AN INVESTIGATION OF THE RELATIONSHIP BETWEEN THIRST AND SPEED OF PERCEPTUAL RECOGNITION

by

NEIL MARVIN DUNFIELD

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS
in the Department
of
PHILOSOPHY AND PSYCHOLOGY

We accept this thesis as conforming to the standard required from candidates for the degree of MASTER OF ARTS

Members of the Department of
Philosophy and Psychology

THE UNIVERSITY OF BRITISH COLUMBIA

April, 1952

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN THIRST AND SPEED OF PERCEPTUAL RECOGNITION

Abstract

This experiment was undertaken to investigate the effect of thirst upon speed of perceptual recognition of thirst satisfying objects. Recent interest in the aspects of perception which may function adaptively has led to many experiments attempting to uncover the relations between perception and motivation. This interest has centered around the distorting and selective influence of motivation upon perception. One aspect of the selective function of motivation is its effect upon the speed of perceptual recognition of need related objects. It was in this respect that the effect of need on perception was investigated in the present experiment.

A significant limitation in much of past experimentation in this field has been the use of 'marginal' stimuli by investigators. 'Marginal' stimuli are stimulating situations in which the presented stimuli are either fleeting, blurred, or actually objectively lacking. It was felt that all perceptual stimuli are not of this sort and that to generalize from these limited experiments using 'marginal' stimuli, to all forms of perceptual situations, is unwarranted by fact.

The present experiment involved stimuli which were more highly structured than had hitherto been used. The purpose of the experiment was to determine if, as had been postulated by other experimenters, the existence of an organic need would decrease the time of perceptual recognition of objects related to the satisfaction of that need.

The need investigated was thirst: need for water. The technique used to induce thirst in the 30 subjects which consituted the experimental group, was to feed them peanut-butter before the experiment. The 30 subjects in the control group did not receive the peanut-butter. All subjects, subsequent to experimental testing, were asked to fill out a self-rating on a subjective five point scale of felt thirst.

The stimulating situation involved the use of ten puzzle-picture cards. Within each card had been hidden one object. Five of these hidden objects were neutral relative to the need being tested. The other five objects were related to the satisfaction of the prevaling induced need. The type of thirst related objects used, had previously been determined through the use of an association

technique applied to a class of undergraduate psychology students.

The experiment yielded the following results:

1. The experimental group rated themselves as significantly more thirsty on the self administered scale of felt thirst than did the control group. Hence, we could analyze the remaining data confident that a differential degree of thirst had been established between the control and experimental groups.

2. It was statistically indicated that neither the control or the experimental group demonstrated a correlation between speed on the need cards and speed on the neutral cards. This indicated that if the induced need was effecting perceptual recognition, it was doing so for only one type of object: need or neutral. Consideration of nearly equivalent amounts of correlation tendencies in the control and experimental groups, throws some doubt on the original hypothesis the need will effect the recognition of need related objects.

3. The application of distribution free statistical methods to the results of the individual cards showed that there was no significant difference between the recognition speed of the control and experimental group on any single card.

4. These results did not lend support to the hypothesis that need will effect the speed of perceptual recognition of objects related to the satisfaction of that need. Within the limitations of the experimental technique, this experiment did not support the general hypothesis that need effects perception in terms of perceptual recognition time.

ACKNOWLEDGMENT

The writer would like to express his gratitude to Mr. D.T. Kenny, for helpful suggestions and encouragement during the course of this work, and to Captain Bruce Rutherford, Seaforth Highlanders (R), for his assistance in obtaining subjects.

CONTENTS

TABLES

CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

INTRODUCTION

In recent years there has been a steadily increasing interest in the relations between perception and motivation. Many attempts have been made, both theoretical and experimental, to demonstrate the integrated nature of these two psychological processes. That the two processes are functionally related is tacitly assumed in the use of several of the more popular projective testing techniques. Sears points this fact out in his analysis of the psychoanalytic concept of projection when he (24,p.324) states

> The so called 'projective techniques' for the measurement of personality are based on the assumption that what is perceived is in part a function of the motivation structure of the personality.

In such tests perception is conceived of as 'functional'; that is, how we perceive the world around us is partially determined by how we want and need to perceive the world.

Sears, in pointing out the general acceptance of such a view, also indicates the limited extent of our knowledge of this relationship:

> As a general statement about perception this scarcely needs documentation, but the details of the relation between the motive and percept have been little considered. (24,p.324)

As he has here suggested, such a conceived relationship, while having a fairly extensive historical representation in common belief, and more recently in the clinical study of personality, has aroused little serious experimental investigation. It is since Sear's review in 1944 that the greater part of the research attempting to uncover the 'details of the relationship between the percept and the motive'have been undertaken.

The general hypothesis that one's motives effect one's perception of the world has received many and varied forms of presentation. But essential to all wordings of this hypothesis is the general assumption that perception is in some way functional. It is an adaptive function of the organism in its interaction with the world. The idea holds that the percept expresses more than the fortuitous mosaic of stimuli and their associated memory traces. The understanding of the process of perception requires more than a mere consideration of classical sensory association theories on the one hand, or such dynamic principles of sensory organization as put forward by Gestaltheories on the other hand. Perception, or any immediate percept, is understood by the contemporary perception theorists who hold the above views, to be the expression of two simultaneously effective determinants: the cognitive and the connative; the knowing and the willing.

Of the theorists expounding this perceptual hypothesis Kretch and Crutchfield (9), in their text on social

psychology, give one of the more lucid and terse expressions of this belief. The hypothesis that motivation is reflected in perception becomes a definitive proposition in their detailed treatment of perception generally:

> Proposition 2 : Perception is functionally selective. The second proposition points out that no one perceives anything that is 'out there' to be perceived, but that only certain objects play a major role in one's perceptual organization. The objects thus accentuated in perception are usually those which are functionally significant to the perceiving individual. (9,p.107)

Gardner Murphy (15) has been equally explicit in describing this assumed relation between perception and motivation. The relationship holding between these two processes comes under his concept of 'autism'. This term is used to designate 'the movement of the cognitive processes in the direction of need satisfaction'. In his treatment of perception he writes:

> It must, however, be born in mind that the existence of needs precedes their expression in perception. Needs are present before one opens one's eyes, before a voice strikes the ear. Needs determine how the incoming energies are to be put into structured form. Perception, then, is not something that is first registered objectively then 'distorted'. Rather, as the need pattern shifts, the stage is set minute by minute for quasi-automatic structure giving tendencies to make the percept suit the need. The need pattern predisposes to one rather than another manner of anchoring the percept round one's needs. Needs keep ahead of percepts. (15,p.377)

Representative of the type of experimental work he cites as support of this hypothesis are those of Levine, Chein and Murphy (10); Proshansky and Murphy (17); and Schaffer and Murphy (23).

Perhaps the most able and abundant support for the hypothesis that need effects perception, and the most careful exposition of the 'details of the relationship between the percept and the motive' is to be found in the works of J.S. Bruner and his collaborators (2,3,4,5,6,7,18,19). They have gone further than most others in outlining, in detail, the nature of the variables that are most probably involved, and the methods of investigation which may prove experimentally fruitful. They have also outlined clearly the areas which, to them, must be explored in order to reconcile any apparent dichotomy between perception and motivation. The following four propositions are taken from a theoretical paper by Bruner and Postman (7) and illustrates the systematic manner which they believe should be employed in pursuing this problem:

1. Select central non-perceptual variables, changes in which can be shown to bring about systematic changes in perceptive functioning.

2. To select variables from various theoretical systems - learning theories, motivational theories, theories of personality - so that these theories may be continuous with the body of perceptual theory.

3. To postulate and then study those intervening mechanisms which account for the changes in perception which occur when we change the central state of the organism.

4. Finally, to emerge with a unified theory of behavior which contains laws relating the manner in which perception is an instrument of adjustive behavior. (7,p.16)

Bruner and Goodman (4) and Bruner and Postman (7)

have stated a few of the changes (which they feel have been demonstrated experimentally) that are traceable to the motivational state of the organism. Essentially these are attributive and selective changes. The perceived object may be distorted through motivational determinants, or the selection and recognition of objects may be changed or influenced by needs. They have expressed the above changes in the following manner:

> a) ...that stimuli which are in congruence with the prevailing directive state of the organism are more readily recognized than incongruent material.
>
> b) ...that incongruent stimuli are distorted to conform to the dominant need or expectation of the perceiver. (7,p.25)

It was as an attempt to test assumption a) above that the experiment reported in this paper was undertaken. In this experiment the details of the relationship between an organic need (thirst) and perceptual recognition time of objects related to the satisfaction of the need, were explored.

Before passing on to a more detailed outline of the specific purpose and methods of the present experiment it would be well to review and evaluate any closely related experimental research. While the studies which treat of the effect of organic need on perception are not legion, there are sufficient to indicate the general orientation of researchers in this field. The experiments to be reviewed here are those by Sanford (21,22), Levine, Chein and

Murphy (10), and McClelland and Atkinson (11).

Almost all the variables that Bruner and Postman have suggested as possible determinants of perception have been tested, in some form or other, by a wide range of experimenters. The variables tested have been drawn from learning theories, motivational theories, and personality theories. All these experiments were undertaken to clarify the nature of the assumed relationship between perception and motivation. The studies reviewed here, treating of organic need and perception, represent a small part of the whole problem.

RELATED RESEARCH ON THE EFFECTS OF ORGANIC NEED ON PERCEPTION

SANFORD: (21,22) Two experiments, reported by Sanford in 1936 and 1937 respectively, were undertaken to determine the effects of hunger upon imaginal processes. Sanford used hours of deprivation of food as an index of the intensity of the hunger drive. The lengths of deprivation varied from one to twenty-four hours, and hence, theoretically, from 'little' to 'great' hunger. The imaginal productions of his subjects were tested through such techniques as word association tests, chain association tests, interpretation of drawings, and completion of pictures.

The results obtained by the use of this method indicate that there is an increase in 'food responses' (to these stimuli conditions) as length of time of food deprivation increased.

On the basis of these results Sanford felt justified in assuming that the existence of an organic need such as hunger does effect the imaginal processes. The effects demonstrated were such that need satisfying imaginings became more frequent in the responses as the strength of the need increased.

It is important in evaluating this experiment that we remember that this particular study was undertaken to explore the effect of hunger on the imaginal processes. Later perception theorists, attempting to defend the concept that need effects perception, have found in Sanford's results, experimental confirmation of their theoretical position. They have taken Sanford's study of the effect of need on the imaginal processes as demonstrative of the effect of need on perception. Pastore (16), in criticizing some of the recent experimental and theoretical papers in this field, makes a statement which is worthy of repetition at this point. While not referring explicitly to Sanford's experiment is does reflect upon any 'perceptual' interpretation of Sanford's results:

> The term perception, judging by its usage, embraces, perhaps unwittingly, many psychological processes; processes which include judging, inferring, and understanding....the way in which the concept is being used should be set forth clearly by the investigator. (16,p.472)

To this list of psychological processes which are being included in the meaning of perception, we might now add the imaginal processes.

Sanford's subjects were asked to interpret imaginatively, auditory and visual stimuli. Sanford has expressely stated that he is testing these imaginal processes. The subjects were not asked to tell what they saw or heard, but rather, what could be imagined or associated with any particular stimuli. It would appear, then, that to include this experiment as evidence for the supposition that need effects perception is giving to the term perception a far broader meaning than is usual.

Many of the criticizms we will have to make of the other related experiments will reflect back upon a 'perceptual' interpretation of Sanford's results.

LEVINE, CHEIN, AND MURPHY: (10) These experimenters made use of a similar experimental procedure to that of Sanford. They undertook to investigate the effect of hunger (food-need) upon the perception of ambiguous visual stimuli. A total of ten subjects were employed, five in the experimental group and five in the control group. The subjects in the experimental group were deprived of food for various lengths of time up to twenty-four hours. The five control subjects were not deprived of food. All subjects were then presented, from behind a ground glass screen, blurred ambiguous pictures on cards. There were eighty of these cards alltogether, forty were chromatic and forty were achromatic. The subjects in both groups were asked to verbalize an association with each card, the objects of the experiment being to determine the relationship, if any,

between a subjects need for food and the number of food associations related to the ambiguous stimuli cards.

These experimenters found that the food responses increased on the achromatic cards for three and six hours of food deprivation and began to decrease from nine hours on. The chromatic cards indicated no such increase in food responses. Analysing only the results from the achromatic cards, they conclude that food need significantly increases the perception of food related forms in ambiguous stimuli.

Pastore (16) has been sharply critical of this experiment and his criticisms cast some doubt upon the conclusions Murphy and his co-workers draw from it. He (16,p.461) points out that

> Allthough the data are presented, the authors do notcompare the overall number of food responses of the experimental group with the control. It can be easily calculated however, that the difference between the experimental and the control group is insignificant.

Another result of this experiment , which weighs against the acceptance of Murphy's conclusions and theorizings, is the experimental fact that the food responses failed to increase with increasing hunger. A point of food deprivation was reached (nine hours) beyond which the number of food responses sharply diminished. In order to explain this phenomenon they have engaged in ad hoc hypothesising. They have postulated a 'reality principle' which, when need becomes too intense, serves to force the subject

away from the non-need satisfying experimental situation back to a possibly more need satisfying reality. This postulated 'reality principle' was supposed to account for the drop in food responses.

A question which could be asked at this point is why should we expect just a drop in the food responses? If the subject becomes re-orientated towards reality to satisfy his needs we would expect his total number of responses to decrease, not just the food responses.

Even overlooking the inadequacey of the handling of the experimental data, and the insufficiencey of their ad hoc hypothesising, there is still one major criticism which can be made against this experiment. This criticism is precisely that which wheighed against the acceptance of Sanford's results as perceptual in nature. Levine, Chein and Murphy are testing nothing but their subjects imaginative and interpretive processes, not perception per se.

This type of experimental investigation, and the deductions from it which are taken as indicative of aspects of perception, is typical of many of the other investigations exploring perception and motivation. Pastore (16,p.459) has the following to say about such experimentation and theorizing:

> At most, they have shown that perception may be a form of adaptive behavior in certain limited forms of perceptual situation, vis, marginal perceptual situations. These marginal situations involve either the exposure of an ambiguous stimul to the subject (a stimulus which is not well defined or not well structured), or the exposure of a stimulus for a brief period of time in a tachistoscope.

> The word marginal is applied to these situations since the subject can not get a clear visual impression of the stimulus involved....The fact that marginal situations form the core of the experimental procedure of these various experiments suggests that perception is not the only factor involved in the experiments. Such marginal perceptual situations allow for the maximum play of interpretive factors. The subjects do not get a clear visual impression, therefore he is constrained to interpret reconstruct the stimulus situation. (16,p.469)

Referring back to the experiment by Levine, Chein and Murphy, Pastore (16,p.469) has the following point to make:

> ...it is not known whether the ambiguous shapes are actually seen as food objects by some of the subjects, or whether the subjects sought reasonable interpretations of an ambiguous shape. The search for approximations may be influenced by a food need, but what the subject reports is essentially an evaluation of a stimulus rather than a perception per se.

That this was not strictly a perceptual experiment can be shown by the nature of the instructions that were given to the subjects:

> I am going to show you a series of pictures behinda scfeen you see in front of you. You will try to verbalize an association with every picture you see. (10,p.289)

As Pastore (16) has pointed out in his evaluation of this experiment, why should this be considered a perceptual experiment when the subjects were expressly told to report an association, not to describe the stimuli.

It is evidence then, that Pastore's criticisms vitiate the acceptance of the results of this experiment as support

of the theory that organic need does effect perception.

McCLELLAND and ATKINSON: (11) This was another experiment in which the experimenters were interested in the relations between hunger and perception. It was part of a series of experiments (1,11,12,13) which

> ...have been begun with creating a specific motivational tension or need of more or less known strength and then proceeded to measure its effects on perception and projection....The first experiment in the series begins at what appeared to be the simplest level, namely the effect on perception of different strengths of a known physiological need. (11,p.206)

The subjects, one hundred and eight naval cadets, were deprived of food for varying lengths of time up to sixteen hours; forty men at one hours deprivation; twenty-four at four hours deprivation; and forty men at sixteen hours deprivation. Following the period of food deprivation the subjects were shown a screen upon which a blank slide was projected. The reason given for use of the blank slide was that they wanted a situation in which the actual realistic cues were minimal.

The results of the experiment indicated that the number of food responses increased significatnly between one and sixteen hours of food deprivation. This was found to be a highly reliable difference. This difference in number of food responses was only evident in 'instrumental' food responses, and did not appear in 'goal' responses.

They found, further, that when a faint smudge or hazy object was introduced on to the screen in place of a blank slide, the number of 'food responses' actually decreased. In fact, the increase in food responses was found to be so small with the smudged slide that they decided to work entirely with the blank screen. Pastore (16) has been very critical of this, and has the following to say relative to the use of a blank screen:

> The reductio ad subsurdum of the procedure of some of the investigators discussed in this paper is indicated in a recent series of experiments dealing with the influence of food need on perception....A blank slide is flashed on the screen. The subject is required to report what he sees. (The experimenter provides cues) Why should this experiment be termed perceptual when a visual experience is excluded by the nature of the experiment? (16,p.471)

It could be easy, perhaps deceptively easy, in evaluating these experiments, to 'compartmentalize' perception. By this is meant, to make of perception a psychological process distinct from inference, judgment, imagination, memory, familiarity, and such related psychological processes. Doubtless all these factors contribute in some measure to all meaningful perception, but it is important in conducting an experiment in perception that we do not allow any one, or all, of these variables to dominate psychologically.

The fleeting, blurred, or ambiguous stimuli which Pastore has called 'marginal' perception is probably just one form of perceptual stimuli. To generalize from experiments using this marginal type of stimuli to all forms of perception is probably

faulty induction. The relationships found in experiments involving marginal stimuli may not be found to apply with other kinds of perceptual stimul. It is probably the case that, as the stimuli become more highly structured the above mentioned variables play less and less role in perception, the percept becomes more closely allied with objective reality.

SPECIFIC PURPOSE OF THE PRESENT EXPERIMENT

On the basis of the above disucssion of research in the field of organic motivation and perception, it was felt that further experimentation was needed. In this experiment it was proposed to eliminate the 'marginal' perceptual aspect of past experiments, and deal with more highly structured visual stimuli. Also, the variables which Pastore points out as having contaminated many past experiments, and making a pure perceptual interpretations questionable, were reduced to a minimum.

The specific purpose of the present experiment was to investigate the relationship between a prevailing organic need state and the speed of perceptual recognition of objects associated with the satisfaction of the need. It was assumed that Bruner and Postman's use of such phrases as 'stimuli which are in congruence' and 'prevailing directive state' refered respectively to 'stimuli commonly associated with the satisfaction of a need', and 'orientated towards the satisfaction of a particular need'. Stated categorically

the hypothesis tested in the present experiment was:

> Subjects who are thirsty will perceptually recognize objects hidden in a puzzle picture quicker than will subjects who do not need a drink (are not thirsty), providing such hidden objects are associated with the quenching of their thirst.

The methods and procedures used in testing this hypothesis are outlined in the next chapter.

CHAPTER II

EXPERIMENTAL MATERIALS, SUBJECTS, AND PROCEDURE

MATERIALS

The stimulating situation was standard for all subjects, being a set of ten 'puzzle-picture' cards. These cards (see Appendix A) were specially constructed for this experiment. The picture on each card is formed of ink line. The lines form an apparently meaningless combination of curve and straight line bounded figures. Each card was 5" x 6" with a black border around it.

The pictures themselves were structured in a manner similar to those used by Kohler (8,pp.190-193) to demonstrate varying 'stability' of visually organized entities. He illustrates that the 'stability' of an object or shape is disturbed or destroyed by the addition of neighbouring lines which assist in the perceptual formation of larger entities or objects. Each picture used in the present experiment contained only one hidden object of definite form. In order to assist in the concealing of these objects in the puzzle-picture some of the essential lines of its form were heterogeneously scattered over the adjacent area. This formed the puzzle-picture aspect of the cards, as only in one spot in the picture were the lines so arranged that they were

perceivable as a meaningful object: the hidden object.

The whole picture was of such a nature that when the object was perceived, it would be with sudden 'insight'. The 'puzzle-picture' aspect of the cards was to prevent too immediate perceptual recognition. The hidden objects though, when once perceptually recognized, presented no ambiguity of form, or any doubt as to its meaning. The objects were well structured forms and could not be considered as 'marginal' stimuli in the sense outlined previously.

On five of these ten 'puzzle-picture' cards were hidden objects associated with the satisfaction of thirst. The hidden objects in these five cards were: 1. A glass spilling water; 2. A running water tap; 3. A 'pop' bottle; 4. A running water fountain; 5. A cup (or mug) spilling water.

Previous to the construction of these cards, and the selection of the type of objects to be hidden, a survey of 124 university students in an undergraduate psychology class was made to determine those objects which individuals most commonly associated with water. In this preliminary study the students were asked to write down the first two things which came to their minds when they thought of water. Some of the most frequently associated things such as 'boat' or 'fish' were obviously impractical to employ in an experiment on thirst. Frequent enough reference was made to the type of objects finally employed in the cards, though, to

warrant their use in an experiment of this sort.

The remaining five cards contained objects assumed to be neutral to the need being tested. These second five cards contained respectively: 6. An electric light bulb; 7. A smoking pipe; 8. A hammer; 9. A rolling pin; 10. Reading glasses. These neutral cards were included as distractors. Their chief purpose was to prevent the subjects from determining the general nature of the hidden objects, as they related to thirst satisfaction. Another, though less important, reason for the inclusion of these neutral cards in the experiment stemmed from the very nature of the hypothesis being tested. If need did effect perception by decreasing the recognition time of these hidden objects, is this decreased recognition time manifest only with need related objects or is it a ubiquitous phenomena common to all types of objects?

It had originally been planned, in order to make the experimental subjects thirsty, to have them suck on a salt tablet just prior to experimental testing with the cards. Later, realizing that salt tablets elicit much unpleasantness, it was decided to abandon this method of inducing thirst. Individuals who are initially discouraged from entering the experiment by being asked to suck a mouthful of salt, are not apt to make the most highly motivated subjects.

It was finally decided that the subjects in the experimental group would be made thirsty by having them eat a fairly

large quantity of peanut-butter. It had been found, preliminary to this experimental investigation, that sufficient quantities of peanut-butter did induce a marked temporary thirst in the majority of people. In the actual experiment the subjects in the experimental group were made thirsty in this manner.

As a measure of the thirst factor, all subjects were given a rating scale of thirst, (see Appendix B) and asked to subjectively rate themselves. This rating scale consisted of a five point scale of 'felt thirst'. To facilitate the subjects rating of themselves each point on the rating scale was accompanied by a short verbal description of the felt subjective state for that point.

For timing the recognition speed a stop watch was used. This watch could be read to one-fifth of a second. The same experimenter did the timing for the whole experiment so it can be assumed that his reaction time is a constant factor in all the reported scores.

SUBJECTS

The subjects used in this experiment were sixty army recruits obtained at a local army depot. Thirty of these subjects composed the experimental group, and the remaining thirty the control group. The average education of all subjects was grade VIII, their age twenty-five, and all had vision which was normal or corrected sufficient for enlistment in the army active forces.

The testing of these subjects extended over a two week period. During this period the various subjects were obtained from several different drafts of recruits. As any particular draft was at the station for only a very few days, it was felt that the subjects were drawn from several 'psychologically isolated' groups (In terms of this experiment). This factor doubtless cut down communication between pre- and post-experimental subjects. The subjects from any particular draft were run through the test in a short period of time, and prevented from communicating with others in their draft until all who were to be tested in their draft, had been tested. The total time taken for any one subject did not exceed fifteen minutes.

Another factor operating to curtail the spread of information amongst prospective subjects was the general ignorance amongst them of the test's purpose. The subjects were <u>not</u> told that this was <u>not</u> a part of the whole army screening program which they had just undertaken. As the subjects were all volunteer recruits, and presumeably eager to make a good 'show' in the army, it was felt that they would do their best under the assumption that it <u>was</u> part and parcel of their screening. And, as their best could only be judged relative to their buddies results (or so they were told), anything which assisted the other fellow and didn't assist themselves, merely lowered their own relative standing. This belief on the part of the subjects further curtailed the spread of

information about the nature of the test, it is believed.

PROCEDURE

The subjects were admitted to the testing room singly. The room was well lit by natural light, and all testing took place during the daytime. The order of subjects had previously been determined for control or experimental group, on the basis of a table of random numbers. Thus, each subject, as he entered the room, was placed into a predetermined group, either control or experimental. Chance alone, determined whether he was to be a control or experimental subject.

Each subject was seated opposite the experimenter at a three foot table. The puzzle-picture cards were held by the experimenter, about two and a half feet from the seated subjects. The cards were arranged and held in such a manner that as soon as one card was completed it could be dropped down, expossing the following card.

When the subject was seated and comfortable he was read the following instructions:

> "You are going to be shown ten cards , in order. On each of these cards is a picture. This picture is made up of jumble of curved and straight lines. In each of these jumbled line pictures there is a hidden object. They are all objects that your know very well and probably see every day. Your are to look at each card as it is shown to you. As soon as you see a hidden object in the picture, report it. I will be keeping time with the stop watch,so

> it is important that you report it the moment you recognize it. Some cards are harder than others, and there maybe some that you will not get at all. But, go right on trying until told to stop. To show you what is meant by a hidden object I will show you this sample card.... Are there any questions now, before we start."

The sample card which is shown to the subjects is a very simple one. The hidden objects, scissors, are quite obvious. (see Appendix A)

If there were any questions at this point, the instructions were merely repeated. If the questions pertained to the nature, or reason, for the test, the answer was deferred until the end of the test with the vague explanation that divulging the nature and purpose of the test at this point would destroy its 'worth'.

Both control and experimental groups were given the same set of instructions, with the addition, in the case of the experimental group, of instructions to eat the peanut-butter. The experimental group were given the peanut-butter on paper plates, and instructed to eat at least four spoonsful, rapidly. They were further instructed to eat one spoonful before being shown each card.

The cards with the neutral objects hidden in them were randomly interspersed with the cards in which the need objects were hidden. The ten cards were presented to the subjects in the following order: Scissors (sample); Light bulb (#1 neutral); Glass spilling water (#1 need); Running water tap (#2 need); Smoking pipe (#2 neutral); Hammer (#3 neutral); 'Pop' bottle (#3 need); Running water fountain (#4 need); Rolling pin (#4 neutral);

Cup spilling water (#5 need); Reading glasses (#5 neutral).

For practical purposes, a subject was stopped at two hundred seconds if he had failed to locate or recognize the hidden object in any one of the cards. He then proceeded to the next card. This time limit was felt to be justified on the basis of pre-experimental work with the cards. While the cards were being constructed, it was discovered, that if a subject did not locate the hidden object in a fairly short time, he soon lost interest and would probably fail to ever locate the object.

After all the cards had been shown, the subjects were asked to indicate, on the rating scale, their degree of 'felt' thirst during the experiment. The time taken by each subject to recognize each hidden object had been entered in a table at the bottom of the sheet which contained the rating scale. This scoring table was folded under, so that the subjects would not be able to see the timed results while they were rating themselves on the scale of thirst.

Any questions which now came up, over the nature or pupose of the test, or any which had been deferred from earlier in the testing session, were now answered in a rather ambiguous, psuedo-technical manner. The answers given were to the effect that this was a testing technique used for isolating those individuals who were least effected by camouflage . This theme was expanded on

at some length for the benefit of the more inquisitive. The peanut-butter was explained away as simulating stressful and distracting situations. It is doubtful if any really believed this explanation, but it probably served the purpose, in many cases, of satisfying their curiosity while clouding the real issues.

CHAPTER III

THE DATA AND THEIR TREATMENT

The following chapter is devoted entirely to the statistical analysis of the data. The non-mathematical implications of these derived statistics form the subject matter of the next chapter.

The results to be analyzed statistically, fall into two relatively distinct sets of datum: the results, in seconds, for all subjects, for recognition of the objects in each one of the ten cards; and, the point values for each subject on the subjective rating scale of 'felt' thirst. The raw data for both of these variables is presented in Appendix C, for both control and experimental groups.

The first set of data to be analyzed is that dealing with the rating scale of thirst. This control is essential for a proper evaluation of the remainder of the data. It is on the basis of this rating scale that we can decide whether or not the experimental variable was significantly conducive of thirst in the experimental group to warrant further analysis of the results.

On the basis of the five point rating scale, and the dichotomous variable of being a member of either the control or

experimental group, the subjects can readily be analyzed on the basis of a 5 x 2 Chi Square test for significance of difference. This analysis is reported in Table I.

When the rating scale values are analyzed in this manner, with four degrees of freedom, Chi Square is equal to 32.44. This is a highly significant figure, for, with the same number of degrees of freedom, a Chi Square value of 13.277 is significant at the .01 level .

As a further check, we may reduce all this data to a 2 x 2 table by grouping all the scale values below point three into the scale value two, and all scale values three and above into the scale value three. It is felt that this type of reduction is justified on the basis of certain linguistic aspects of the rating scale. At a scale value between two and three we can consider a transition occurs in definition of terms designating the scale points. A 'semantic' division between 'higher' and 'lower' ratings of thirst occurs here, for it is at this point and above, on the scale, that the subject first indicates the desire for a drink of water, or that he was conscious of needing a drink.

On the basis of a 2 x 2 table, with one degree of freedom, Chi Square is now equal to 14.77. This is once again highly significant at the .01 level. Further, if Yate's correction for small frequencies is applied to this 2 x 2 table , Chi Square is equal to 12.725, still highly significant at the .01 level.

TABLE I

CHI SQUARE TEST OF RATING SCALE VALUES FOR CONTROL AND EXPERIMENTAL GROUPS

	COLUMNS					Sum of Rows
Scale Values	1	2	3	4	5	
EX. f_e	10	10	8.5	1	.5	30
EX. f_o	2	11	16	0	1	
CO. f_e	10	10	8.5	1	.5	30
CO. f_o	10	9	1	2	0	
Sum of Columns	20	20	17	2	1	60

It is obvious from the above analysis that, using either a 5 x 2 or a 2 x 2 table of Chi Square test, we can feel highly confident that the self rated values on the rating scales are significantly different between the control and experimental groups. And, as the mean scale value is 1.56 for the control group, as against 2.56 for the experimental group, we can feel confident that the experimental group rated themselves significantly more thirsty than did the control group. Some variable other than mere chance is operating to differentiate the control from the experimental group on the basis of their subjective ratings. This is logically assumed, in the presence of controls, to be the introduction of the experimental variable: peanut-butter.

Turning now to an analysis of the subjects recognition times on each of the ten cards, we find that the values can be grouped together for each group, and distributed in the form of a table. This has been done in the form of a rough distribution table contained in Appendix D. Examination of this distribution curve for both the control and the experimental groups, indicates a marked positive skewness in each case. Reflection upon the experimental procedure used, suggests that such a shape of curve was to be expected. In fact, the shape of the distribution, ideally, should more closely approximate the "J" shaped curve than the conventional "bell" form. This is due to the timing procedure used

with the cards. Conventional statistical methods are inapplicable to these sets of figures.

Before undertaking a card by card analysis of the results, it was decided to make use of a form of statistical exploratory technique to see if any difference was indicated between the two groups. The technique used was one that is not effected by the form of distribution of the scores in question. This statistical technique was to determine the rank order correlation, in each group, between the summed scores on the need cards and the summed scores on the neutral cards.

It was believed that this method would tentatively determine whether any such change as did subsequently become indicated, in recognition times, occurred similarly for both need and neutral cards. If there was a correlation between the summed speeds on the need cards and the neutral cards, for each subjects, it would indicate that probably thirst was effecting recognition speed in an all or none fashion. This rank order method would not indicate if any change had occurred in fact.

This form of analysis was given to both the control and the experimental group. The tables for the calculation of these rank order correlations are given in Appendix E. In the experimental group the 'rho' of .2 is not significant at the .05 level. This indicates that there is no significant correlation between an experimental subject's score on the need cards and his

score on the neutral cards. Similarly, a 'rho' of .05 is not statistically significant, for the control group. Hence, if thirst did decrease the recognition time of the experimental group, it did so for only the need or neutral cards alone, and not for both types of objects simultaneously. The existence of similar results for the control group, though, makes any significant change, attributable to thirst, seem quite unlikely.

Let us turn now, to an analysis of the individual card scores for the control and experimental groups. It was pointed out previously that normality of distribution of scores could not be assumed in the population from which our sample was taken. In view of this, statistics had to be employed which made no assumptions of the shape of the distribution. Mood (14), in his text on the mathematical theory of statistics, points out, that not all the adequate forms of statistical analysis are forced to assume normality in the population forms. In this regard, he (14,p.385) states,

> During the past few years, however, techniques have been developed for estimating parameters and testing hypothesis which require no assumption about the form of the distribution function. These techniques are called non-parametric methods, or better, distribution free methods.

These distribution-free methods are based on 'order' statistics. The method used to analyze the results on the individual cards, like the previous application of 'rho', is an 'order' statistic: the 'run test' for the comparison of two samples.

For each card, the subjects in each group are separately ordered. The two groups are then combined in over-all order. A record of the group from which every particular value was taken, was kept by labelling all control values X and all experimental values Y. Runs are then calculated for the total sample. A run is a series of values derived from the same original group; that is to say, a run of X's or a run of Y's. The number of runs is signified by the letter 'D', and then (14,p.392),

> The test is then performed by observing the total number of runs in the combined sample, accepting the null hypothesis if 'D' is greater than some specified number 'D_o', and rejecting the null hypothesis if 'D' $\leq$ 'D_o'.

One determines D_o for testing the null hypothesis by putting the right hand side of the equation,

$$t = \frac{Do - 2\alpha\beta}{2\alpha\beta\sqrt{N}},$$

equal to 1.645 for testing at the .05 level, and at 2.326 for testing at the .01 level, (α is equal to the probability of one group, and β equal to the probability of the other group, in this case, .5 for each). Taken to the nearest whole numbers, D_o is equal to 6 at the .05 level and 9 at the .01 level.

In combining the values from both samples, to form the one ordered group, the scores were ordered in such a manner that, whenever there were several similar values in both X and Y groups, they were combined to form the least number of runs. Thus, if

TABLE II

TOTAL NUMBER OF RUN (D VALUES) FOR EACH OF THE TEN CARDS, FOR 60 SUBJECTS

Card #	D	D_o at .01 level	D_o at .05 level
1	24	9	6
2	25	9	6
3	--	9	6
4	27	9	6
5	31	9	6
6	18	9	6
7	26	9	6
8	23	9	6
9	24	9	6
10	25	9	6

anything, we are favouring the rejection of the null hypothesis. The calculated 'D' values for each of the ten cards is given in Table II. Because of the unexpected difficulty of card three, resulting in very few recognitions, its analysis is ommitted in this table.

A similar 'run test' could be given for the combined scores for all subjects, on all cards, in each group. This would give us an N of six hundred. This procedure, is felt to be unnecessary. If statistical analysis of the individual cards reveals no significant difference between the control and the experimental groups, in terms of differences in recognition times, a difference found on the basis of any other statistical procedure, (a mathematical improbibility) would merely be a statistical artifact indicating faulty analytical technique.

The theoretical implications of these derived statistics, and their reflection upon the hypothesis being tested, is discussed in the next chapter.

CHAPTER IV

DISCUSSION OF RESULTS

Before commencing a discussion of the obtained results, it may be worthwhile to state the hypothesis under test: subjects who are made experimentally thirsty will perceptually recognize objects associated with the satisfaction of that thirst more quickly than will subjects who are not thirsty.

In order to differentiate the two groups with regards to thirst, peanut-butter was fed to the experimental group, and witheld from the control group. When all subjects were subsequently asked to rate themselves on the five point subjective scale of thirst, it was found that the experimental group rated themselves significantly more thirsty than did the control group. The Chi Square test indicated that this difference was significant beyond the .01 level of confidence.

It has been pointed out previously, that the rating scale also could be looked upon as a two point scale, with all values two and below considered as value two, and all values three and above assigned a point three rating. When this is done, and the appropriate correction for continuity is applied, the two group are still found to be significantly different at the .01 level. If we now take into

account that the mean value for the experimental group is higher than the mean rating scale value for the control group, we can feel highly confident that the experimental group was actually more thirsty during this experiment, than was the control group (as judged by themselves). Further, to the extent that the experiment was adequately controlled, we can feel equally confident that it was the introduction of the experimental variable peanut-butter, which accounted for this differential thirst rating.

Aquestion may now be raised over the actual nature of this induced thirst. It should be recalled, that in the majority of the experiments dealing with hunger as the organic need being tested, the subjects were actually deprived of food for varying lengths of time, ranging from zero to twenty-four. It is questionable if the method used in the present experiment is completely analagous to the deprivation method. For the methods to be comparable in all respects, the subjects should have been actually deprived of fluid intake for varying lengths of time, preceding experimental testing.

It is a defensible position, that there are two distinct conditions which can appropriately be called thirst. One of these conditions , is where there is merely a drying of the mucous-membrane lining of the throat and mouth. The other condition, which can also be called thirst, is where the general fluid level of the organism is lowered. The latter condition is usually accompanied by

the former, but the existence of the former need not necessitate the former. In fact, it was just this relation of dry throat, independent of a lowering of the body fluid level, which was accomplished in the present experiment.

It can be logically and theoretically pointed out, that these two conditions are not necessarily completely mutually exclusive. And, if the type of induced thirst employed in this experiment is not reflected in the recognition time of thirst related objects, nothing can be deduced regarding the effect of a more general 'body thirst' on the perceptual recognition process. This possible limitation of our results is pointed out merely to indicate one of the difficulties inherent in experimentation with so-called 'basic physiological' needs. The experimenter can never be sure whether he is working with a 'basic physiological' need, or merely an appetitive need, or if there is , in fact, any difference between the two.

A further question which can be asked, one very closely related to this last point, deals with the psychological validity of subjective scales of organic needs. Is it not more feasible to use some more objective criterion of need, such as hours of deprivation, as the index of the degree of organic need? The experimenters with hunger, have universally used hours of deprivation as their index of need. They have reasoned, that as time passes, the organism becomes increasingly in need of food, for its

metabolic processes. Hence, time of deprivation from food is considered a valid, objective criterion of need. They have assumed that such a criterion is a better index of need than is the subjects own subjective rating of his needs. The question remains, though, just how good an indecator of objective need is an individuals report of his felt need?

The only study in this field of organic need and perception which treats of this problem of the relations between hours of deprivation and self ratings, is the experiment of McClelland and Atkinson (11). In this experiment they gave their subjects a five point rating scale of thirst, as well as using the deprivation method of inducing organic need. They (11,p.216) make the following remarks regarding the validity of the rating scale as an objective index of need:

> The number of food responses followed the subjective ratings very closely. Perhaps the subjective state should have been considered the main determinants of food responses and used rather than hours of deprivation to differentiate the three hungary groups through the rest of the experiment. But the situation is not so simple as this. It is also possible to argue that the subjective state of hunger is a response to a physiological condition just as the number of food responses are. Both are negatively accelerated functions of the amount of deprivation....it was decided to use hours of deprivation rather than subjective hunger ratings as the basis for isolating the degree of hunger drive.

The fact that they found the number of food responses followed the subjective ratings very closely, and the former followed the number of hours deprivation, can not be taken to

means that an appetitive need will function similarly with need responses. This whole question needs further experimental exploration as the necessary factual data is not available at present for its resolution.

Because of the nature of the distributions obtained, and the necessity to stop the subjects at two hundred seconds if they had failed to locate the hidden objects, the statistical analysis employed statistics not involving the assumption of normality. Non-parametric, or distribution free statistics were used.

The first such distribution free method employed was the method of rank order correlation. This is essentially an exploratory technique and usually precedes more detailed statistical analysis of data. When this form of analysis was given to the data of this experiment, it was found that perception of need and neutral cards were independent in both the control and experimental groups.

One would expect that subjects would be at least partially consistent as either perceptually 'fast' or 'slow'in recognition time of hidden objects. This is to be expected independent of the functioning of the experimental variable, and could be expected to occur at least in the control group. There is a very slight positive correlation between recognition time on need and neutral cards, for both the control and experimental groups, to be sure, (being greatest for the experimental group), but this is not a statistically significant correlation.

One possible explanation for this lack of correlation is that recognition of these hidden objects requires more than one perceptual ability. These perceptual abilities being distinct and uncorrelated. This explanation though, seems very unlikely as an examination of the cards would tend to indicate that they are constructed along essentially similar lines, the perceptual task being uniform for all ten cards. In fact, the cards were originally constructed so that the perceptual task would be the same in all cards.

Application of the 'run-test' to the scores of the individual cards resulted in no statistically reliable difference between the forms of distribution of the control and experimental groups. We can feel highly confident then, in assuming that any minor difference which may have appeared between the two groups, appeared purely on the basis of chance. No difference in perceptual recognition time was demonstrated between the two groups.

Bruner (4) has classified the determinants of perception as either 'behavioral' or 'autochthonous'. That latter are the organizing processes perculier to the neuro-sensory functioning of the organism. The former were the determinants derived from the organisms motives and needs. He suggested, that as one determinant became less effective, the other would become increasingly effective. In the experiment just concluded it would tend to indicate that the 'autochthonous determinats were effective enough to over-rule any

possible effect of the behavioral determinants induced by the need for fluid.

It was pointed out in the introductory chapter, that the majority of experimenters, when attempting to illustrate the effects of need on perception, had traditionally made use of 'marginal' perceptual situations. Further, it was suggested that the contention of some perception theorists that all perception is of the blurred, fleeting type, epitomized in their experiments, is probably a questionable assumption. The experiment reported in this paper made use of highly structured visual stimuli which could not be construed as 'marginal'.

Perception may be adaptive and reflect as one of its determinants, at a 'marginal' level of stimulation, the existing motivating directives of the organism. To the extent that many experiments as well as several of the more popular projective tests appear to demonstrate this, the hypothesis can tentatively be accepted as possessing some validity. But that all perception functions this way is another question, a question which to date still lacks adequate experimental confirmation of a positive answer.

The experiment reported in this paper, to the extent that it made use of highly structured rather than unstructured stimuli, is somewhat different than past studies. This point was made clear in the opening chapter. It does not necessarily question

the possibility of need effecting marginal perception. The fact that we obtained negative results in this experiment may, rather than question any hypothesis of the perception theorists, merely indicate limitations in the technique used in this experiment.

The experiment was originally undertaken to see if there was any effect on recognition time of need related objects by variable intensities of the need in question. It becomes a debateable point, as to just what are need related objects. It will be recalled that the selection of objects for this study was determined by finding what things were most commonly associated with the word water. McClelland and Atkinson have uncovered some interesting data on the nature of need ralted objects . They (11,p.211) report some facts which help to clarify this point of the nature of need related objects:

> The results show that there was a reliable increase in the number of 'instrumental' food responses as hours of deprivation increased, while the number of 'goal' objects responses stayed practically the same....Another way of stating it is that the hungary groups saw more ($P \leq .06$) objects related to getting food than they did actual food objects, whereas the non-hungary group saw an equal number of each....Introduction of some hazy shadows or smudges on the screen cut down the average number of food responses.

Their explanation of the fact that introduction of a smudged rather than a blank screen decreased the actual number of food responses, is similar to Bruner's (4) contention that, as one set of perceptual determinants increase, the other decreases. In this case

it was apparently the autochthonous determinants which were increasing. If we consider our experiment as utilizing a highly structured stimulus, then McClelland and Atkinson's use of a blank screen is the polar extreme.

Let us now examine this dichotomy between 'instrumental' and 'goal' objects, as it may apply to our experiment. In order to explain the fact that 'instrumental' responses increased while 'goal' responses remained virtually unchanged in number, they suggest, along with Sanford, that there is "a tendency to reduce the displeasure of frustration by supressing thought of the goal." (11,p.220). As a need gets greater a persons phantasies and perceptions begin to concern themselves more and more with realistic means of satisfying that need. This is not unlike Muphy's postulation of a 'reality principle' to explain his drop in number of food responses beyond a certain number of hours of deprivation.

If we not look at our own data and attempt to use these concepts, it becomes readily apparent how difficult it is to fully classify our hidden objects as either 'goal' or 'instrumental' in nature. It may be a relatively uncomplicated issue with food need (as McClelland and Atkinson have demonstrated), but with thirst it is far more difficult. Considered from one point of view, all the objects in oure cards are instrumental objects: cup, glass, bottle, fountain stand, tap. Yet, to the extent that the major portion of them also entail water as either pouring or spilling from them,

they can just as readily be classified as 'goal' type objects. It would probably be safe to classify all these need objects as 'mixed' type objects, embodying both 'goal' and 'instrumental' aspects.

If these hidden objects entail 'goal' object aspects, in terms of the need being tested, then, in accord with the above outlined theory, the obvious explanation of our negative results is that perceptual recognition in the experimental group was repressed or hindered by the prevailing need. And yet, if such were the case, why were the thirsty subjects not slower on the need cards than they were on the neutral cards? Are we to assume that one factor, the need, was functioning to increase perceptual recognition through suppression, while simultaneously functioning to decrease perceptual recognition time in an adaptive manner? If we assume that such is the case, then in this experiment the two processes neutralize each other. This hardly seems to be a parsimonious explanation of negative experimental results. The fact that the control group functioned similarly to the experimental group makes it appear as if the original explanation that, in this experiment, need did not effect perception, was the correct one.

In summing up the results of this experiment, we can say, recalling that we had previously established a higher degree of thirst in the experimental group than in the control group, that we can find no acceptable verification of the original hypothesis that

need will decrease recognition time of need related objects.

As has been pointed out frequently, in this discussion of results. there are several limitations to conclusions which can be drawn from this type of experiment. There are still several questions which remain unanswered. The unfortunate necessity of eliminating card three, the 'pop' bottle, was unforseen. This reduced the number of need cards to four. The question of the type of thirst, as it may differentially effect perceptual recognition, is still an open question. As far as thirst is concerned, it is still undetermined what is the real difference between 'goal' and 'instrumental' objects. The question of degrees of stimuli structuring of the perceptual stimuli has not been adequately explored to date. We may be able to classify stimuli of no structure or very high structure, but how does one graduate the intermediary degrees of structure? An experiment which may answer some of these questions is suggested in the concluding chapter.

CHAPTER FIVE

CONCLUSION AND SUMMARY

It was pointed out in the introductory chapter, that the conception that perception is an adaptive process has been widely accepted by psychologists. It was also noted that much of the experimental evidence in support of this hypothesis is limited in its application. Experimenters have failed to treat of all types of perception, inder varying conditions of stimuli structure.

It is difficult to accept the contention of many perception theorists that all perception is of the 'marginal' type. Visual perception is not composed entirely of brief snatches of ambiguous stimuli which must be structured and 'filled in ' by the perceiver. On the contrary, the majority of everyday perception involves stimuli which are well structured and of definite form. If this were not the case we would live in an almost completely autistic world. For a number of reasons it is felt that to generalize from experiments making use of 'marginal' perceptual stimuli to all forms of stimulating situations is probably faulty induction.

The present experiment used perceptual stimuli which were well structured and presented a minimum of perceptual ambiguity on recognition. The results of the investigation, using this

type of stimuli, failed to support the hypothesis that need effects perception. Hence, withing the limits of this experiment, some doubt is cast upon the theory of the adaptive function of perception.

Perception may be adaptive and reflect as one of its determinants, at a 'marginal' level of stimulation, the existing motivating directives of the organism, but, that all perception functions this way is quite another problem.

It is only through a wide range of experiments, involving not only varying degrees of need and types of need but also varying amounts of stimuli structuring, that we will be able to discover to what extent need does effect perception. The constant repetition of experiments making use of 'marginal' stimuli will contribute little more to our knowledge of all forms of perception, and its possible functional relation to motivation.

SUMMARY

This experiment was undertaken to investigate the effect of thirst upon the perceptual recognition time of objects related to the satisfaction of that thirst. It was made clear that many of the past experiments using 'marginal' stimuli left the total field of perception inadequately explored.

The stimulating situation used in this experiment consisted of ten puzzle*picture cards, with one object hidden in each. Five of these cards contained need related objects and five contained neutral objects, relative to the need being tested.

A group of 30 subjects were made thirsty by having them eat peanut-butter. Another 30 subjects, the control group, were not thus made thirsty.

Each subject was shown the cards one at a time. He was timed on his speed of recognition of the hidden objects in each card. All subjects were then asked to rate themselves on a five point scale for the degree of their subjectively felt thirst.

Analysis of the results indicated that the peanut-butter made the experimental group significantly more thirsty than the control group. Further analysis indicated that there was no difference in speed of perceptual recognition in either the control or experimental group, for either the need or neutral objects. Any difference which did occur could be accounted for purely on the basis of chance.

A discussion of the limitations of certain other experiments, as well as implications for further research is included.

CHAPTER SIX

IMPLICATIONS FOR FUTURE RESEARCH

The following experimental outline is subtended to this paper as suggestive of a possible means for clarifying some of the questions evolved, and left unanswered, in the discussion of technique and results in chapter four. It is suggested as a means of clarifying some of these issues, not as an answer to all of the problems. The latter would be extreemly difficult to accomplish withing the limits of a single experiment.

An experimental group is deprived of water for varying lengths of time. They are then shown an ambiguous object for a fleeting time in a tachistoscope. Or, they are asked to verbalize an association with an blurred object shown behind, or on, a ground glass screen. Their responses are checked against a non-thirsty group, for number of 'thirst object' responses. These thirst responses being defined as related to the satisfaction of the need for liquid. If it is found that there is a dominance of need related objects in the responses of the experimental thirsty group, as would be expected from similar experiments with hunger, then the common observed need responses are collected. These common responses are then analysed into 'goal' and 'instrumental' objects, if this is possible. The objects are then hidden in a

puzzle-picture such as was used in the preceeding experiment. These hidden objects are drawn highly structured and non-ambiguous.

Another group of subjects are now made thirsty. They are made thirsty through water deprivation. A second group is made thirsty through the use of salt tablets. A control group is left non-thirsty. They are all then shown the puzzle-picture cards and asked to recognize the hidden objects. In this manner it would be possible to determine the effects, if any, of the two different types of thirst, and along with this it would be possible to explore the true nature of need related objects.

As a further experiment, or as an extension of this one, another group of experimental subjects are shown cards which contain both a need 'goal' object, and a need 'instrumental' object. In this way, using this type of card, it could be determined if there is any difference between recognition of the two types of objects. This is, of course, dependent upon the experimenters ability to differentiate the two types of objects in the original responses to a blurred or blank screen.

BIBLIOGRAPHY

1. ATKINSON, J.W. AND McCLELLAND, D.C. The projective expression of needs: II. The effect of different intensities of the hunger drive on thematic apperception. J. exp. Psychol., 1948, 38, 643-658

2. BRUNER, J.S. Emotional selectivity in perception and reaction J. Personal., 1947, 16, 69-77

3. BRUNER, J.S. Perceptual theory and the Rorschach test. J. Personal., 1948, 17, 157-168

4. BRUNER, J.S. AND GOODMAN, C.D. Value and need as organizing factors in perception. J. ab. & soc. Psychol., 1947, 42, 33-44

5. BRUNER, J.S. AND POSTMAN, L. Tension and tension-release as organizing factors in perception. J. Personal., 1947, 15, 300-308

6. BRUNER, J.S. AND POSTMAN, L. Symbolic value as an organizing factor in perception. J. soc. Psychol., 1948, 27, 203-208

7. BRUNER, J.S. AND POSTMAN, L. Perception, cognition and behavior. J. Personal., 1949, 18, 14-31

8. KOHLER, W. Gestalt Psychology. New York: Harcourt-Brace and Co., 1947

9. KRETCH, D. AND CRUTCHFIELD, R.S. Theory and Problems of Social Psychology. New York: McGraw-Hill, 1948

10. LEVINE, R., CHEIN, L. AND MURPHY, G. The relationship of intensity of a need to the amount of perceptual distortion; a preliminary report. J. Psychol., 1942, 13, 283-293

11. McCLELLAND, D.C. AND ATKINSON, J.W. The projective expression of needs: I. The effects of different intensities of the hunger drive on perception. J. Psychol., 1948, 25, 205-222

12. McCLELLAND, D.C. AND ATKINSON, J.W. The projective expression of needs: III. The effect of ego-involvment, success and failure on perception. J. Psychol., 1949, 27, 311-330

13. McCLELLAND, D.C. AND LIBERMAN, A.M. The effect of need for achievement on the recognition of need related words. J. Personal., 1949, 18, 236-251

14. MOOD, A.F. Introduction to the theory of statistics. New York: McGraw-Hill, 1950

15. MURPHY, G. Personality, a biosocial approach to origin and structure. New York: Harpers, 1947

16. PASTORE, N. Need as a determinant of perception. J. Psychol., 1949, 28, 457-475

17. PROSHANSKY, H.M. AND MURPHY, G. The effects of reward and punishment on perception. J. Psychol., 1942, 13, 295-305

18. POSTMAN, L. AND BRUNER, J.S. Perception under stress. Psych. Rev., 1948, 55, 313-323

19. POSTMAN, L. AND BRUNER, J.S. Multiplicity of set as a determinant of perceptual organization. J. exp. Psychol., 1949, 39, 369-377

20. POSTMAN, L., BRUNER, J.S. AND McGINNIES, E.M. Personal values as selective factors in perception. J. abn. & soc. Psychol., 1948, 43, 142-154

21. SANFORD, R.N. The effect of abstinance from food upon imaginal processes: A preliminary experiment. J. Psychol., 1936, 2, 129-136

22. SANFORD, R.N. The effects of abstinance from food upon imaginal processes: A further experiment. J. Psychol., 1937, 3, 145-159

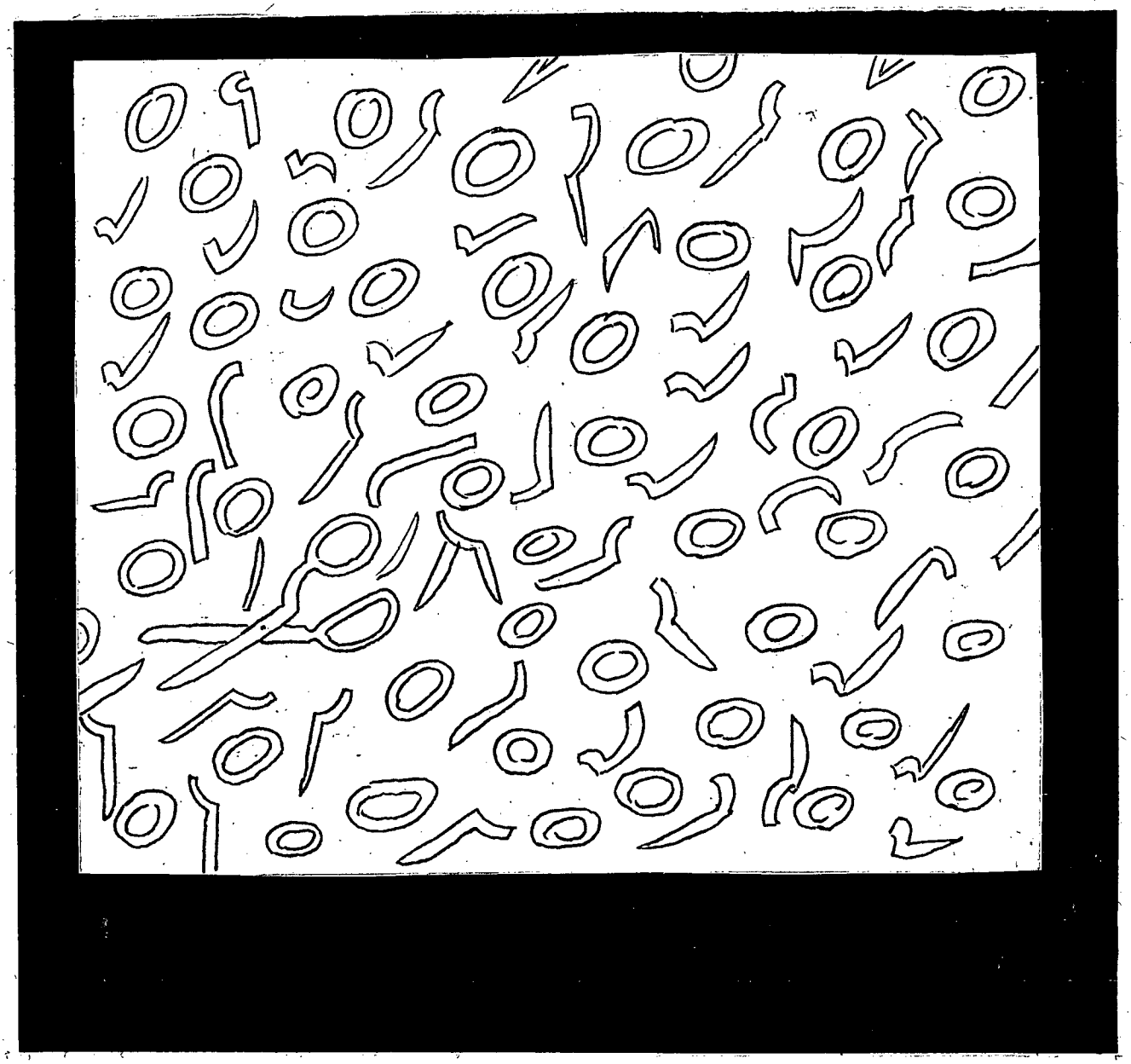
23. SCHAFFER, R. AND MURPHY, G. The role of autism in visual figure ground relationship. J. exp. Psychol., 1943, 32, 335-343

24. SEARS, R.R. Experimental analysis of psychoanalytic phenomena. In J. McV. Hunt (Ed.), Personality and the Behavior Disorders. New York: Ronald, 1944

APPENDIX A

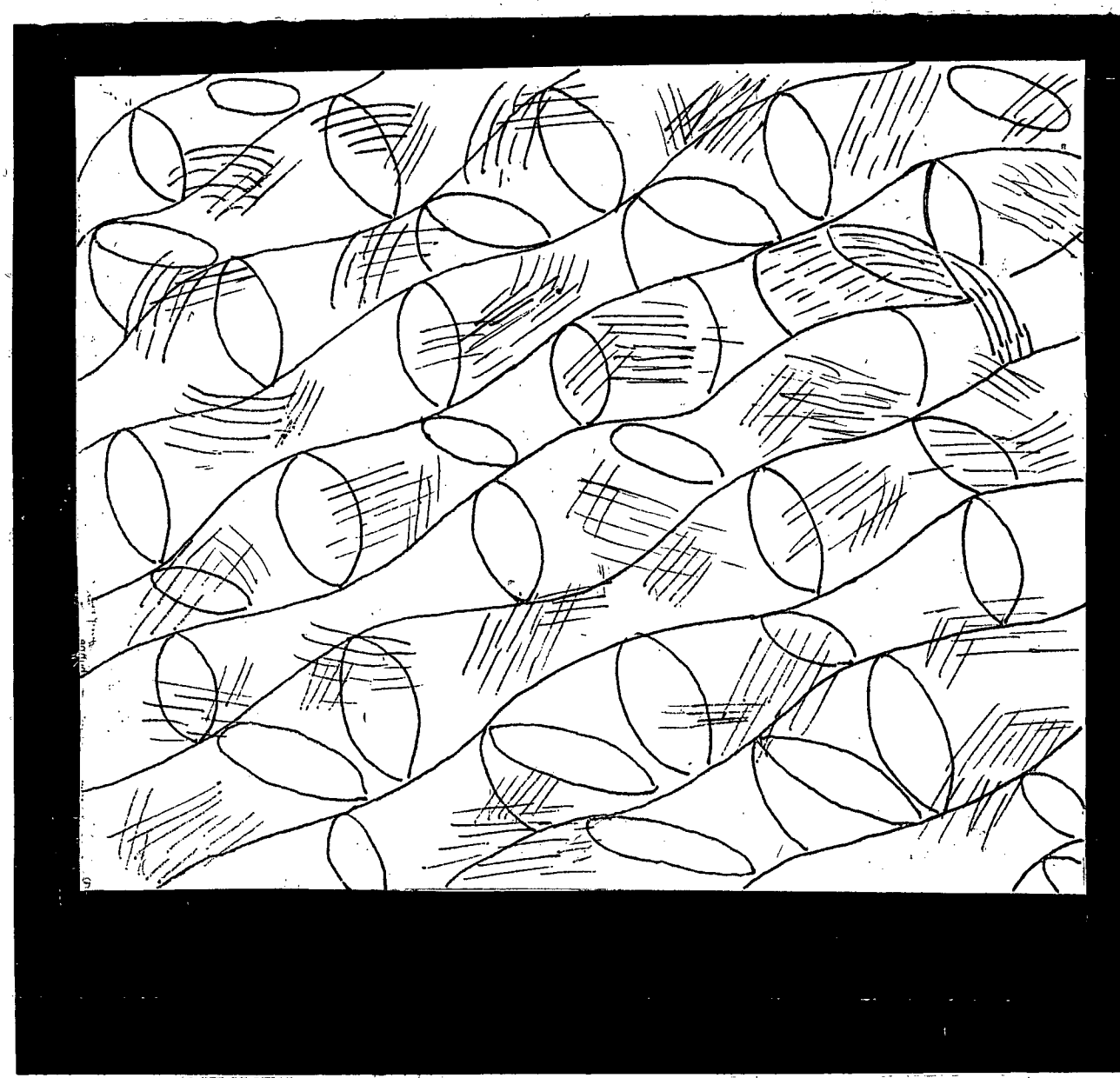
THE SET OF PUZZLE-PICTURE CARDS

SCISSORS

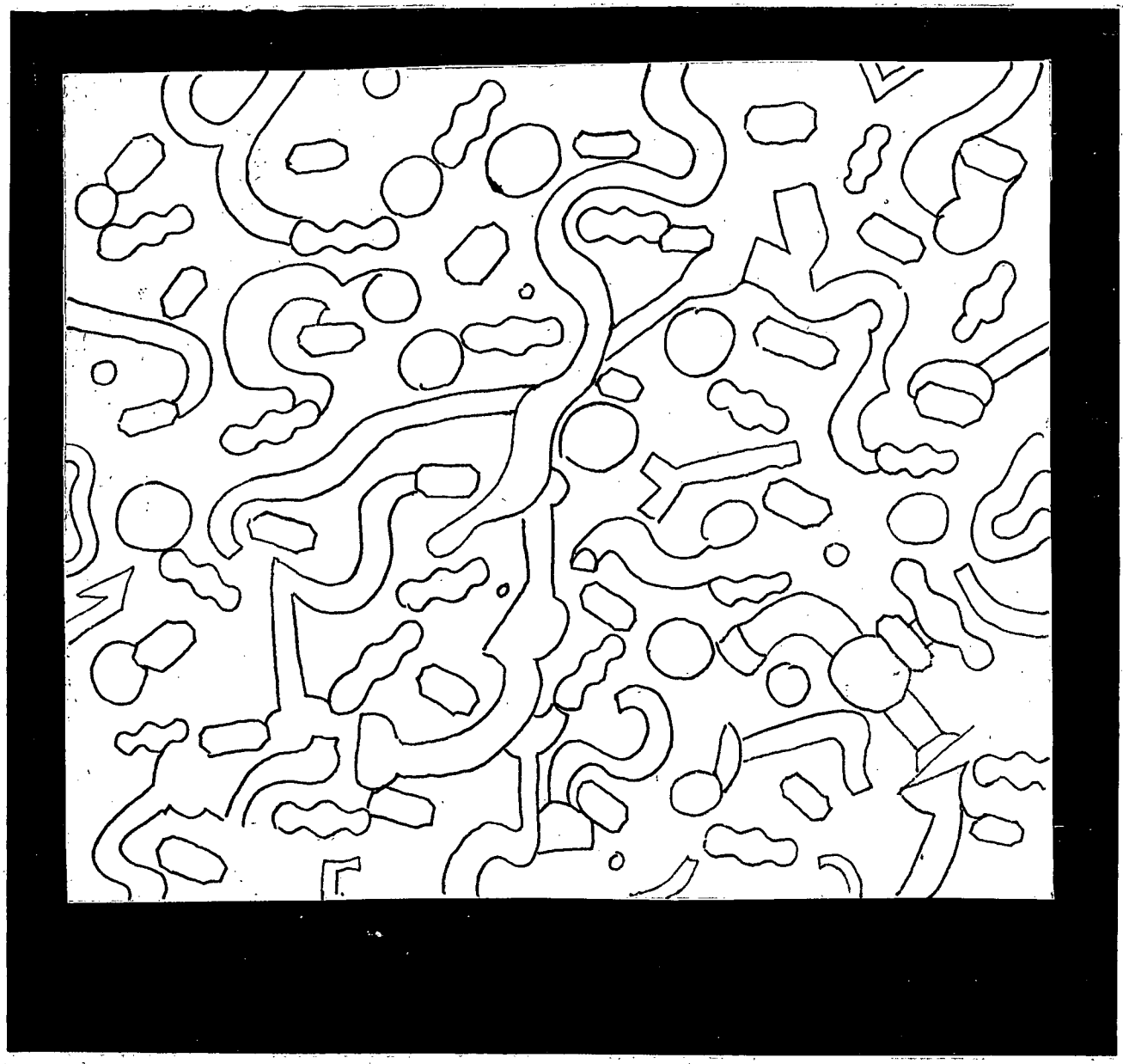


CARD ONE

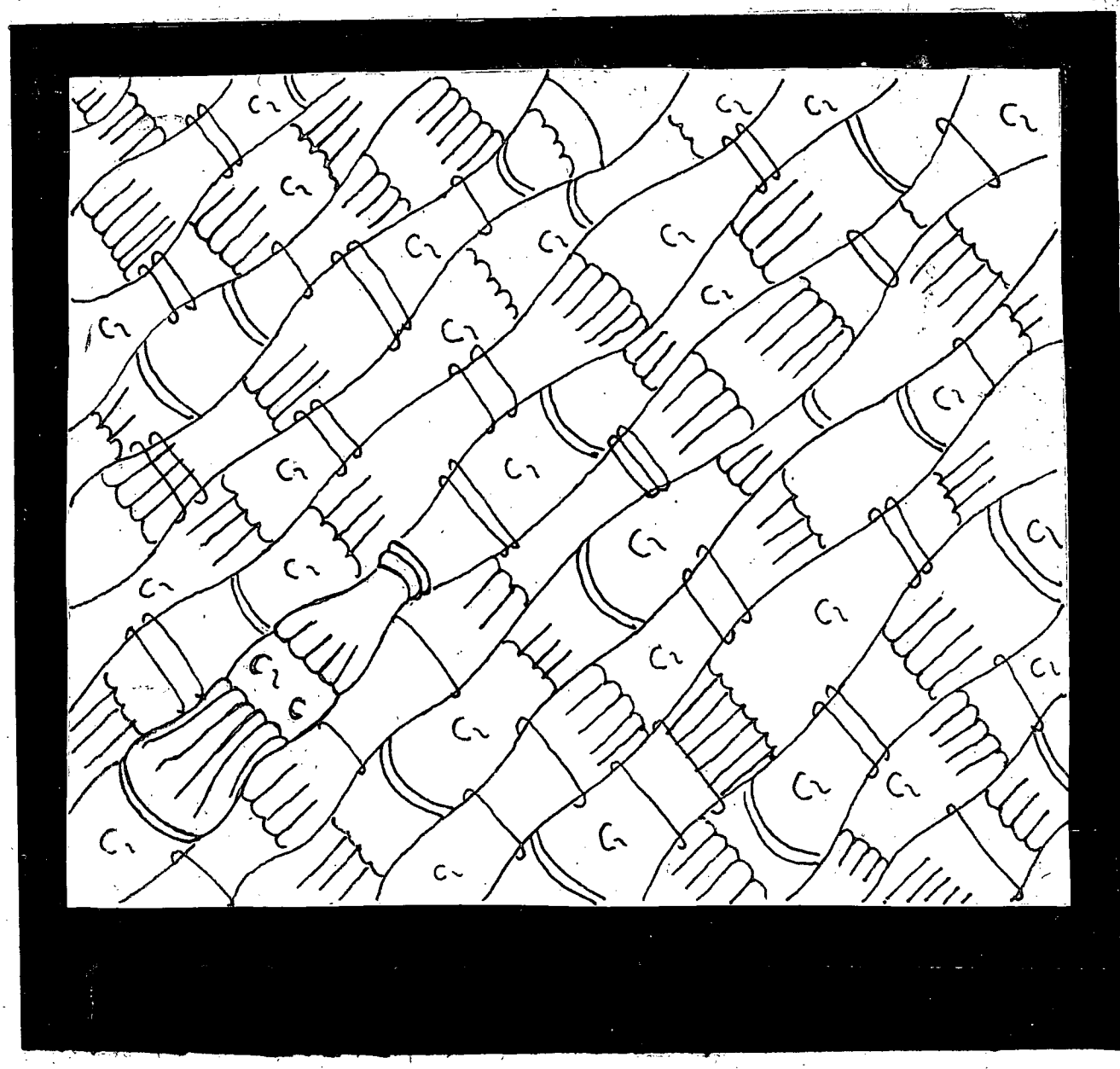
NEED OBJECT: GLASS SPILLING WATER



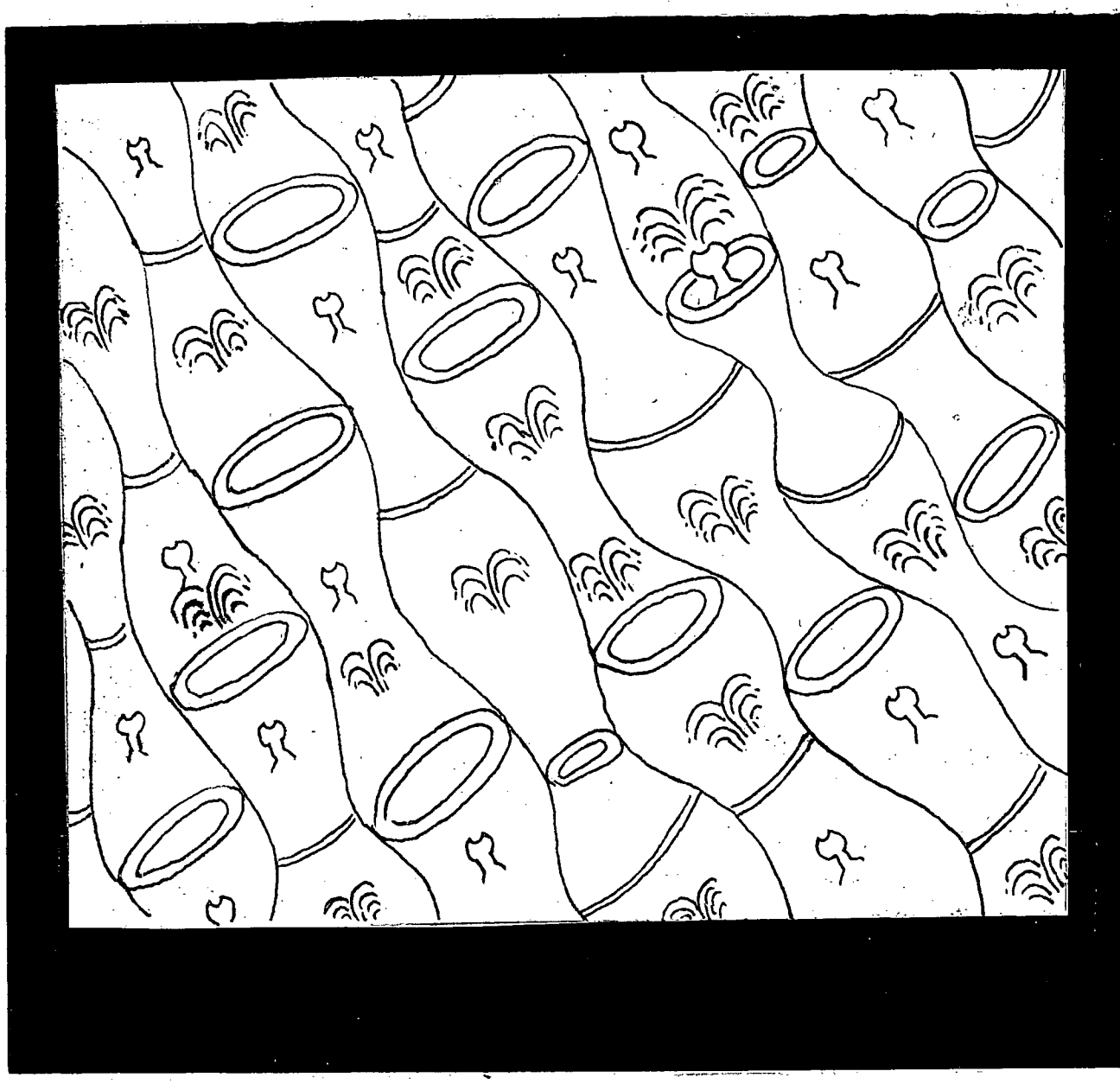
NEED OBJECT: WATER TAP



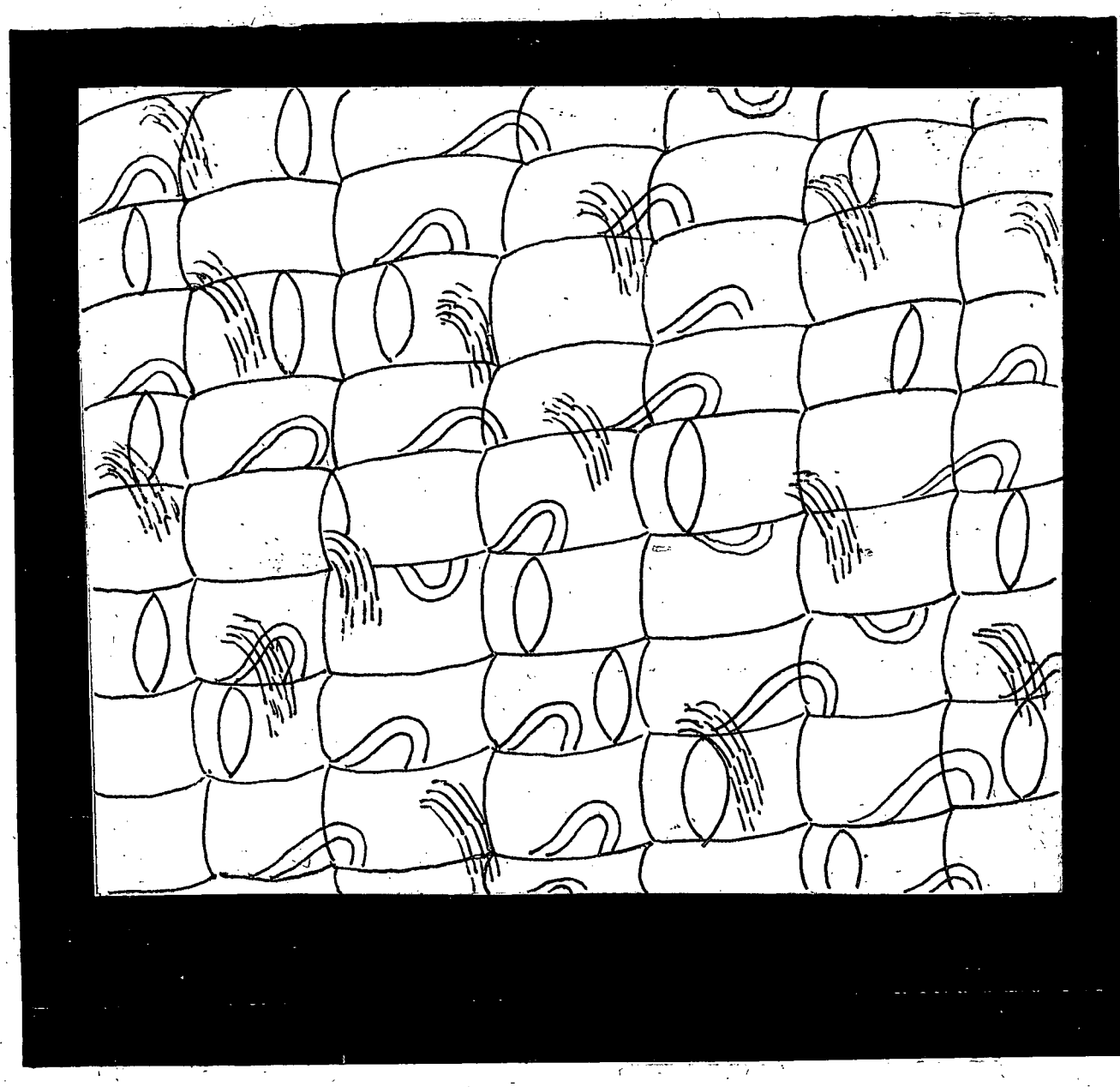
NEED OBJECT: 'POP' BOTTLE



NEED OBJECT: RUNNING WATER FOUNTAIN

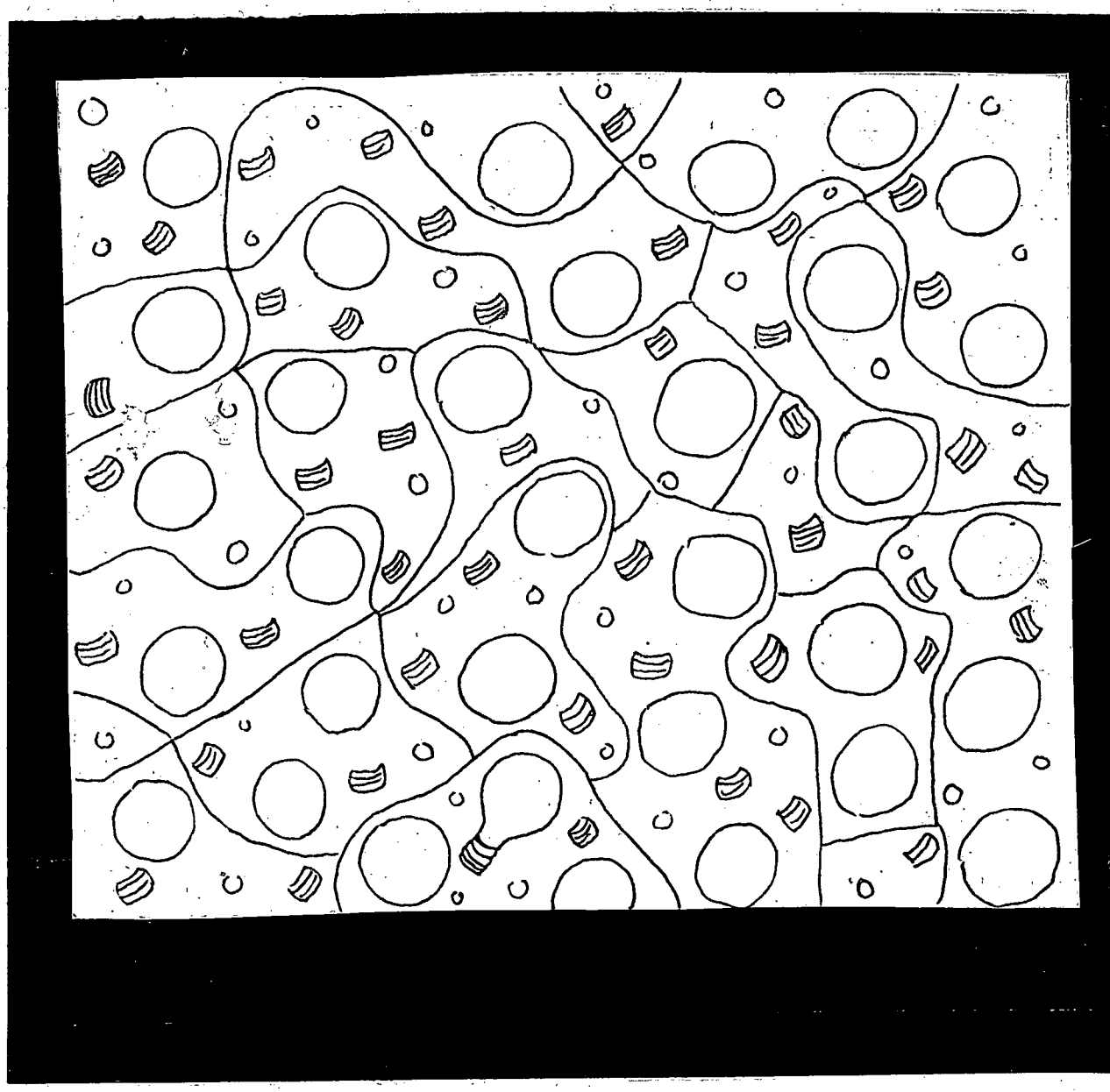


NEED OBJECT: CUP (OR MUG) SPILLING WATER



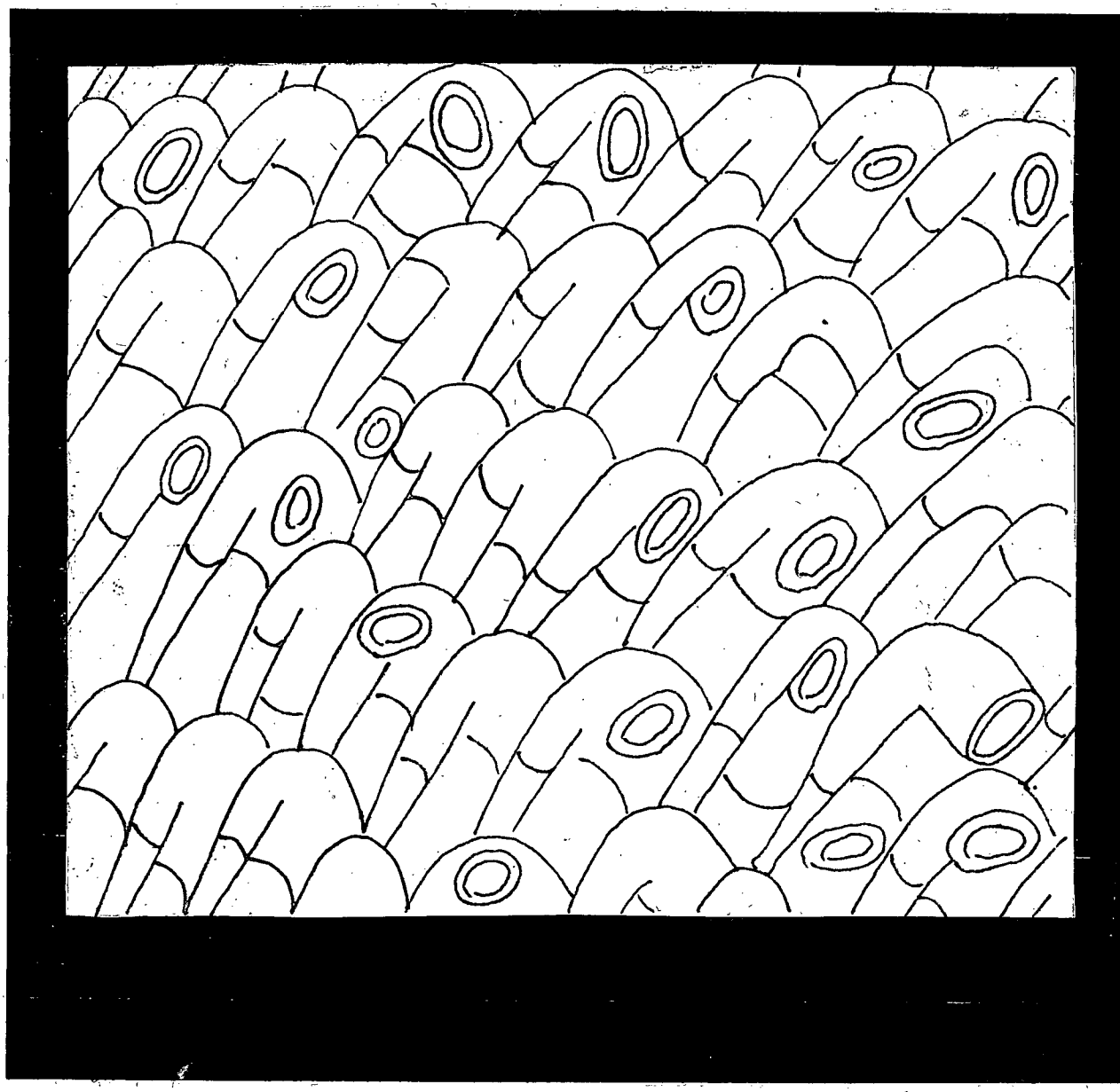
CARD SIX

NEUTRAL OBJECT: ELECTRIC LIGHT BULB

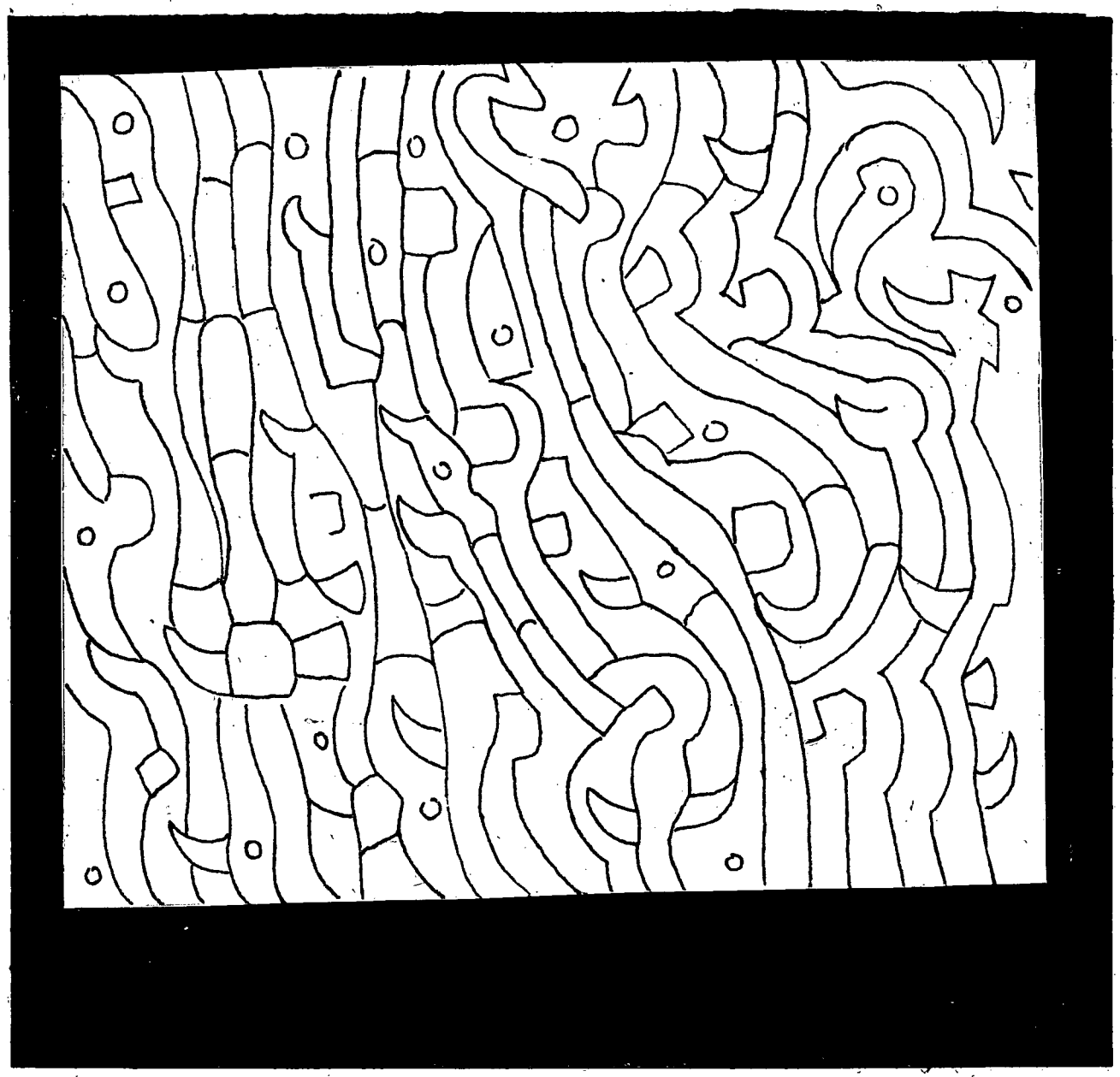


CARD SEVEN

NEUTRAL OBJECT: SMOKING PIPE

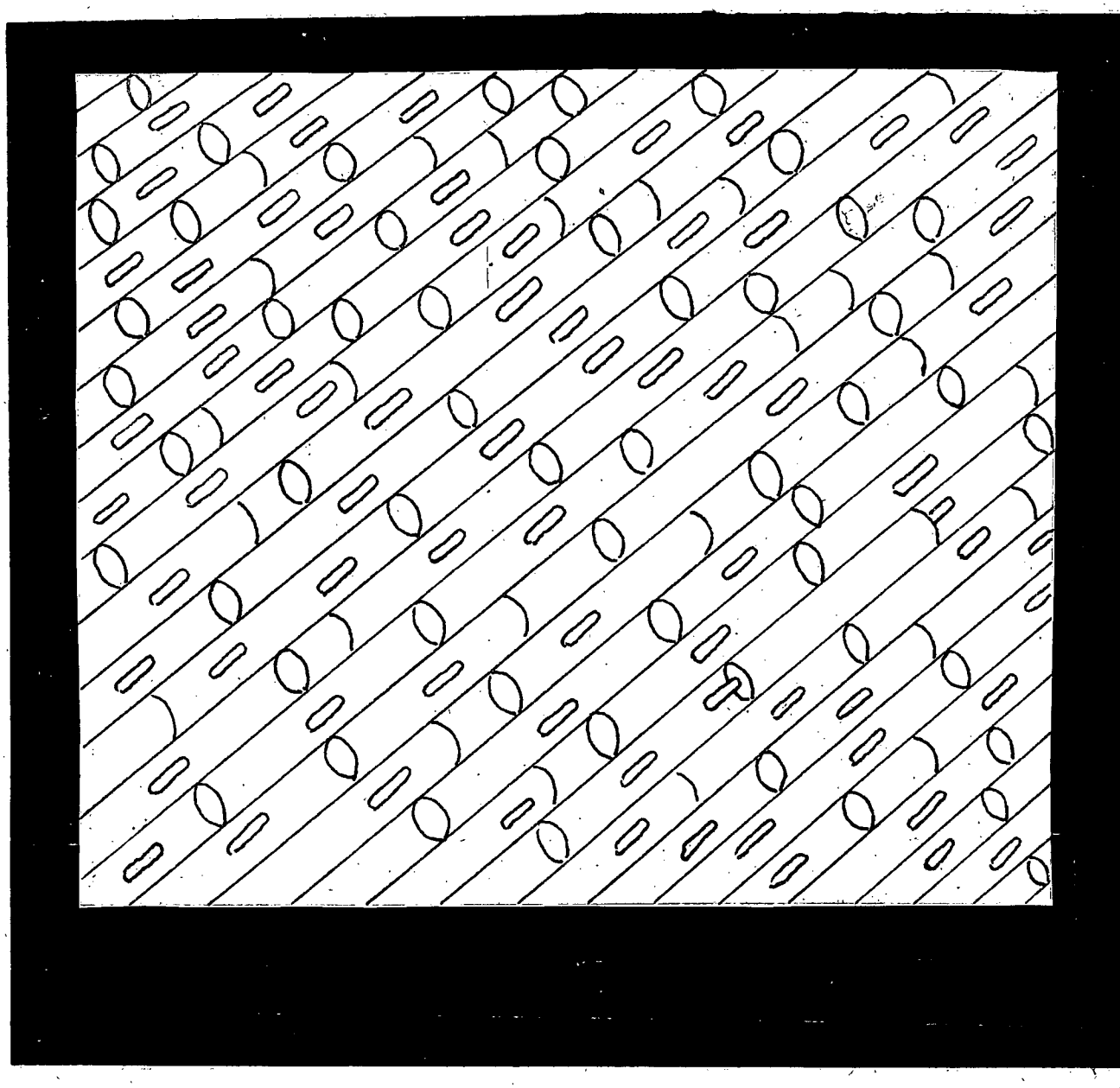


NEUTRAL OBJECT: A HAMMER



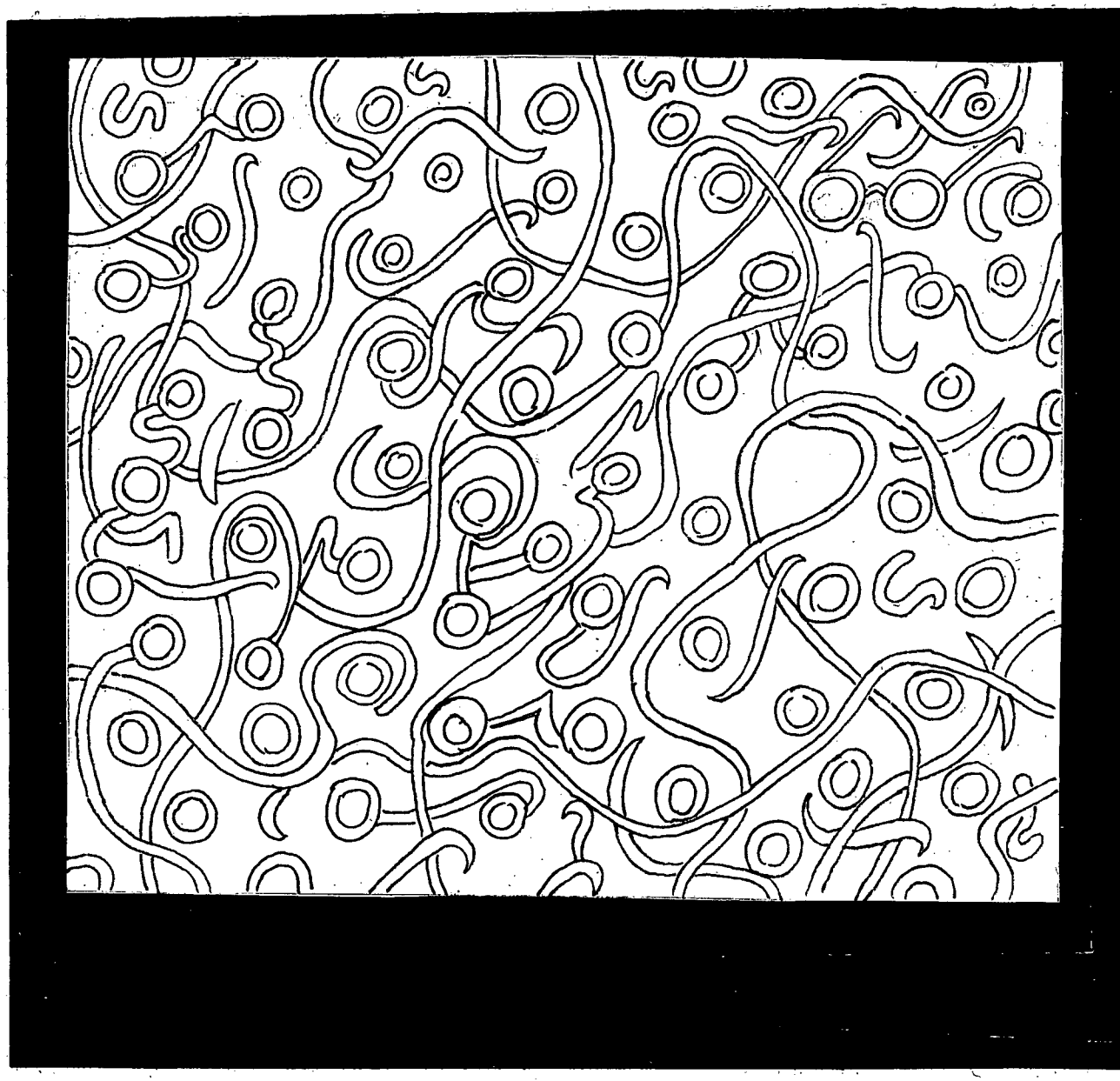
CARD NINE

NEUTRAL OBJECT: A ROLLING PIN



CARD TEN

NEUTRAL OBJECT: READING GLASSES



APPENDIX B

RATING SCAIE OF THIRST

Name .....

Age ..... Sex ..... Education .....

_____ 1. Not thirsty - did not feel the need for a drink during the experiment.

_____ 2. Slightly thirsty - but did not particularly notice it during the experiment.

_____ 3. Quite thirsty - mouth felt dry during the experiment; would have liked a drink.

_____ 4. Very thirsty - mouth felt very dry during the experiment; would have liked a drink very much.

_____ 5. Extremely thirsty - felt so very thirsty that I found it difficult to concentrate on the pictures.

	Time/sec.	Remarks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

APPENDIX C

RAW DATA FOR CONTROL AND EXPERIMENTAL GROUPS

OBJECT RECOGNITION TIME IN SECONDS FOR CARDS
ONE TO TEN FOR THE CONTROL GROUP

Subject	Card Number										Rating Scale
	1	2	3	4	5	6	7	8	9	10	
01	15.0	5.4	200.0	6.0	9.0	2.0	5.0	5.6	6.4	11.0	1
03	9.4	4.0	13.0	4.0	14.4	3.0	11.2	5.0	4.0	5.2	2
05	16.0	4.8	200.0	4.8	20.0	1.8	6.0	8.8	8.4	24.8	1
07	9.4	8.0	12.4	9.4	4.6	2.0	4.4	2.0	3.4	8.8	4
08	175.0	9.0	200.0	17.8	15.6	3.4	3.0	3.0	2.8	16.4	1
10	17.6	6.8	200.0	12.0	38.0	4.4	8.2	9.2	6.0	38.2	1
15	7.8	11.8	200.0	7.0	10.0	2.6	13.6	39.0	23.2	23.8	2
19	21.0	5.2	200.0	10.0	10.4	9.0	20.6	5.0	11.0	10.6	2
20	13.2	13.8	14.0	8.0	15.9	4.2	98.8	6.2	4.0	18.0	2
21	7.0	25.6	200.0	13.4	36.0	2.0	2.0	3.8	11.0	19.0	2
23	3.0	4.8	16.0	2.6	3.0	18.0	31.0	4.0	8.0	3.2	1
27	30.0	7.0	3.8	4.0	3.2	2.2	5.0	3.0	2.6	11.4	2
29	12.8	4.2	19.0	11.2	26.0	2.0	3.4	3.2	3.0	61.2	1
31	61.4	18.2	200.0	21.0	22.8	11.8	6.8	3.8	7.4	25.6	1
33	16.0	5.2	200.0	3.8	32.4	2.0	5.4	3.0	2.2	8.6	1
34	10.0	5.4	200.0	6.0	9.2	12.6	5.0	4.0	28.0	26.0	1
36	4.0	5.4	200.0	5.2	19.8	2.6	16.6	3.8	12.4	200.0	1
37	4.0	29.4	200.0	11.4	4.0	4.0	14.0	5.4	3.8	10.6	2
40	7.4	31.0	200.0	3.6	4.0	4.4	8.6	6.8	3.8	40.0	1
42	5.0	26.2	200.0	4.0	11.8	2.0	6.0	2.6	7.0	7.0	2
43	21.0	4.0	200.0	2.8	3.4	5.8	3.0	32.0	2.0	60.0	1
45	23.2	10.2	200.0	3.8	4.0	2.4	3.4	6.2	2.4	17.4	3
47	14.0	3.0	200.0	10.6	17.0	3.6	3.2	3.4	4.6	32.0	4
49	33.2	19.0	200.0	13.6	20.0	1.8	2.2	4.6	10.6	33.4	1
52	200.0	9.2	200.0	10.0	26.0	1.6	17.2	8.4	6.4	23.2	1
54	22.0	36.6	200.0	8.0	23.0	4.8	8.8	1.8	8.0	24.4	1
55	7.0	33.2	200.0	4.6	15.0	3.8	3.4	8.4	14.2	6.4	2
56	6.0	200.0	200.0	4.0	8.0	5.6	3.8	3.0	11.0	200.0	1
57	4.0	6.2	200.0	8.6	13.2	2.0	2.4	4.8	6.8	8.0	1
53	6.4	4.0	200.0	2.8	21.8	2.0	4.0	5.2	4.4	11.0	1

OBJECT RECOGNITION TIME IN SECONDS FOR CARDS
ONE TO TEN FOR THE EXPERIMENTAL GROUP

Subject	Card Number										Rating Scale
	1	2	3	4	5	6	7	8	9	10	
00	108.2	9.0	200.0	12.4	21.6	1.8	19.6	5.0	31.4	41.8	2
02	6.8	25.4	37.6	8.4	2.8	1.0	2.4	3.4	3.4	33.2	1
04	95.4	5.0	200.0	15.2	12.4	4.4	7.0	5.0	4.2	10.0	5
06	134.8	29.4	200.0	4.6	9.0	8.0	9.4	5.0	17.2	18.0	3
09	35.0	23.8	200.0	4.8	3.8	5.8	7.0	3.2	30.0	9.0	2
11	200.0	5.0	4.8	8.0	24.4	3.4	2.8	3.2	4.4	200.0	1
12	56.6	5.6	200.0	14.8	37.2	4.6	6.0	1.4	2.8	25.2	3
13	40.0	5.0	200.0	8.0	22.6	5.0	8.2	2.4	3.0	106.0	2
14	9.0	4.6	200.0	6.0	19.2	2.0	9.8	5.0	4.0	5.0	3
16	9.0	3.8	200.0	5.4	21.2	8.4	6.4	3.8	7.0	16.6	2
17	5.0	3.2	30.2	8.8	11.0	2.0	3.0	11.0	15.0	15.4	2
18	200.0	7.0	200.0	3.0	41.4	9.0	7.0	7.6	5.8	26.0	3
22	5.0	19.0	200.0	1.4	8.0	2.6	6.0	1.8	2.4	10.0	2
24	17.8	11.0	5.0	8.6	6.0	9.0	4.6	17.8	3.4	20.0	2
25	13.0	9.6	200.0	13.0	9.4	5.0	11.4	3.4	5.0	30.0	3
26	9.0	17.6	200.0	4.8	11.8	3.8	6.0	5.2	8.0	25.0	3
28	15.6	7.0	200.0	5.0	22.8	2.6	21.6	3.0	20.4	200.0	3
30	3.6	7.0	3.2	2.4	6.8	6.0	3.0	2.8	4.6	25.0	3
32	26.8	10.0	200.0	26.0	10.2	1.8	4.2	5.2	4.2	25.4	2
35	9.0	3.0	200.0	5.4	8.0	5.8	3.2	1.6	14.6	200.0	3
38	6.8	9.4	200.0	7.8	15.0	2.6	3.0	3.6	4.6	21.0	2
39	35.0	4.0	200.0	9.0	16.0	2.0	2.0	41.0	3.0	48.0	3
41	3.0	49.6	200.0	2.0	2.0	8.4	1.8	13.0	3.2	10.4	3
44	19.0	11.8	200.0	7.0	8.0	6.0	7.0	13.0	9.2	24.6	3
46	200.0	9.0	200.0	10.0	6.8	2.2	4.6	6.4	26.8	14.6	3
48	9.4	23.2	200.0	3.8	21.2	3.8	2.6	3.0	6.0	200.0	3
50	19.6	9.0	200.0	6.8	14.2	6.8	28.0	4.8	3.2	11.2	2
51	43.0	19.0	200.0	8.0	7.2	1.4	5.2	3.8	3.8	28.0	3
58	3.4	8.4	200.0	3.4	5.4	1.8	13.0	4.0	6.0	21.2	2
59	42.0	5.8	200.0	3.6	5.4	3.4	16.0	6.2	2.4	6.0	3

APPENDIX D

DISTRIBUTION OF RAW SCORES FOR CONTROL AND EXPERIMENTAL GROUPS, BY TIME VALUE AND CARD NUMBER

DISTRIBUTION OF RAW SCORES FOR CONTROL GROUP, BY TIME VALUE AND CARD NUMBER

.9-1.9	1.9-2.9	2.9-3.9	3.9-4.9	4.9-5.9	5.9-6.9
1.6(6)	2.6 (4)	3.0 (1)	4.0 (1)	5.0 (1)	6.0 (1)
1.8 "	2.8 "	3.0 (2)	4.0 "	5.2 (2)	6.4 "
1.8 "	2.8 "	3.8 (3)	4.0 "	5.2 "	6.2 (2)
1.8(8)	2.0 (6)	3.6 (4)	4.0 (2)	5.4 "	6.8 "
	2.0 "	3.8 "	4.0 "	5.4 "	6.0 (4)
	2.0 "	3.8 "	4.0 "	5.4 "	6.0 "
	2.0 "	3.0 (5)	4.2 "	5.2 (4)	6.0 (7)
	2.0 "	3.2 "	4.8 "	5.6 (6)	6.0 "
	2.0 "	3.4 "	4.8 "	5.8 "	6.8 "
	2.0 "	3.0 (6)	4.0 (4)	5.0 (7)	6.2 (8)
	2.0 "	3.4 "	4.0 "	5.0 "	6.2 "
	2.2 "	3.6 "	4.0 "	5.0 "	6.8 "
	2.4 "	3.8 "	4.0 "	5.4 "	6.0 (9)
	2.6 "	3.0 (7)	4.6 "	5.0 (8)	6.4 "
	2.6 "	3.0 "	4.8 "	5.0 "	6.4 "
	2.0 (7)	3.2 "	4.0 (5)	5.2 "	6.8 "
	2.2 "	3.4 "	4.0 "	5.4 "	6.4 (10)
	2.4 "	3.4 "	4.0 "	5.6 "	
	2.0 (8)	3.4 "	4.6 "	5.2 (10)	
	2.6 "	3.8 "	4.0 (6)		
	2.0 (9)	3.0 (8)	4.2 "		
	2.2 "	3.0 "	4.4 "		
	2.4 "	3.0 "	4.4 "		
	2.6 "	3.0 "	4.8 "		
	2.8 "	3.2 "	4.0 (7)		
		3.4 "	4.4 "		
		3.8 "	4.0 (8)		
		3.8 "	4.0 "		
		3.8 "	4.6 "		
		3.0 (9)	4.8 "		
		3.4 "	4.0 (9)		
		3.8 "	4.0 "		
		3.8 "	4.4 "		
		3.2 (10)	4.6 "		

6.9-7.9	7.9-8.9	8.9-9.9	9.9-10.9	10.9-11.9	11.9-12.9	12.9-13.9	13.9-14.9	14.9-15.9	15.9-16.9
7.0 (1)	8.0 (2)	9.4 (1)	10.0 (1)	11.8 (1)	12.8 (1)	13.2 (1)	14.0 (1)	15.0 (1)	16.0 (1)
7.0 "	8.0 (4)	9.4 "	10.2 (2)	11.2 (4)	12.4 (3)	13.8 (2)	14.0 (3)	15.0 (5)	16.0 (2)
7.4 "	8.0 "	9.0 (2)	10.0 (4)	11.4 (4)	12.0 (4)	13.0 (3)	14.4 (5)	15.6 "	16.0 (3)
7.8 "	8.6 "	9.2 "	10.0 "	11.8 (5)	12.6 (6)	13.4 (4)	14.0 (7)	15.8 "	16.6 (7)
7.0 (2(	8.0 (5)	9.4 (4)	10.6 "	11.8 (6)	12.4 (9)	13.6 "	14.2 (9)		16.4 (10)
7.0 (4)	8.2 (7)	9.0 (5)	10.4 (5)	11.2 (7)		13.2 (5)			
7.0 (9)	8.8 "	9.2 "	10.8 "	11.0 (9)		13.6 (7)			
7.4 "	8.8 "	9.0 (6)	10.6 (9)	11.0 "					
7.0 (10)	8.4 (8)	9.2 "	10.6 (10)	11.0 "					
	8.4 "		10.6 "	11.0 (10)					
	8.8 "		10.6 "	11.0 "					
	8.0 (9)			11.4 "					
	8.0 "								
	8.4 "								
	8.0 (10)								
	8.6 "								
	8.8 "								

16.9-17.9	17.9-18.9	18.9-19.9	19.9-20.9	20.9-21.9	21.9-22.9	22.9-23.9	23.9-24.9	24.9-25.9	25.9-26.9
17.6 (1)	18.2 (2)	19.0 (2)	2.00 (5)	21.0 (1)	22.0 (1)	23.2 (1)	24.4 (10)	25.6 (2)	26.2 (2)
17.8 (4)	18.0 (6)	19.0 (3)	20.0 "	21.0 "	22.8 (5)	23.0 (5)	24.8 "	25.6 (10)	26.0 (5)
17.0 (5)	18.0 (10)	19.8 (5)	20.6 (9)	21.0 (4)		23.2 (9)			26.0 "
17.2 (7)		19.0 (10)		21.8 (5)		23.0 (10)			26.0 (10)
17.4 (10)						23.8 "			

26.9-39.9	39.9-199.9	199.9-200.1
30.0 (1)	61.4 (1)	200.0 (2)
33.2 "	175.0 "	200.0 (2)
29.4 (2)	98.8 (7)	200.0 (3)
31.0 "	40.0 (10)	200.0 "
33.2 "	60.0 "	200.0 "
36.6 "	61.2 "	200.0 "
32.4 (5)		200.0 "
36.0 "		200.0 "
38.0 "		200.0 "
31.0 (7)		200.0 "
32.0 (8)		200.0 "
39.0 "		200.0 "
28.0 (9)		200.0 "
32.0 (10)		200.0 "
33.4 "		200.0 "
38.2 "		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 "
		200.0 (10)
		200.0 "

The numbers in the parenthesis are card numbers. The other numbers are the individual time scores

DISTRIBUTION OF RAW SCORES FOR EXPERIMENTAL GROUP, BY TIME VALUE AND CARD NUMBER.

.9-1.9	1.9-2.9	2.9-3.9	3.9-4.9	4.9-5.9	5.9-6.9	6.9-7.9	7.9-8.9	8.9-9.9	9.9-10.9	10.9-11.9	11.9-12.9	12.9-13.9	13.9-14.9	14.9-15.9	15.9-16.9	16.9-17.9	17.9-18.9	18.9-19.9	19.9-20.9	20.9-21.9	21.9-22.9	22.9-23.2	23.9-24.9	24.9-25.9	25.9-26.9	26.9-39.9	39.9-199.9	199.9-200.1
1.4 (4)	2.0 (4)	3.0 (1)	4.0 (2)	5.0 (1)	6.8 (1)	7.0 (2)	8.4 (2)	9.0 (1)	10.0 (2)	11.0 (2)	12.4 (4)	13.0 (1)	14.8 (4)	15.6 (1)	16.0 (5)	17.8 (1)	18.0 (10)	19.0 (1)	20.4 (9)	21.2 (5)	22.6 (5)	23.2 (2)	24.4 (5)	25.4 (2)	26.8 (1)	35.0 (1)	40.0 (1)	200.0 (1)
1.0 (6)	2.4 "	3.4 "	4.6 "	5.0 "	6.8 "	7.0 "	8.0 (4)	9.0 "	10.0 (4)	11.8 "	12.4 (5)	13.0 (4)	14.2 (5)	15.2 (4)	16.0 (7)	17.6 (2)		19.6 "	20.0 (10)	21.2 "	22.8 "	23.8 "	24.6 (10)	25.0 (10)	26.0 (4)	35.0 "	42.0 "	200.0 "
1.4 "	2.0 (5)	3.6 "	4.8 (3)	5.0 (2)	6.8 "	7.0 "	8.0 "	9.0 "	10.0 (4)	11.5 "		13.0 (7)	14.6 (9)	15.0 (5)	16.6 (10)	17.8 (8)		19.0 (3)		21.0 (7)				25.0 "	26.8 (9)	29.4 (2)	43.0 "	200.0 (3)
1.8 "	2.8 "	3.0 (2)	4.6 (4)	5.0 "	6.8 "	7.0 (4)	8.0 "	9.0 "	10.2 (5)	11.8 "		13.0 (8)	14.6 (10)	15.0 (9)		17.2 (9)		19.0 "		21.0 (10)				25.2 "	26.0 (10)	38.2 (4)	56.6 "	200.0 "
1.8 "	2.0 (6)	3.2 "	4.8 "	5.0 "	6.0 (5)	7.8 "	8.4 "	9.4 "	10.0 "	11.4 (7)		13.0 "		15.4 (10)				19.2 (5)		21.2 "				25.4 "		37.6 "	95.4 "	200.0 "
1.8 "	2.0 "	3.8 "	4.8 (4)	5.6 (2)	6.8 "	7.2 (5)	8.6 "	9.0 (2)	10.4 (10)	11.0 (8)								19.6 (7)								37.2 (5)	108.2 "	200.0 "
1.8 (7)	2.0 "	3.2 (3)	4.4 (6)	5.8 "	6.0 (6)	7.0 "	8.8 "	9.0 "		11.2 (10)																28.0 (7)	134.8 "	200.0 "
1.4 (8)	2.0 "	3.0 (4)	4.6 "	5.0 (9)	6.0 "	7.0 "	8.0 (5)	9.0 "																		30.0 (9)	141.4 (5)	200.0 "
1.6 "	2.6 "	3.4 "	4.2 (7)	5.0 (4)	6.0 "	7.0 "	8.0 "	9.4 "																		31.4 "	141.0 (8)	200.0 "
1.8 (8)	2.6 "	3.6 "	4.6 "	5.4 "	6.8 "	7.0 "	8.0 "	9.6 "																		28.0 (10)	141.8 (10)	200.0 "
	2.6 "	3.8 "	4.6 "	5.4 "	6.0 (7)	7.6 (8)	8.0 (6)	9.0 (4)																		30.0 "	148.0 (10)	200.0 "
	2.0 (7)	3.8 (5)	4.0 (8)	5.4 (5)	6.0 (7)	7.0 (9)	8.4 "	9.0 (5)																		33.2 "	106.0 "	200.0 "
	2.4 "	3.4 (6)	4.8 "	5.4 "	6.0 "		8.4 "	9.4 "																				200.0 "
	2.6 "	3.4 "	4.0 (9)	5.0 (6)	6.4 "		8.2 (7)	9.0 (6)																				200.0 "
	2.8 "	3.8 "	4.2 "	5.0 "	6.2 (8)		8.0 (9)	9.0 "																				200.0 "
	2.4 (8)	3.8 "	4.2 "	5.8 "	6.4 "			9.4 (7)																				200.0 "
	2.8 "	3.0 (7)	4.4 "	5.8 "	6.0 (9)			9.8 "																				200.0 "
	2.4 (9)	3.0 "	4.6 "	5.2 (7)	6.0 "			9.2 (9)																				200.0 "
	2.4 "	3.0 "		5.0 (8)	6.0 (10)			9.0 (10)																				200.0 "
	2.8 "	3.2 "		5.0 "																								200.0 "
		3.0 (8)		5.0 "																								200.0 "
		3.0 "		5.0 "																								200.0 "
		3.2 "		5.2 "																								200.0 "
		3.2 "		5.2 "																								200.0 "
		3.4 "		5.0 (9)																								200.0 "
		3.4 "		5.8 (9)																								200.0 "
		3.6 "		5.0 (10)																								200.0 "
		3.8 "																										200.0 "
		3.8 "																										200.0 "
		3.0 (9)																										200.0 "
		3.0 "																										200.0 "
		3.2 "																										200.0 "
		3.2 "																										200.0 "
		3.4 "																										200.0 "
		3.4 "																										200.0 "
		3.8 "																										200.0 "
																												200.0 (10)
																												200.0 (10)
																												200.0 (10)
																												200.0 (10)

The numbers in parenthesis are card numbers. The other numbers are the individual time scores.

APPENDIX E

RANK ORDER CORRELATION BETWEEN FIRST FIVE AND LAST FIVE CARDS FOR CONTROL AND EXPERIMENTAL GROUPS

RANK ORDER CORRELATION BETWEEN FIRST FIVE AND LAST FIVE CARDS FOR CONTROL GROUP

Subject	Rank order on summed scores for cards 1 - 5	6 - 10	D	D^2
01	12	9	3	9
03	3	7	4	16
05	16	16	0	0
07	2	1	1	1
08	28	8	20	400
10	23	23	0	0
15	13	26	13	169
19	18	19	1	1
20	5	28	23	529
21	24	12.5	11.5	132.25
23	1	22	21	441
27	4	4	0	0
29	6	24	18	324
31	27	18	9	81
33	21	2	19	361
34	7	25	18	324
36	10	30	20	400
37	20	12.5	7.5	46.25
40	17	21	4	16
42	19	5	14	196
49	25	17	8	64
45	14	10	4	16
47	15	14	1	1
43	8	27	19	361
52	30	20	10	100
53	11	6	5	25
54	26	15	11	121
55	22	11	11	121
56	29	29	0	0
57	9	3	6	36

N = 30
df= 28 rho = .05

rho of .05 is not significant at the 5% level of confidence.

RANK ORDER CORRELATION BETWEEN FIRST FIVE AND LAST FIVE CARDS FOR EXPERIMENTAL GROUP

Subject	Rank order on summed scores for cards 1 - 5	6 - 10	D	D^2
00	27	25	2	4
02	4	12	8	64
04	26	5	21	441
06	28	22	6	36
09	21	20	1	1
11	11	27	16	256
12	25	6	19	361
13	23	26	3	9
14	8	2	6	36
16	10	10.5	.5	.25
17	3	14	11	121
18	30	21	9	81
22	7	1	6	36
24	2	18.5	16.5	272.25
25	13	18.5	5.5	30.25
26	12	15	3	9
28	16	30	14	196
30	1	9	8	64
32	22	8	14	196
35	6	29	23	529
38	9	4	5	25
39	20	24	4	16
41	17	7	10	100
44	14	23	9	81
46	29	17	12	144
48	19	28	9	81
50	15	16	1	1
51	24	10.5	13.5	182.25
58	5	13	8	64
59	18	3	15	225

N = 30
df = 28 rho = .2

rho of .2 is not significant at the 5% level of confidence.