly, and remember to answer *every* question. There are no right or wrong answers, and this isn't a test of intelligence or ability, but simply a measure of the way you behave.

1. Are you happiest when you get involved in some project that calls for rapid action? . . . . . Yes ? No
2. Do you sometimes feel happy, sometimes depressed, without any apparent reason? . . . . . Yes ? No
3. Does your mind often wander while you are trying to concentrate? . . . . . Yes ? No
4. Do you usually take the initiative in making new friends? . . . . . Yes ? No
5. Are you inclined to be quick and sure in your actions? . . . . . Yes ? No
6. Are you frequently "lost in thought" even when supposed to be taking part in a conversation? . . . . . Yes ? No
7. Are you sometimes bubbling over with energy and sometimes very sluggish? . . . . . Yes ? No
8. Would you rate yourself as a lively individual? . . . . . Yes ? No
9. Would you be very unhappy if you were prevented from making numerous social contacts? . . . . . Yes ? No
10. Are you inclined to be moody? . . . . . Yes ? No
11. Do you have frequent ups and downs in mood, either with or without apparent cause? . . . . . Yes ? No
12. Do you prefer action to planning for action? . . . . . Yes ? No

|  |       |    |
|--|-------|----|
| 13. Are your daydreams frequently about things that can never come true ?                                      | Yes ? | No |
| 14. Are you inclined to keep in the background on social occasions ?   | Yes ? | No |
| 15. Are you inclined to ponder over your past ?  | Yes ? | No |
| 16. Is it difficult to "lose yourself" even at a lively party ?  | Yes ? | No |
| 17. Do you ever feel "just miserable" for no good reason at all ?  | Yes ? | No |
| 18. Are you inclined to be overconscientious ?   | Yes ? | No |
| 19. Do you often find that you have made up your mind too late ?   | Yes ? | No |
| 20. Do you like to mix socially with people ?  | Yes ? | No |
| 21. Have you often lost sleep over your worries ?  | Yes ? | No |
| 22. Are you inclined to limit your acquaintances to a select few ?   | Yes ? | No |
| 23. Are you often troubled about feelings of guilt ?   | Yes ? | No |
| 24. Do you ever take your work as if it were a matter of life or death ?                                       | Yes ? | No |
| 25. Are your feelings rather easily hurt ?   | Yes ? | No |
| 26. Do you like to have many social engagements ?  | Yes ? | No |
| 27. Would you rate yourself as a tense or "highly-strung" individual ?   | Yes ? | No |
| 28. Do you generally prefer to take the lead in group activities ?   | Yes ? | No |
| 29. Do you often experience periods of loneliness ?  | Yes ? | No |
| 30. Are you inclined to be shy in the presence of the opposite sex ?   | Yes ? | No |
| 31. Do you like to indulge in a reverie (daydreaming) ?  | Yes ? | No |
| 32. Do you nearly always have a "ready answer" for remarks directed at you ?                                   | Yes ? | No |
| 33. Do you spend much time in thinking over good times you have had in the past ?                              | Yes ? | No |
| 34. Would you rate yourself as a happy-go-lucky individual ?   | Yes ? | No |
| 35. Have you often felt listless and tired for no good reason ?  | Yes ? | No |
| 36. Are you inclined to keep quiet when out in a social group ?  | Yes ? | No |
| 37. After a critical moment is over, do you usually think of something you should have done but failed to do ? | Yes ? | No |
| 38. Can you usually let yourself go and have a hilariously good time at a gay party ?                          | Yes ? | No |
| 39. Do ideas run through your head so that you cannot sleep ?  | Yes ? | No |
| 40. Do you like work that requires considerable attention ?  | Yes ? | No |
| 41. Have you ever been bothered by having a useless thought come into your mind repeatedly ?                   | Yes ? | No |
| 42. Are you inclined to take your work casually, that is as a matter of course ?                               | Yes ? | No |
| 43. Are you touchy on various subjects ?   | Yes ? | No |
| 44. Do other people regard you as a lively individual ?  | Yes ? | No |
| 45. Do you often feel disgruntled ?  | Yes ? | No |
| 46. Would you rate yourself as a talkative individual ?  | Yes ? | No |
| 47. Do you have periods of such great restlessness that you cannot sit long in a chair ?                       | Yes ? | No |
| 48. Do you like to play pranks upon others ?   | Yes ? | No |



APPENDIX 4

TEST OF PERFORMANCE SPEED

APPENDIX 4

TEST OF PERFORMANCE SPEED

PCT.

Name .....
First Language .....
Age (yrs. & mos.) .....

This page is filled with randomly scrambled vowels and consonants. You are asked simply to cross out the vowels with an horizontal line, and the consonants with a vertical line.

Example: A C E D I F O L U V
A C E D I F O L U V

Do not skip letters, and try not to make errors.

I U I L I C A O U O F A F V U D L C F D I I E L F U I F A L C I E E E L U F F A
L E I U C F D A E A D E D O L I O C D I V V F O D L U D E O C U F F F O L D D E
I I E L F U I F A I D E D O L I O C D I I U I L L C A O U O V V F O D L U D E O
F A F V U D L C F D C I E E E L U F F A L E I U C F D A E A D E D O L I O C D I
A F F U L E E B I C L F C I O U I L F D I D C I O L U D E D E F E I D C L V F O
L A F I U F L E I I F U E L V L E U A L A L A B C O O V L V A U U D I O O D A F
D F L I U O I C F L C I E E E L I F F A I I E L F U I F A L V L V O O C E A L A
D F C L D U V F A F A E A D F C U I E L E D D L O F F F U C O D C V A L V O E I
I E O V L A V C D O L E I U C F D A E A C U F F F O L D D E F A F V U D L C F D
O U O A C L L I U I O V V F D L L F O E O E D V L D O F V V D L F O U O A I E D
D E L A O U O F L D V V F O D L V D O E E O F L L D F V V O I U I L L C A O U O
I I L A U F F U L F I E F I A C E E U F L I C D E L U L L U D L U I F E F L F V
I L I F A U E I A F I I E F F L U L V U L C F U L C F U D E A D I L E O A F C E
U E A F I O A L D C F D D C L A E E I F F D D E C V O O B I U L L E O D I I L U
L O O U I C C C F L F D D F F D I I A D I V I L I I V U E D E F I I C L O L U I
F D L C O U L C F L I U A D U F D O A D A E U E E L O O A D C C V D E I U V E F
F A D O O I D U U A E D D E L O F F V C E O F L L D F V V O C I E E E L U F F A
I E O V L A V C D O V V F O D L V D E O D F L I U O I C F L I I E L F U I F A L
D E L A O U O F L D D E D U L I O C D I L A U E L V L E U F F A F V U D L C F D
O F V L C D I E F E V L V O O C E A L A L E I U C F D A E A I U L L C A O U O F

APPENDIX 5

ABSTRACT OF

Performance Speed as a Function of  
Four Subject Variables

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ABSTRACT OF

Performance Speed as a Function of  
Four Subject Variables<sup>1</sup>

This paper is a study of four subject correlates of performance speed: approach and avoidance motivation, as defined by McClelland's two-factor theory of motivation; and extraversion and neuroticism, as defined by Eysenck's Maudsley Personality Inventory.

In view of research by Babcock, and reviews of the literature by Tate (1950) and Payne (1961), it was decided to use a simple timed visual-motor task as a measure of performance speed. Approach and avoidance motivation were measured by McClelland's thematic apperception method and the Mandler-Sarason Test Anxiety Questionnaire, respectively. These two measures were then combined in the manner of Raphelson to create a "direction of drive" dimension, ranging from "approach" to "avoidance".

Extraversion and neuroticism, measured by the E and N scales of the M.P.I., were combined in the manner of Eysenck to form a "personality type" dimension, ranging from

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<sup>1</sup> Merlin W. Donald, Master's thesis presented to the School of Psychology and Education of the University of Ottawa, Ontario, September 1962, x-68.

neurotic introverts (NI) through stable introverts (SI) and stable extraverts (SE) to neurotic extraverts (NE).

The ninety-nine subjects were then placed in their appropriate categories along both dimensions, and the chi-square method was used to establish the independent variability of the tests and dimensions.

The mean performance speed scores for each group were tabulated, then plotted on graphs to illustrate trends. These trends were tested for significance by the t technique.

Results indicated that performance speed is a function of both drive and personality, although the relationships were discovered only in part. It was suggested that test anxiety (avoidance drive) reduces performance speed in a subject whose motives are both opposed and indefinite, and that neurotic introverts have significantly lower performance speed than stable extraverts because the former are more vulnerable to stress and are hampered by stronger interfering conditioned responses than the latter group.