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A STUDY OF THE FACILITATION OF THE PERCEPTUAL
PROCESS THROUGH THE INTRODUCTION
OF A SPECIFIC SET

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A STUDY OF THE FACILITATION OF THE PERCEPTUAL
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OF A SPECIFIC SET
A THESIS

APPROVED FOR THE DEPARTMENT OF PSYCHOLOGY

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CHAPTER I

INTRODUCTION

The child, says Piaget (22), believes that everyone sees things exactly as he does. As he matures, he makes room in his thinking for the realization of differing perceptions of others. Murphy (21) says that such a realization is difficult to come by and that most adults go through life never suspecting that things may have a vastly different appearance to others than they do to themselves.

That such variability in perception is not readily apparent is attested by the fact that it was not suspected by psychology itself in its earlier years. The older psychologists argued that perception is fully determined by sensation and that sensation is fully determined by the stimulus. It was not until after the advent of Gestalt, with its studies of perception as a function of organiza-

tion of the stimulus field and its emphasis on total integrations, that psychological theory proposed, and experimentation demonstrated, that interpretation of the same stimulus material may differ widely among observers and in the same observer as conditions under which the perception occurs are varied. The movement swept beyond the classical, nativistic Gestalt formulations to studies of experience, set expectancies, personality configuration, and motivational conditions as determiners of perception.

The fact that perception has been experimentally shown to be malleable, a function of many factors, and that behavior is contingent upon it, has implications which reach into nearly every branch of psychological endeavor.

In the field of learning, perception, as brought about by set expectancy, has been shown to determine what is learned and whether learning will take place at all (8). The process of learning itself has been described as reorganization of the perceptual field (28). This viewpoint has been applied in the clinical area where therapy has been considered as a learning experience which has as its goal perceptual reorganization and differentiation with consequent insight (16). Motivational psychologists are finding an intimate, interacting relationship between the motivational state of the organism and the nature of its perceptions, and this approach is affording a new, integrated view of

organismic functioning (9). In social psychology, group behavior is studied as a function of perception as determined by social learning experiences (26). In the field of special education, psychologists are urging that the central problem is not mental deficiency or other handicap itself, but rather how the child perceives himself and his handicap in relation to his group identifications (2). Industrial psychologists are pointing out that in the importance to worker morale and increased production, favorable environmental changes introduced by management are secondary to the way in which the worker perceives these occurrences (17). A current approach to the study of personality is through the inference of needs and attitudes from the subject's interpretation of stimulus material (14).

All of these applications of perceptual theory have followed experimentation which gained momentum in the '30's showing that perception is not a fixed reaction of the organism but is rather a dependent variable, amenable to a wide variety of influences. Investigation has ranged from the study of perception related to such physical dimensions as shape, size, length, weight, color, and quantity to judgmental activity in level of aspiration experiments.

In 1928, Weaver and Zener (30) showed that in judging magnitudes of weights in a graduated series, subjects reported the same stimulus weight as heavy or light,

depending on the weight magnitude of the preceding stimulus series. Anschbacher (1) demonstrated that judgment of quantity may be influenced by knowledge of value when he asked subjects to estimate the number of United States postage stamps pasted in an irregular pattern on a card. American subjects, familiar with the value of the stamps, estimated the number to be greater with high value stamps than did Canadian subjects unfamiliar with their value. Duncker (7) found that of two pieces of cloth, one cut in the form of a leaf and the other in the form of a donkey, the leaf shape was judged to be greener although both were of the identical faintly greenish hue. Experimenting with visual perception of form, Braly (3) asked subjects to reproduce patterns of dots tachistoscopically exposed and arranged in simple geometric forms. He found that the forms reproduced by the experimental group, exposed to a preliminary series showing only one pattern, differed significantly from those of the control group to which the preliminary series was not presented. These findings suggested the extent to which the individual may be a contributor to the nature of his own perceptions, and interest was accordingly turned to investigation of motivation, individual needs and values, and personality-related variables as determinants of perception. In 1936, Sanford (25) reported his classic experiment on the effect of the hunger

drive on perceptual selectivity. He found that twice as many food associations were given in response to ambiguous figures and to a word association test by subjects who had fasted 24 hours than by subjects who were not hungry. Proshansky and Murphy (24) in 1944 studied the effects of reward and punishment on estimation of length of lines and weights. After being rewarded for judgments of long lines and heavy weights, subjects overestimated the magnitude of both weights and lines in comparison with their original judgments. Using the TAT, McClelland and Lieberman (19) classified subjects on the basis of their degree of need for achievement. Those with a greater need displayed a lower recognition threshold to tachistoscopically presented words related to achievement and security than did those with less need. Bruner and Goodman (4) concluded that need was an influential determiner of size perception because experimentation showed that poor children over-estimated the size of coins as compared to rich children. With the Allport-Vernon Study of Values, Postman, Bruner, and McGinnies (23) established high value areas in their subjects and then found that words representing these areas were more quickly recognized when presented tachistoscopically than were those relating to other areas. Carrying this type of investigation further, McGinnies (20) found that socially taboo words had a higher recognition threshold than neutral

words.

These findings, which represent but a small sample of the total evidence of the variability of perception and the diversity of its determinants, raise with new insistence psychology's old problem of how perception comes about. Explanatory systems of the past have been found to provide only partial answers as new investigation revealed perception as an ever more complex phenomenon. The highly developed associationism of the nineteenth century was inadequate to explain the problem of determining tendencies which was brought into focus by the Wurtzburg psychologists as they experimentally pitted the force of the "will" against that of the associative mechanism. Structural psychology, which viewed perception as a pattern of sensory elements held together through association, could not accommodate itself to the immediate, unitary character of organized experience as described by Gestalt. And classical Gestalt, with its nativistic concepts held no room for experience as a major determiner of what is perceived. Despairing of untangling these problems, the behavioristically inclined re-defined perception as discriminative response and turned to a study of what they termed objective behavior.

Current treatment of perception in the light of its newly found motivational determinants is largely descrip-

tive, and its theoretical concern is to state relationships among manipulable variables, inferred organismic states, and perceptual responses, and to apply these relationships in the understanding of molar behavior.

Perception is described in functional terms as an integrated act of adjustive behavior involving the total organism (21). Its biological function is adaptation of the organism to its environment, and its goal is need fulfillment. Perception is then seen to be dependent on the directive states of the organism, its expectancies and motivational condition, and behavior becomes a function of perception. From this viewpoint behavior can, therefore, be understood only in terms of perception, and perception can be comprehended only through a study of the motivations of the organism. The old dichotomies of perception vs. behavior, or cognition vs. motivation, disappear.

Experimentation has for the most part demonstrated a new facet of perceptual functioning, given it a name, and then related it to behavior theory in the functionalist setting. Representative are Bruner and Postman's (5) "principle of defense," the raised threshold to anxiety-arousing stimuli, and the "principle of vigilance," lowered threshold to extreme threat; McCleary and Lazarus' (18) "subception," the pre-recognition GSR, and Klein's (13) "adaptive lag," underestimation of size as stimulus magni-

tude is gradually increased.

Internal mediation of these perceptual effects is largely accounted for in terms of operationally defined hypothetical constructs. Bruner and Postman (6) posit "accentuation" as an internal mechanism related to over-estimation of coin size by underprivileged children, a "hierarchy of thresholds" to account for pre-recognition GSR's, and "availability of trace systems" as responsible for perceptual selectivity.

Evaluating this type of theorizing, Tolman says:

I am now convinced that intervening variables to which we attempt to give merely operational meaning by tying them through empirically grounded functions either to the stimulus variables, on the one hand, or to the response variables, on the other, really can give us no help unless we also embed them in a model from whose attributed properties we can deduce new relationships to be looked for (29, p. 49).

Tolman asks for a theoretical statement of just how these constructs can be expected to interact and produce the final perceptual behaviors which they do, and he makes a plea for a "brain model:"

A model provides a conceptual substrate -- a substrate which is endowed by its author with certain intrinsic properties of its own. And, if the model be a happy one, then we are led by it to expect new behavioral relations which we would probably otherwise never have thought of (29, p. 48).

Clearly, the interest of current perceptual theory has centered in perceptual resultants rather than perceptual

processes, and an important descriptive psychology has evolved without theoretical roots in basic intra-organismic functioning.

If the functional approach has led away from the classical issues involved in perception per se, it has in so doing redefined the problem. If perception is an adaptive act, a unitary product of integrated needs, cognitions, past experiences, and constitutional structure, an adequate perceptual theory must comprehend total organismic functioning. It must state the factors and their relationships which account for perception and its variability. It must designate the mechanism by which need, perception, and behavior are integrated, and it must provide a theoretical basis for the direction and control of adjustive behavior.

Such a theoretical formulation has been made by L. B. Hoisington. He states the limitations which must be imposed on any present theory of organismic functioning:

The known facts in physiology, anatomy and neurology may be inadequate at present to serve as the basis for psychological theories which, in every respect, will pass muster. If this is true, it does not help at all for the psychologist to devise a theory in terms of the psychological facts which the theory is designed to explain. Unwillingness to invent theories willy-nilly need not inhibit reference to end organs, organic processes, and stimulating energies (11, p. 18).

Hoisington points out that when a stimulus, which is a physical energy, impinges upon a receptor initiating the arousal of a sensory experience, it at the same time

sets up organic changes which result in neural processes, and this neural activity produces heightened muscular tonicity and muscular preparedness for action. Receptors are attached to the neuro-muscular system, so the organism is aroused to activity concomitantly with the arousal of sensory cue.

Jacobson (12) has shown that the isolated event of a stimulus impinging on a receptor will not arouse a sensory experience. Further organismic reaction is necessary, and this reaction is in the form of slight muscular tensions which Hoisington calls a neuro-muscular adjustment. Without it, sensory experience would be impossible.

The immediate resultant of receptor stimulation is an incipient sensory experience which Hoisington terms a "sensory cue" and whose characteristics are fully determined by stimulus and receptor. With neural excitation, the cue arouses a neuro-muscular adjustment from which issues the fully developed experience. The relationship between sensory experience and neuro-muscular adjustment is one of interaction. The adjustment brings the complete sensory experience into being, but because the adjustment is made to the unique characteristics of the developing cue, the sensory experience guides the course of its own creation. Sensory experience and muscular adjustment, produced and developed cooperatively, constitute the basis for adaptive

functioning. Sensory experience supplies that indispensable something to which the organism can adjust, and without it no controlled adjustment would be possible. In Hoisington's formulation, neuro-muscular adjustment becomes the instrument by which perception, and what we understand by meaning, arise (11, p. 20).

Sensory experience is not a terminal resultant standing in isolation from other modes of human functioning. The perceptual adjustment in its final form includes both muscular tensions which render the sensory experience definite and concrete and muscular tensions which arise from adjustment to the concretized sensory experience. From these last tensions may arise the adjustments from which adaptive behavior automatically follows (11, p. 21).

The behavior with which we are concerned is reducible to muscular contraction patterns. Differential patterns support differential activities, and since meanings arise with muscular adjustment, the meaning of the activity inheres in the pattern itself. Neuro-muscular adjustment becomes the mechanism by which perception and behavior are integrated into one unitary, adaptive function. The adaptive aspect of organismic activity does not begin with overt adaptive behavior. It begins with perception, itself, which is a process of muscular adjustment to the sensory.

Continuing consistency of this adaptive function is

effected through the total organized functioning of all organismic systems -- the neural, muscular, digestive, respiratory, circulatory, and any other organic system. Hoisington calls this total organized state "organic organization." This implies that all systems function cooperatively to serve adaptive ends, and their functions are interacting. While this organization is native, it does not arise independently of functioning. Functioning affects functioning and through it the organic organization undergoes change. The relationship between new adjustments and existing organization is one of interaction. The new adjustment is a joint function of sensory experience and existing organization. As the adjustment is made, it in turn changes the organic organization. These changes may be more or less definite and lasting. This constitutes what we call learning (11, pp. 22-24).

The adaptive act, then, does not take place in isolation, but within a matrix of already organized neuromuscular adjustments. There are broad, more or less permanent adjustments which represent general attitudes, purposes, goals, and task orientations. These Hoisington calls determinations. More specific adjustments, which shift more easily with environmental and task demands, arise in functional harmony with them. Behavior thus takes on consistency, and control is effected through functional unity

(11, p. 68).

While consistency is effected through the influence of existing organic organization on new adjustment, variability is afforded through the reverse relationship of the influence of the new adjustment on organic organization. In the course of this ongoing, interacting process, no perception can arise twice. Each perception is a new product, a function of all that has gone before, represented in the present state of organization. Variability is inevitable in perception, as well as in behavior (11, p. 81).

From Hoisington's viewpoint, the organism both creates and reacts to its environment. The environment becomes objectified sensory components created through the process of perception. This is not the free creation of the solipsist, but one firmly anchored in a physical world through the sensory cue which is fully determined by stimulus and receptor. The cue is developed into perception by a process influenced by the total present motivations or determinations, experiences, and expectations of the organism. Perception and behavior are plastic processes with consistent, adjustive functions (11, pp. 55-59).

In the light of Hoisington's perceptual theory, experiments showing the influence of affect, motivation, and other factors on perception may be interpreted as demonstrations of the organism's habitual modes of integrated

functioning. Like the meanings initiated by external stimulating energies, affective meanings also have their origins in sensory cues. These sensory cues are aroused by intra-organic stimulation. In affective reaction, the unitary muscular adjustment develops whatever internally and externally aroused cues are current and consonant with existing organization into one integrated value meaning. Since the adjustment is made to the cue, meanings will vary with variations in cue arousal. Affective components are powerful determinants of both strength and direction of neuromuscular adjustment (11 pp. 136-138).

In the Proshansky and Murphy experiment (24), for example, the adjustments of the experimental group, rewarded with coins on presentation of long lines and heavy weights, differed from that of the unrewarded control group. For the experimental group, the adjustment yielded a value meaning (11 p. 54). Subjects in both groups had a general determination, aroused by experimental instruction, for estimating lengths and weights. For the controls, perceptions of weights and lines arose as an integration of specific adjustments shaped in part by the general determination and in part by the affectively neutral sensory cues arising from presentation of the stimulus material. The experimental group reacted not only to cues of the stimulus material but also to affective sensory cues. Since the sensory cues

varied with the two groups, the perception, arising with adjustment to cues, also would be expected to vary. As the long lines assumed a value meaning for the experimental group, the adjustment for perceiving long lines was strengthened. This new adjustment changed existing organization. The effect of this change was evidenced when the experimental group in comparison to the control overestimated the length of intermediate lines subsequently presented without reward.

These relationships provide a conceptual substrate for the view of affect and percept as aspects of one unitary process. Affect does not act spontaneously to initiate behavior, nor is it evoked as a direct response to external stimuli. It arises always in conjunction with perceptual material as a consequence of previous functioning. This formulation is consistent with McCleary and Lazarus' (18) pre-recognition GSR. If affective components arise as a part of neuro-muscular adjustment and the affective reaction is reflected in GSR, one would expect a GSR as the organism attempted to adjust to a sensory cue whose past fully developed meaning was affective. In Hoisington terms, affect is a native reaction which through functioning has become an integral part of some neuro-muscular adjustment and not others.

The role of the organism as the architect of his own perceptions has been made dramatically explicit as

affective and other personality-related factors have been experimentally manipulated to produce perceptual variability. Hoisington's theory would view these instances, not as special cases, but as representative of the continually creative aspect of the perceptual process. Perception is always a function of organic organization, unique in each individual, and a resultant of his own organismic reaction. Neuro-muscular adjustment is responsible for perceptual stability as well as perceptual change, and it is consistently active throughout the habitual perception of the commonplace. The everyday perception of a chair under normal conditions is as truly a creative process as the perception of food objects in ink blots by hungry subjects.

CHAPTER II

THE PROBLEM

This study is concerned with the role of neuromuscular adjustment in making possible perception of the familiar, and it seeks experimentally to investigate the relationships between sensory cue, adjustment, and developed perception as posited by Hoisington. It departs from the type of studies mentioned in that the interest is not in perceptual selectivity, change, or distortion, but in the basic, creative processes involved in the emergence of a single perception. This calls for a situation in which perception is not dependent on shifts of attention and one in which the subject maintains throughout the experiment a general adjustment to perceive the class of material presented. The stimulus material should be unambiguous in the sense that its characteristics are appropriate for the arousal of one common meaning.

A subject with a general set for perceiving familiar material will perceive or not as stimulation is varied around threshold. In accordance with Hoisington's theory, raising stimulation from below to above threshold serves to

increase the adequacy of the sensory cue in touching off these adjustments which give rise to clarity of perception. The cue arouses in the organism certain expectations which are adjustments or sets, and these and the cue must harmonize before the sensory experience becomes definite and stable. The factor of neuro-muscular adjustment necessary in this process is not obvious since, as long as other factors are held constant, its functioning is correlated with stimulus adequacy which is the easily observable variable.

To demonstrate the operation of neuro-muscular adjustment experimentally, it is necessary to break up this relationship so that set may be varied independently of stimulus and its effect on perception observed.

Hoisington's theory would predict that when a stimulus is slightly below perceptual threshold, perception will occur if the appropriate adjustment is brought about by means other than increased stimulation. If perception results automatically from receptor stimulation alone, the adjustments of the organism could have no effect on perception.

The hypothesis to be tested is: When a subject has a general set to perceive a certain class of familiar material which he reports to be below perceptual threshold, perception will occur if an appropriate specific set is introduced.

It is assumed that appropriate experimental instructions arouse in the subject a neuro-muscular adjustment, and that it is the same type of adjustment which could also be aroused by increased stimulation. It is further assumed that the factors investigated in the experimental situation are the same as those which operate in normal perception of the familiar.

CHAPTER III

EXPERIMENTAL DESIGN AND PROCEDURE

Subjects were presented with lists of words on cards placed at a distance just beyond where they reported they could read neither the letters nor the words. With the card and the subject in the same position, the subject was then told what one of the words was and asked to pick it out.

Subjects

Sixty adolescent and adult subjects were used. They were chosen without special requirements as to age, sex, occupation, or educational level, although a large proportion were University of Oklahoma students and employees of the University of Oklahoma Hospitals.

Apparatus

On each of twelve 5 x 8 cards cut from ten-ply, white show card stock was printed a different list of ten words. The words were numbered from one to ten, arranged in a column and spaced one-half inch apart.

Six of the 12 cards were used as trial cards to establish thresholds. The other six were test cards on which

the specific words were to be identified. The words to be identified, chosen arbitrarily, were: somebody, although, building, township, whichever, and entirely. The position of the words to be identified was randomized, using Tippet's table of random numbers (15). Each of these words was also printed separately on a small card.

To control for familiarity, words were chosen from the 1,000 most frequently used words as listed by Thorndike (27), and the type face selected was one widely used as a body type in books and newspapers, ten-point Excelsior, light face. Numbers were larger and heavier, 14-point bold face.

To eliminate identification of the words by such obvious cues as length and long ascenders and descenders, words on each card were of the same number of letters, and were printed in capital letters.

Since first and last letters of the words were surrounded by more white space than those in the middle, the possibility of their merging with other letters when seen from a distance was less, and they may, therefore, have yielded more definite cues. To investigate this possible effect, two sets of cards were made, one to allow for maximal influence, and the other to afford no influence. In Set A, none of the ten words on a card began or ended with the same letter as another word. In this arrangement, it

may have been possible to identify words correctly by cues from beginning and ending letters alone. In Set B, the words were the same as in set A with the addition of black horizontal rules printed on either side of each word and flush with it. The rules were slightly taller than the letters. In this arrangement, beginning and ending letters were surrounded by no more white space than those in the middle, so their position could result in no special advantage over other letters as cue producers.

To hold the cards and allow for systematic varying of their distance from the subject, 13 parallel grooves one inch apart were cut completely across the width of a pine board, which measured 7 x 14 inches. The grooves were numbered.

Procedure

Subjects were told, "This is not a test of vision. I want to place this card at a distance just beyond the spot where you can read it." By varying the distance of the six trial cards from the subject, the shortest distance was found at which he failed to recognize any letter or word. The six test cards on which the specific words were to be identified were presented three inches farther from the subject than this.

After the subject reported he could read neither letters nor words on the first test card, he was told: "I

am going to tell you what one of these words is. Get it clearly in mind, then look at each word carefully and pick it out."

After all six cards were presented, the subject was told: "Now, we will go through the cards again. This time, I will give you a little card on which is printed the word you are looking for exactly as it appears on the other card. Study it over for a minute, get a clear picture in mind, then find the word." At this presentation, only the cards on which the words had been missed were shown again. By this procedure, the attempt to induce the specific adjustment was made by two different methods, the verbal and the visual.

After the last card had been presented, subjects were asked how many of the six words they thought they got right. They were told the correct number after they had given their estimates. They were then encouraged to tell how, when they could not read them, they identified the words. They were asked if seeing the little card made a difference and why. As a final check, one card was presented again at the same distance and the subject was asked if he could read any of it and to describe what he did see.

The 60 subjects were divided into three groups of 20 each. The procedure was essentially the same for all groups. Group I was presented with Card Set A (words without rules). In Group II, the only change was to replace

the small printed card with a small blank card. The subjects were told to look at this for a moment before finding the word to be identified. This change was made as a control to determine whether any facilitory effect of the visual method in Group I were a function of the subjects' seeing the printed word to be identified or to some other factor such as the brief rest, the change of focus or practice effects. In Group III, the only difference in procedure from Group I was the use of Card Set B (words with rules).

To control for unwanted possible variation in visual acuity which might result from dark adaptation, the experimental room was always well lighted, and no subject served after having come from a more brightly lighted environment.

Hypotheses

The procedure yielded data for testing one major and two minor hypotheses. The specific hypotheses were:

1. The number of words correctly identified by the three groups will be significantly greater than chance.
2. There will be no significant difference in the number of correct choices made by Group III (words with rules) and Group I (words without rules).
3. The number of correct identifications made with the visual stimulus will be significantly greater in Group I (using small printed cards) than in Group II (using small blank cards).

Significance in all three hypotheses was defined as the five percent level of confidence.

CHAPTER IV

RESULTS

A summary of the total correct responses with their observed deviations above expected frequencies and critical deviations at the one percent level of confidence is presented in Table I. Data are presented separately for the verbal and visual methods and their totals, since expectancies and N's vary among the three categories.

TABLE I

OBSERVED AND EXPECTED FREQUENCIES AND PERCENTS
OF TOTAL CORRECT RESPONSES WITH CRITICAL
DIFFERENCES AT THE ONE-PERCENT CONFIDENCE LEVEL

	N	f_o	f_e	$f_o - f_e$	CD_f	$\%_o$	$\%_e$	$\%_o - \%_e$	$CD\%$
Verbal Method	360	212	36	176	15	59	10	49	4
Visual Method	148	71	16	55	10	47	11	36	7
Total	360	283	52	231	23	79	14	65	6

With the verbal method, the 60 subjects attempted to identify six words each, so the total possible number of correct responses is 360. Since ten words appear on each card, the probability of a correct choice is one-tenth, and one would expect one-tenth of 360 or 36 correct choices to be made by chance alone. The number of correct responses actually made is 212. Significance of observed frequencies was evaluated by the t test, using the binomial approximation of normal standard variable (10, p. 45). A difference of 15 between observed and expected frequencies is significant at the one percent level of confidence. The observed difference is 176.

With the visual method, only those cards which had been missed with the verbal method were shown. These presentations total 148. Since it is possible that some of the subjects may have remembered their previous word choice and decided to restrict the second choice to the remaining nine words, the probability of a correct choice by chance alone is considered here as one in nine, or 11 percent. Accordingly, frequency expected with the visual method is 16. The actual number of correct choices is 71. The difference between observed and expected frequencies is 55, while a difference of 10 would be significant at the one percent level of confidence.

Considering the total visual and verbal performance and combining the two separate expected frequencies, we

would expect 52 choices or 14 percent of the total 360 to be made correctly by chance alone. The total number of correct choices is 283. The difference between observed and expected frequencies is 231. A difference of 23 is significant at the one percent level of confidence.

These results are seen to be highly significant, and they uphold Hypothesis 1, which states that the number of correct choices made by the three groups will be significantly greater than that expected by chance.

In Table II, the observed and expected frequencies of correct choices, with their critical differences, are presented by groups. These data show that in all categories the observed frequencies of correct responses are significant beyond the one percent level of confidence.

Hypothesis 2 states that Group III, using words with rules, will not differ significantly in number of correct identifications from Group I, using words without rules. As seen in Table II, Group I made 71 correct identifications with the verbal method or 59 percent, while Group III made 64 correct identifications, or 53 percent. These differences were evaluated by the formula for the standard error of the difference between percentages (10, p. 72). The resulting t of .89 shows that a difference this large would be expected to arise by chance about 40 percent of the time. With the visual method, the percentage of words

TABLE II

OBSERVED AND EXPECTED FREQUENCIES AND PERCENTS
OF CORRECT RESPONSES WITH CRITICAL DIFFERENCES
AT THE ONE PERCENT-CONFIDENCE LEVEL

Group	N	f_o	f_e	$f_o - f_e$	CD_f	% _o	% _e	% _o - % _e	CD%
Verbal Method									
I	120	71	12	59	8	59	10	49	7
II	120	77	12	65	8	64	10	54	7
III	120	64	12	52	8	53	10	43	7
Visual Method									
I	49	26	5	21	6	53	11	42	12
II	43	14	5	9	5	33	11	22	16
III	56	31	6	25	6	55	11	44	11
Total Visual and Verbal Method									
I	120	97	17	80	10	80	14	66	8
II	120	91	17	74	10	76	14	62	8
III	120	95	18	77	10	79	15	64	8

correctly identified by Group I is 53, while Group III chose 55 percent correctly (Table II). Evaluation of this difference yields a t of .20. A t at least this large would be expected to arise by chance more than 80 percent of the time. These results are consistent with Hypothesis 2. Masking

first and last letters effected no appreciable change in the number of words recognized.

Hypothesis 3 calls for a significantly greater number of correct identifications by Group I, when using small printed cards, than by Group II, when using small blank cards. As seen in Table II, Group I made 26 correct identifications, or 53 percent, while Group II made 14, or 33 percent. The differences between these percentages is just significant at the five percent level of confidence ($t = 2.0$). This is consistent with Hypothesis 3 suggesting that the printed card was effective in facilitating word recognition.

An analysis was made of errors with the verbal method for each of the six words. These are shown in Table III for Groups I and II combined. Group III is not included here since stimulus conditions for this group were different. These data show a wide variation in word difficulty as measured by number of errors.

Differences in frequency of errors among the words were evaluated by the formula for the standard error of a binomial distribution. These comparisons show that "Building" and "Whichever" are two standard errors above the mean, while "Although" and "Somebody" are two below the mean. "Entirely" and "Township" approximate the mean. The words are, therefore, considered as representing different

levels of difficulty. They are grouped into three categories, difficult, average, and easy words for further comparisons.

TABLE III
ANALYSIS OF ERRORS BY WORDS
WITH THE VERBAL METHOD
GROUPS I AND II

Words	N	f	%
Building	40	31	77
Whichever	40	21	52
Township	40	16	40
Entirely	40	14	35
Although	40	6	15
Somebody	40	4	10

The words are classified according to these categories and presented in Table IV with their frequencies of errors with the verbal method and corrections with the visual method shown separately for Groups I and II. In Table V, the corrections are shown in percents.

Table V shows that the percentage of correct responses made by subjects using the blank cards falls as word difficulty increases. There is a reversal among these

TABLE IV

FREQUENCY OF ERRORS WITH THE VERBAL METHOD
AND CORRECTIONS WITH THE VISUAL METHOD
BY LEVELS OF DIFFICULTY
GROUPS I AND II

Words by Levels of Difficulty	Group I		Group II	
	Errors	Corrections	Errors	Corrections
Difficult (Building and Whichever)	28	17	24	5
Average (Township and Entirely)	15	4	15	5
Easy (Although and Somebody)	6	5	4	4

TABLE V

PERCENT OF CORRECTED RESPONSES WITH THE VISUAL METHOD
BY LEVELS OF DIFFICULTY, GROUPS I AND II

	Group I	Group II
Difficult Words	61	21
Average Words	27	33
Easy Words	83	100

relationships with subjects using the small printed cards. The percentage of correct responses to difficult words is 61 for Group I, while it is 21 for Group II. This difference is significant above the one percent level of confidence ($t = 3.2$). Differences in the two groups in correct identification of the average and easy words are not significant. For average words, $t = .36$; for easy words, $t = .11$. It should be noted that in the statistical comparison of easy words, the N's of four and five are smaller than recommended in percentage differences formulas. However, since a t at least as large as the resulting t of .11 would be expected to arise by chance more than 90 percent of the time, it seems unlikely that this difference is significant.

With the easy and average words, the two groups follow the same pattern. Easy words missed at the first presentation with the verbal instructions were most frequently identified correctly at the second attempt by both groups. The percentage of correct responses made by the two groups at the second presentation of easy words was 90. Average words present more difficulty at the second trial for both groups. The percentage of total correct responses at the second presentation of average words was 30. The difference in percentages of correct responses at the two levels of difficulty is significant above the one percent level of confidence ($t = 4.75$). With the most difficult words, the

percentage of correct responses falls still farther for the subjects using the blank card, although this difference is not significant ($t = .82$). In contrast, there is a sharp rise in percentage of correct identifications in the group using printed cards. The percentage rose from 27 with average words, to 61 with difficult words, and this difference is significant at the one percent level of confidence ($t = 2.7$). The facilitory effect, then, of the printed cards is seen only when the task becomes difficult.

Analysis of choices of words by groups, presented in Table VI, shows that part of the differential word difficulty in Groups I and II can be traced to a tendency of some of the words to be consistently confused with others. Of the 21 erroneous choices for "Building" made by these subjects with the verbal method, six subjects chose "Delights," and five chose "Neighbor." Six of the 14 subjects who wrongly identified "Whichever" thought this word was "Gentleman." Six times out of 14, "Township" was incorrectly identified as "Mannerly." No word was mistaken for "Entirely" more than three times, for "Somebody" more than twice, or for "Although" more than once.

With the addition of the horizontal rules to the words presented to Group III, the pattern of repetition changes. The erroneously repeated words found in Groups I and II drop out, and two new ones appear. Of 15 subjects

TABLE VI
CHOICES OF WORDS BY GROUPS, VERBAL METHOD

	N	Group I Response	N	Group II Response	N	Group III Response
Building:	5	Building	4	Building	5	Building
	7	No Choice	3	No Choice	1	No Choice
	2	Eleventh	4	Delights	9	Children
	2	Delights	4	Neighbor	2	Returned
	1	Quantity	3	Returned	1	Delights
	1	Fanciest	2	Sometime	1	Sometime
	1	Neighbor				
	1	Sometime				
Whichever:	7	Whichever	12	Whichever	13	Whichever
	6	No Choice	1	No Choice	1	No Choice
	2	Gentleman	4	Gentlemen	1	Seemingly
	2	Different	2	Twentieth	1	Personage
	1	Undertook	1	Undertook	1	Different
	1	Seemingly			1	Twentieth
	1	Twentieth			1	Expressed
					1	Righteous
Township:	13	Township	11	Township	12	Township
	2	No Choice	4	Mannerly	2	No Choice
	2	Mannerly	3	Hundreds	3	Hundreds
	1	Northern	1	Northern	3	Strength
	1	Strength	1	Strength		
	1	Fanciest				
Entirely	12	Entirely	14	Entirely	5	Entirely
	3	No Choice	1	No Choice	2	No Choice
	3	Southern	2	Yourself	7	Yourself
	1	Lookouts	2	Lookouts	2	Doubtful
	1	Thousand	1	Thousand	1	Creature
					1	Prisoner
					1	Midnight
					1	Thousand
Although:	16	Although	18	Although	15	Although
	1	No Choice	1	Families	1	Lengthen
	1	Publicly	1	Daughter	1	Increase
	1	Snowball			1	Clothing
	1	Lengthen			1	Daughter
					1	Publicly
Somebody:	18	Somebody	18	Somebody	15	Somebody
	1	Villager	1	Interest	3	Approach
	1	Approach	1	Approach	1	Carriage
					1	Teaching

in Group III making erroneous choices for "Building," nine chose "Children." Seven of the 13 subjects who made wrong choices for "Entirely" thought that the correct word was "Yourself." These differences between groups, with their significances, are shown in Table VII.

TABLE VII

FREQUENCY OF REPEATED ERRONEOUS WORD CHOICES WITH
THE VERBAL METHOD BY GROUPS, WITH CRITICAL
DIFFERENCES BETWEEN GROUPS AT THE FIVE
PERCENT CONFIDENCE LEVEL

	Groups I & II			Group III			%	%	CD
	N	F	%	N	F	%	I & II - III	@5%	
<u>Building:</u>									
Wrong Choice:									
Children	21	0	00	14	9	64	64		21
Delights	21	6	29	14	1	7	22		23
Neighbor	21	5	24	14	0	00	24		23
<u>Whichever:</u>									
Wrong Choice:									
Gentleman	14	6	43	7	0	00	43		43
<u>Township:</u>									
Wrong Choice:									
Mannerly	14	6	43	6	0	00	43		47
<u>Entirely:</u>									
Wrong Choice:									
Yourself	10	2	20	13	7	54	34		43

In Table VIII is presented an analysis of correct responses for each word with both verbal and visual methods for Group III. Here the variation in word difficulty changes from that found in Groups I and II. With the exception of "Building" and "Entirely," which were confused with "Children" and "Yourself," the words presented to Group III are more nearly comparable in number of correct identifications. Statistical evaluation shows "Building" and "Entirely" to be four standard deviations above the mean while the other four words do not vary significantly.

TABLE VIII

FREQUENCY OF ERRORS WITH THE VERBAL METHOD
AND CORRECTIONS WITH THE VISUAL METHOD
BY WORDS, GROUP III

Words	Errors with Verbal Methods			Corrections with Visual Method		
	N	f	%	N	f	%
Building	20	15	75	15	9	60
Entirely	20	15	75	15	8	55
Township	20	8	40	8	6	75
Whichever	20	7	35	7	1	14
Somebody	20	5	25	5	3	60
Although	20	5	25	5	2	40

In addition to confirming the three experimental hypotheses, these analyses of the data show the following results:

With Groups I and II, words fall into different levels of difficulty.

The difference in numbers of correct responses between subjects using small printed cards and those using small blank cards is apparent only with the most difficult words.

Part of the differential word difficulty can be accounted for by a tendency of certain words to be repeatedly mistaken for the correct words.

The addition of horizontal rules to the words changes both the level of difficulty and the pattern of erroneous word repetition.

CHAPTER V

DISCUSSION

Hoisington describes a sensory cue as an experience in its pristine form. It is an indistinct, indefinite sensory experience resulting solely from receptor stimulation in the absence of the further neuro-muscular adjustments which render it concrete and definite.

As you recover from unconscious states. . . your first visual experiences, the ones which occur before you regain much use of your muscles, are foggy, hazy, misty. The very first visual experience is a fairly uniform, loose grey blur. As functional competence returns, visual experience becomes greys of different brightness, but still without such definite qualities as red, blue, green or yellow, without definite shape and very indefinite in size (11, p. 28).

In this experiment, an attempt was made to arouse in the subjects an experience which resembled the sensory cue as described by Hoisington.

The words, placed where the subjects reported they could no longer identify them, lost their precise shapes, and the sharp blacks of the printed surface and the intervening white spaces merged into varying shades of grey. Subjects typically described them as "a blur," "a jumble,"

"uneven gray," a "conglomeration." Hoisington describes the cue as it occurs in common experience as:

Fleeting glimpses of things, or a fleeting sound, in which you have not much more than sensory cues, but to which you were not able to make a well developed appropriate muscular adjustment. . . . The complete perceptual pattern did not arise; hence you did not have the meaning of the object. Even in this case you do know that there was something there; adjustment for that much meaning was present (12, p. 108).

The cue in the experimental situation was adequate only for adjustments which yielded this type of general meaning. From the introspective reports of the subjects (designated by number, S. 1 to S. 60, in the Appendix), typical expressions were: "You can see that there is printing that is supposed to be a word" (S. 56); "You can see there are letters, but can't tell what anything is" (S. 48); "They look like they might be letters, and then there is a blur" (S. 43); "It looked like a blurred line" (S. 31).

According to Hoisington, the introduction of a specific adjustment at this point should result in development of these undifferentiated sensory cues into an experience concrete enough to yield a definite perception.

The essence of the perceptive process is adjustment connected with some sensory experience which experience is thereby rendered unitary and discrete (11, p. 94).

The adjustment which renders the cue definite is one which results in patterning and rendering specific the aroused cue. Hoisington emphasizes that perception, or

meaning, bases on a pattern of sensory experience. The pattern is not a function of the spatial characteristics of the cue, but of the unitary functional character of the organism (11 p. 17).

We would expect, then, that the adoption of an adjustment for a specific word would result in a re-patterning of its vague cues into a specific meaning. That the specific meaning ensued is evidenced by the subjects' ability to identify the words. Reports of the subjects directly refer to a patterning process. Subjects were asked to describe what they saw when the words were beyond threshold, and they were also asked to explain how they identified the specific words. These reports yielded descriptions of the words under conditions of general and specific set. Comparison of these reports show a shift in emphasis from ambiguity with the general set to organization with specific set.

A subject who, with a general set, described the words as "a lot of scratch marks" reported that he recognized the words he was looking for by "the general contour" (S. 41). With other subjects descriptions shifted from "conglomeration" to "configuration" (S. 53); "indistinct, jumbled," to "total form" (S. 60); "uneven gray" to "a pattern of dark and light" (S. 55); "a bunch of lines" to "a composite whole" (S. 58); "no definite pattern" to "a certain shape"

(S. 43); "a gray streak" to "constellation" (S. 45). These descriptions are typical. With nearly all subjects who were able to give an introspective account of their performance, the change from the undifferentiated cue to some kind of pattern is evident.

These findings support Hoisington's contention that the patterning is a consequence of functional organization of the observer. The stimulus material remained the same under the two conditions of set. The pattern appeared only with the adoption of a specific adjustment by the perceiving individual. The patterning is not, however, exclusively a function of the organismic adjustment. The cue, says Hoisington, guides the course of its own development. This is evident in the experimental situation in that, in the majority of cases, only the appropriate cues yielded themselves to the expected patterning. The inappropriate cues from the "wrong" words demanded a different adjustment before perception could occur. The adjustment was not present, the cues remained undifferentiated, and the word remained unrecognized. The appropriate cues, on the other hand, fitted into the prepared adjustment and assumed the pattern which yielded specific meaning. Cue and adjustment harmonized and perception became stable. This illustrates what Hoisington describes as the intimate, interacting relationship between the sensory and motor in the percep-

tual process.

Specific characteristics of the cues which emerged in the patterning process were described by the subjects as they sought to explain how they selected the words. The majority of these fall into a few general categories: total shape, shape of first and last letters, differential distribution of light space, and length. A further factor frequently mentioned refers not to the stimulus material, but to the adjustment itself, a feeling of fitness, of rightness or familiarity. Three of these, shape, first and last letters, and length, have been described by early investigators in studies of perception of printed material.

Summarizing these investigations, Woodworth (31, pp. 737-745) reports that Cattell in 1885 found that with a tachistoscopic exposure of 10 ms, subjects could report no more than four unconnected letters but could read as many as four connected short words. He concluded that words were recognized not by spelling them out, but by a "total word picture." Other experimenters corroborated Cattell's findings and spoke of "general word shape" as a primary cue. These studies were done with words printed in small letters whose long ascenders and descenders were shown to add differentiating characteristics to the general form. Wagner eliminated these cues by using all capital letters and found that, with a 100 ms tachistoscopic ex-

posure, words of 12 to 15 capital letters could be correctly read. Discussing this, Woodworth says:

In reading words printed in capitals, one simply must see the letters because the general shape fails as a cue (31, p. 744).

But subjects in the present experiment, which uses all capitals, were definite in specifying shape as a primary cue. One explained, "In 'Building' I got a block pattern. It is built on an oblong or rectangle" (S. 14). Another said, "If there was an 'S' at the end, there wouldn't be a block shape" (S. 39). One subject (S. 60) drew the shape of "Entirely" as a rectangle with a dip in the upper outline to represent the depression made by the "y." In Groups I and II there was reference to beginning and ending shapes: "At the beginning or ending there was a jutting out that makes the external form easier to identify" (S. 18); or, "I tried to compare the general word shape. The final and beginning. . . well, not letters, a final and beginning shape. A wide space at the beginning for a 'W,' and a rounding affair at the end for the 'R'" (S. 3). When beginning and ending cues were minimized with the addition of rules in Group III, subjects continued to specify shape: "A word has to have a certain contour" (S. 41); "I looked for shape and open spaces" (S. 50); "I glanced down the list real quick and saw the shape of the word" (S. 58). When adjusted with a specific set, subjects were apparently

able to utilize as cues the subtle variations in outline of the words which resulted from the composite of its variously shaped letters.

An unexpected finding was the subjects' consistent reporting of length as a cue. When it was pointed out to them that all the words were of approximately the same length since they all had the same number of letters, the subjects still insisted that the words they chose were of the right length. A few subjects recognized the inconsistency as they named the cue: "I used length, but they were all of the same length" (S. 33); "Configuration and length of the word. . . . The idea didn't strike me until afterward that they were all the same length" (S. 53). Apparently, although length could not serve as a differentiating cue for selection of words, it did add a feeling of confirmation to the choice once it had been made. The total word pattern does include this characteristic.

To these cues noted by other investigators, subjects in the present experiment added a new one, the differential distribution of white space. They described it: "The pattern of black and white" (S. 40); "The relative openness" (S. 2); "The shading" (S. 44); "The color of the print" (S. 48); "The compression, striping" (S. 55).

Some of the subjects were specific in how these cues were used.

"There is a gap between the 'L' and 'Y' in 'Entirely.' When it is blurred, there is a gap. There is a gap where there is an 'O.' After seeing the little card, I started looking for any words that were gappy. 'Whichever' didn't look gappy. It was homogeneous" (S. 4).

"I would think of the 'O' and the 'C' as making more of a blank space, and other letters, 'H,' 'G,' 'M,' would be filled in more, and would be darker" (S. 26).

"Compared spacing of lightness and darkness. Knowing what the word was, you knew where there should be a light space" (S. 28).

"The relationship of amount of white to dark. Some letters have very little ink in the middle" (S. 55).

"'Although' was easiest because it broke with the 'L.' Spaces were what I was looking for. Building was hard because it was up and down" (S. 52).

Apparently the light-dark dimension is one which gives distinctive cues for word identification. Herein may lie one of the influential factors contributing to the differential word difficulty found in the analysis of right and wrong responses. "Somebody" contains two "Os," while "Although" has one "O" as well as the beginning "A" whose triangular shape affords an unusual amount of white space and makes it one of the lightest letters in the alphabet. These were the two most readily recognized words. On the

other hand, "Building," the most difficult word, has two "Is" which contribute a minimum of white space and crowd closely to the letters on each side. The confusion noted among "Building," "Delights," and "Children" is partly a function of the "L" which falls about the center of all three words and provides their only comparatively outstanding white space contrast. The light-dark variable merits further study, especially in view of the tachistoscopic experimentation which attributes variations in reaction time and recognition thresholds solely to the emotion-arousing or ego-involving aspects of the word-meaning. The present experiment demonstrates that recognition thresholds may vary widely with equally familiar, affectively neutral words. One might speculate that an EDR tracing would show lowered skin resistance as subjects put forth the greater effort called for in identification of the more difficult words.

Cue characteristics already described belong to the exterosensory component of the perceptual pattern. The feelings of fitting and fitness reported by subjects refer to the proprioceptive motor component, the adjustment itself. In Hoisington's thinking, it is through these feelings, which issue upon harmonious interaction of the sensory and motor, that control of behavior is effected. He says:

Sensory experience gives the something to which adjustment is made, and the kinesthetic components

of meaning supply the cue or the sense of adequacy or inadequacy, the correctness or the incorrectness of the adjustment. . . . It is the subtle, kinesthetic feel which supplies that delicate something which is often called fitness or fitting (11, p. 83).

Hoisington points out that in normal, smooth functioning these feelings are likely to be obscure and infrequently noticed. Feelings of non-fitness or disagreement are more obvious. These involve strain and result when specific and general adjustments are not harmonious. As the adjustments shift and a harmonious state emerges the feeling of appropriateness becomes a more prominent aspect of the resulting meaning (11, p. 48).

In the experimental situation there was a continued shifting as the subjects attempted to form a pattern of the "right" and "wrong" cues which would harmonize with their prepared adjustment for perception of a specific word. Hoisington would predict that, under these conditions, strain would occur and when adjustments were finally harmonized, a definite feeling of "rightness" should become noticeable. Testimony of the subjects bears out this expectation:

"Something fell in. . . . The whole thing fit in together" (S. 7); "A feeling that things were fitting. A coming together. A one-to-one relationship" (S. 9); "I didn't see it, but I felt like I could see it" (S. 16); "It looked like that ought to be the word instead of another word" (S. 18); "It was very vague, but it fit. . . . I did

it like I was putting a pattern together" (S. 20); "I felt like I knew which one it was" (S. 3); "I had a feeling that one might be the right word. Something jumped out, but I can't tell you what" (S. 38); "Something registers in your mind. Something stands out, whatever it is" (S. 48); "I don't know how, but I thought, 'This is it!'" (S. 59).

Some subjects mentioned a feeling of non-fitness or disagreement: "Nothing but the right word fit;" "The wrong words didn't look right;" "Don't know why, but as you look down you know some aren't the right words" (S. 13); "I couldn't see how the rest of them could be it" (S. 39); "I was sure of township because the other words didn't fit" (S. 42); "'Entirely' and 'Although' were right. There didn't seem to be any other words that looked like them" (S. 44).

While most of the cues mentioned by the subjects fall into the described categories, individual differences provided varied approaches to the task. Two subjects squinted at the small cards and explained that they made them blur like the distant card and then matched blurs. One subject set himself for perceiving "A" and reported that he selected his words on the basis of presence or absence of that letter. Two, in Group III, reported that they tried to match the width of the minute spaces between the rules and the words on the small card with those on the test card.

The plasticity of the perceptual approach is apparent also in the subjects' equal success in identifying words as stimulus conditions were changed with the addition of rules with Group III. That the approach differed is evidenced by the change in word difficulty and generalization effects. It was also apparent in the type of response given to trial cards. Without rules, the first response as cards were moved closer to the subject was to first or last letters. When rules were added, the first response was to whole words. The focus of adjustment shifted, and the subjects were able to respond to a part or a whole in accordance with the changing environmental opportunities.

Subjects were divided in opinion about the efficacy of both small blank and small printed cards. A few subjects using the small blank cards said they rested their eyes and made the words look clearer. Some who said they found the printed cards helpful described a matching process: "I concentrated on the length and shape of the letters on the little cards and tried to get the same length and shape on the big card" (S. 9); "With the little card, I matched them. I couldn't do it before because I couldn't see the word in my mind. I didn't know whether they were capitals or little letters. Didn't know which way they went" (S. 18). Others said the little card helped them to know

what to look for and to visualize it: "You have to remember the printing, and it is hard, but with the little card in front of you, you can see the relationship and check it" (S. 10); "The printed card gave a picture of the word" (S. 14); "The little card helped very definitely because I was looking for little letters when they were big letters" (S. 12); "I matched the striping of the little and big card for a total perception of the word. I haven't a clear image of the spoken word; the mental image isn't printed in any particular type" (S. 55).

Some subjects said the word looked clearer after seeing the printed card, while others reported the same effect after hearing the spoken word: "With the little card, I got more structure in the shape of the words" (S. 3); "It was sharper after you said the word" (S. 40); "It didn't assume the shape of the word until you knew what you were looking for" (S. 39). These comments point to the patterning process which follows with specific adjustment whether verbally or visually induced.

Those who said they did not find the printed card helpful were quite definite in their opinions: "The little card didn't help a bit" (S. 60); "The little card made it worse" (S. 54); "The little card didn't help. If you can't see, you can't see" (S. 43).

There was a wide difference in the attitudes of the

subjects toward the small cards. Some expressed active rejection: "I kept wishing you wouldn't give me those little cards. I know what those words look like and how to spell them" (S. 6); "The little cards didn't help, but that is because of my needs. I didn't feel that I needed to look at them because I know what words look like" (S. 52); "I don't think the little cards helped because I am used to that style of printing. I use it in lettering maps and stuff" (S. 50). Other subjects grasped at the cards with a show of eagerness, studied them at length, and pronounced them helpful.

In the analysis of responses by word difficulty, it was shown that the effect of the small printed cards was felt only when the subjects were identifying the most difficult words. The unanswered question is why the subjects did not also use these cards as an aid to finding the words of average difficulty. In their introspective reports the subjects described certain distinctive cues by which they identified the words. Characteristics of shape or shading made some words more easily identified than others.

One might speculate that on receiving the small printed card the subject responded more quickly to the distinctive cues of the easy and average words and felt no need of further sharpening his adjustment. Then as he tried to identify the word on the distant card, the cue was

fitted into an erroneous word which resembled the correct one. If, however, the word had no unique characteristic which was outstanding, the subject was reduced to a search for more subtle cues for which the small card was a definite help. Therefore, with the more difficult words, the subject studied the small card at greater length, became more highly sensitized to its cues and made the more precise adjustments necessary for correct identification. The effectiveness of the stimulus material, in both cases familiar words printed in the same type face, is shown to be dependent on the adjustive state of the organism. The stimulus was ineffective until the resulting sensory material was reacted to in a way which rendered it effective. These relationships demonstrate Hoisington's statement that, "Sensory experience and muscular adjustment, produced and developed cooperatively, constitute the bases for adaptive functioning on the part of animal organisms" (11, p. 21).

Evidences of spontaneous operation of the set phenomenon were frequent during the trial period when thresholds were established. When a subject recognized a word on a letter, he adjusted himself to find it again or subsequently presented cards. It was found in preliminary experimentation that to overcome this effect it was necessary to present six different trial cards in rotation. When, for example, only three trial cards were used, the

set for any once recognized word persisted and, as the cards were moved farther from the subject, it was identified at distances where it had previously been indistinguishable. Six cards afforded the opportunity for a greater variety of adjustments, and the persistence of a single set was discouraged.

The set phenomenon was again apparent as the subjects slowly became organized for the task of long distance reading. As they were double-checked, the first thresholds established were rarely found to be reliable. Each threshold had to be checked several times, a procedure which, roughly estimated, required an average of around 20 minutes. During this time, the reported thresholds gradually increased in distance until the limit was reached. The subjects had to become fully adjusted to the task before perceptual acuity, as measured by ability to read words or letters with a general set, reached its maximum.

Results of statistical analyses, introspective reports, and spontaneous behavior of the subjects during this experiment are all consistent with the predictions deduced from Hoisington's perceptual theory and his descriptions of the perceptual process. In the experimental situation, recognition of such commonplace items as familiar words was shown to be dependent on the expectations of the subjects. Factors in the perceptual process, cue and neuro-muscular

adjustment are identifiable, and their interaction resulted in precise perception as Hoisington predicts. The factor of organic organization is also obvious in that identification of the words depends on the learned adjustments of the literate. Since in this situation perceptual variability was produced in the absence of explicit manipulation of attitudes, personality variables or emotional reactions, the results are consistent with Hoisington's statement that these variables make themselves felt in perception and behavior through the mechanism of neuro-muscular adjustment which is total organismic reaction.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study is an experimental investigation of relationships among factors in the perceptual process as posited by L. B. Hoisington.

Recent experimentation has demonstrated that perception is variable, a function of attitudes, motivational states, and personality factors. Current theorizing about these findings is largely descriptive, calling on operationally defined constructs to account for internal mediation of perceptual effects.

Hoisington's theoretical approach was discussed in relation to present findings and theorizing in the field and presented as fulfilling a need for a basic theory of intra-organismic functioning as a conceptual substrate for current descriptive psychology.

Central to Hoisington's perceptual theory are relationships which he posits among sensory cue, neuro-muscular adjustment, and perception. In order to investigate these relationships experimentally, 60 subjects were asked to pick out a specified word from lists of words placed at

a distance three inches beyond where they reported they could read neither letters nor words.

The major hypothesis, deduced from Hoisington's theory, is:

When a subject has a general set to perceive a certain class of familiar material which he reports to be below perceptual threshold, perception may be brought about if an appropriate specific set is introduced.

Experimental results uphold the hypothesis beyond the one percent confidence level. Introspective reports of the subjects describe perceptual events as outlined by Hoisington's theory, and spontaneous behavior of the subjects during the experiment followed its predictions.

Results of this experiment are consistent with Hoisington's statement that the emergence and nature of the completed perception are dependent on the adjustive states of the organism and that the perceptual process is a function of total organismic reaction.

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APPENDIX

INTROSPECTIVE REPORTS OF SUBJECTS

Group I

S. 1: Most of the cues came from the last letter. There isn't anything after the last letter, and you can see it from the right. I can see the first letter or last letter when I see (identify) the word, but they fade out. The little cards didn't seem to help, but they may have helped transfer the shape from the little one to the big one. (6 right).

S. 2: The term comes to me, bluntness, and the amount of vertical as to horizontal stimulation. 'Whichever' would have a lot of vertical lines, W, I, T. And in 'Entirely', the Y over on the end when I finally picked it out. The relative openness of the different parts. The little card helped because then I knew what kind of thing to look for. (5 right).

S. 3: I had a tendency to look back to where I saw the word before and used that as a point of departure. Or you get a cue. Tried to compare the general word shape. The final and beginning. . . well, not letters; a final and beginning shape. A wide space at the beginning for a W, and a rounding affair at the end for the R. With the little card, I got more structure in the shape of the word. (3 right).

S. 4: When I saw the little card, I started looking for gaps. There is a gap between the L and Y in 'Entirely'. When it is blurred, there is a gap. There is a gap where there is an O. The first and last letters stood out more. After seeing the little card, I started looking for any words that were gappy. 'Whichever' didn't look gappy. It was homogeneous. I think I did it by eliminations. I didn't visualize it until I saw the little card. After I saw the little cards, the words looked pretty clear to me. (5 right).

S. 5: They looked like letters even at that distance, maybe because of the variations. It could be Russian, but it looks like letters because of the uniform width and height. I can see spaces between some of them like in a J or an L. But it is blurred. I had a strange feeling when I got the little card. I could see in my mind what it should look like, and I actually felt the card would give me a false idea of what it should be. I felt it was going to bother me, distract me from my ability to recognize the word. I looked for the configuration of the first and last letter. There's nothing around them, and I could get more of the form from the left side. (6 right).

S. 6: I felt that it was pretty much pure guess. Two or three I knew were wrong, but didn't know if any were right. I looked down the front for an initial letter, but didn't even find one I had any confidence about. I kept wishing you wouldn't give me those little cards. I know what those words look like and how to spell them. (3 right).

S. 7: I worked by feel. Something fell in. The shape. Like looking for the letter Y, there was a break. You couldn't see the letter, but the space between. A pattern. The little card was a standard, and the whole thing fit in together. (5 right).

S. 8: The length and total constellation of the word. At the beginning or ending there was a jutting out that made the external form easier to discriminate. The words seemed to be different lengths. I assumed that most of the words were fairly long, longer than the average word, and the word you gave me would be longer. The little card gave me an idea of the form I was looking for. Looked like a bunch of marks grouped together. From the spacing and the way they are put together, they look like not quite legible words. The vague form of the letters, and you think of words. (4 right).

S. 9: It must have been the shape. The length and beginning and ending letters. The Y would come down. I concentrated on the length and shape of the letters on the little card and tried to get the same length and shape on the big card. A feeling that things were fitting. A coming together, a one-to-one relationship. (4 right).

S. 10: The relationship between space and light. You have to remember the printing, and it is hard, but when you have the little card in front of you, you can see the relationship and check it. After looking at the little card, the

words became clearer. It corrected my mental image and helped to know what I was looking for. I squinted at the little card and tried to make it blur like the words on the big one. Then I matched blurs. (5 right).

S. 11: The total combination of letters makes a different form with the different words. There are differences in the distribution of white space. (5 right).

S. 12: Final letters, lengths and general configuration. Couldn't see anything in the middle; the letters were pretty much the same. I looked at the spacing between the letters. The little card helped very definitely because I was looking for little letters when they were big letters. (3 right).

S. 13: The general shape of the letters. Whether it goes up or down. At first, I thought it was the length. Vacant spots. Don't know why, but as you look down you know some aren't the right word. Can't imagine why the little card helped, but they seemed to be a little clearer after seeing it. (6 right).

S. 14: In 'Building' I got a block pattern. It is built on an oblong or rectangle. I got 'Entirely' because the Y stands out. With the little card, I chose between No. 4 and No. 7 for 'Building' because of the hole in No. 7. I identified them by the general shape. The first letter helped to cue the shape of the word. You can tell sort of the shape of the first letters. The little card gave a picture of the word. (6 right).

S. 15: I looked for first or last letters and for spaces, like between A, L, and Y. The little card helped recognize the spaces. I wasn't sure at all. I couldn't see well enough to focus on any one of them. It looked like a line after a number that looked like a word. Not a solid line. There are spaces there that might make you think of a word, but it was almost solid. Sometimes it looked like two lines when I knew there was just one. (6 right).

S. 16: I didn't really see them; it just looked like I could see them. The letters and words were all jumbled up. I didn't see it, but I felt like I could see it. (6 right).

S. 17: First and last letters. The little card helped to point up the differences. They didn't even look like words. (2 right).

S. 18: I just looked until I saw something familiar. It looked like that ought to be the word instead of another word. The letters looked different. You get a form. With the little card, I matched them. I couldn't do it before because I couldn't see the words in my mind. I didn't know whether they were capitals or little letters. Didn't know which way they went. (5 right).

S. 19: On the last card, they were all the same length. I wasn't conscious of what I was doing. I concentrated on the beginning letter. I couldn't actually see, but there were differences in the words. For instance, the M had a straight line, and the E had a curve. The length and the general shape of the word. Having the little card didn't help. (6 right).

S. 20: I was guessing from cues. It was the general shape. When you told me the word, I knew how it looked and went down the line to see what looked like my mental picture of the word. It was very vague, but it fit. Fitting those faint cues into my mental picture of how it would look. But there were not enough letters. The first and last letters seemed to stand out. The direction of the letters. I did it like I would putting a pattern together. (6 right).

Group II

S. 21: It must have been the shape, but they all looked alike. It was very confusing. (5 right).

S. 22: The first and last letters. I counted the letters, but I couldn't see them. (4 right).

S. 23: Spaces and open letters. They all looked alike at first glance. The right one looked more like the word. Because of the shape. I felt like I knew which one it was. (4 right).

S. 24: I took the first one that looked like it. It looked like it because of the individual letters and length of the words, and could you say the shape of the words? The A and E looked different. The lines go horizontally and there are more of them than in a T. Most of it was guessing. (6 right).

S. 25: Haven't any idea how many right. I would think of C and O as making more of a blank space, and other letters, H, G, M would be filled in more and would be darker. I used what I thought was the width of the word. On some I felt I had made a fairly good guess. (3 right).

S. 26: Probably none right. Don't know how I did it. (6 right).

S. 27: Beginning and terminal T, P, Y, had spaces in the lower portion. I looked for the way the word broke up into syllables. Looked for configuration then tried to identify specific letters. Blank card didn't help. (4 right).

S. 28: Compared spacing of lightness and darkness. Knowing what the word was you knew where there should be a light space. Could make out letters if there was enough spacing in between them. Some words didn't look similar to the word I was looking for at all. I ruled them out if they had a dark space where there should be a light space. You get a feeling of, say, a 'G'. (6 right).

S. 29: I could see them if I knew what it was. You have an impression of the word and look for a geometric design -- I mean the picture of the word. Beginning and ending of the word. (6 right).

S. 30: I looked for the shape of the letters. You get used to seeing an R with the top sticking out, and the delta on the A. Actually, it was the pattern of the word. You have learned to associate a certain shape with each letter and when you put them together it makes a pattern that is different. The spacing between the letters. Some spaces are wider. The I and E are filled in. They are black printing, and look like rectangular blocks, but not filled in. The overall impression is that it is black, but as you look further, it isn't solid. You know it isn't something just blacked in with ink. You expect it to be a word because they are numbered. (3 right).

S. 31: If I got any right, it was the first two. Looked like a blurred line. Beginning and ending letters. Couldn't see one letter completely. Not at all sure. (6 right).

S. 32: Maybe I got two or three right. When I knew what it was, maybe I could figure it out. I tried to find one or two letters. (5 right).

S. 33: Doubt if any were right because I couldn't see. I looked for a letter I could make out at the beginning and ending. I used length, but they are all the same length. The closeness of the letters. If they were closer, it would be a longer word. If they were closer, it looked fuzzy, more of a black spot. At first glance I thought I could see the first or last letter, but after the first glance, they would all mix up. They didn't look exactly like a black square, but almost that. Not a square, a block. It was a guess. (5 right).

S. 34: Length of the word. Starting and ending letters. Mostly last letters. Before I knew what it was, it looked like a jumble of letters, but when I know what it is it looks like the word. (4 right).

S. 35: Main thing I looked for was the shape of the last letter and shape of the first letter. It helped to look at the blank card. Rested my eyes and made the words clearer. (4 right).

S. 36: Don't know how many right, two or three maybe. I squinted my eyes, but that didn't help. The way the words looked, and some of the letters. Usually the first and last letters. It looked like a blot a rubber stamp would make if you shaved the letters off. Blank card didn't help. (3 right).

S. 37: I didn't get any right. Length of the word. Shape of the first and last of the word. The shape of the letters. What is on the top half of the letters. I couldn't see, but you know how a letter looks in your mind. They looked like a long line with a bunch of black marks and white spaces in between, sort of shaded marks that all run together. (3 right).

S. 38: I was trying to find little letters. I thought they went below the line. They jumped out. There was something about them, but I can't tell you what. I didn't know whether they were type or whether you had lettered them in. I had a feeling that one might be the right word. I couldn't even read the numbers. I had to count. (4 right).

S. 39: I got four right. I was fairly sure. Length of the word, and shape of first and last letter. If there was an S, there wouldn't be a block shape. I couldn't see how the rest of them could be it. Mostly how long they were in comparison to the rest of them. Looked like a jumbled mess of black and white, like somebody doodled. No individual letters; one continuous thing. It didn't assume the shape of the word until you knew what you were looking for. (6 right).

S. 40: Well, maybe I got two or three right. I couldn't see the letter, but there was something in the configuration, pattern, shape of the word that stood out. It was sharper after you said the word. Didn't know if it was capitals or small letters. They seemed to be a pattern of black and white. White spaces with black breaking it up. The black always stands out. At first glance, they look much the same. But as you look at them closely, you can see they are different. There was no difference with the blank card except it helped to focus like when you close your eyes and rest them a minute, and then look again, it is sharper. (4 right).

Group III

S. 41: I was only sure of the first word. Judged from the general contour and length. I couldn't see the letters, but I could still see there were marks from one end to the other. I judged by how many marks there were. A word has to have a certain contour. It looked like there were black rectangles with horizontal lines between to obscure the lettering. (S was surprised there were no horizontal lines and wondered what gave him that illusion) Don't know that having the little card helped. It looked like a lot of scratch marks. (6 right).

S. 42: I got 'Township' right, and the last time I got 'Somebody' and 'Building' right. The O and Y made 'Somebody' stand out. Before looking at the little card, I couldn't get a clear picture of what I was looking for. I looked at the little card, then the big one and seemed to see it better. The U and G in building, I could almost see those. I was sure of 'Township' because other words didn't fit. There just didn't seem to be anything else it could be. I looked like a bunch of little marks between two black ones. When I look at them, I can see they are letters, and the more I look, the more they fit into place. The letters become separate and they make words. They were clearer after seeing the little cards. (6 right).

S. 43: Maybe I got two right. They were swimming. The little card didn't help. If you can't see, you can't see. Each word was a certain shape. I looked for the shape. I can see there are letters but there is no definite pattern. They look like they might be letters, and then there is a blur. (4 right).

S. 44: 'Entirely' and 'Although' right. There didn't seem to be any other words that looked like them. You could tell by the shading. The O and C would be lighter. It looked like just a blob -- you should turn the projector a little more. When you showed the cards, I looked at the words and thought what they might be. Then when you told me the words, I couldn't get my mind out of that groove. They didn't look like this word I was handed. I thought about asking you to tell me the word before you showed the card. (2 right).

S. 45: Don't know how many right. That would be a very difficult thing to judge. I looked where there would be light and dark spots, and could get additional cues as to where the marks would be more crowded. They didn't even look like distinct lines. What it actually looked like was a gray streak in between two black bars with lighter areas in between. The little card helped to find the white spaces at the beginning and ending of the words. The total constellation of the word. That's rather strange. You don't think of identifying a word from that. Before knowing the word, I looked for cues that might give me a lead. After knowing the word, I evolved a picture in my mind and I tried to match it. (4 right).

S. 46. Might have gotten two right. I got them right before I saw the little card. Identified them by groups of letters -- sometimes I could get a glimmer of ING, and a U would be a wider space. If I could identify three of the letters, I could guess at the rest. They looked like little, blurry letters. The vertical part runs together. The other parts don't run together so much. The little card didn't help. When you told me what to look for, I went down the line looking for a syllable or letter. Before I knew, I just looked for something I could recognize. (4 right).

S. 47. Maybe I got four right out of the six. At one time or other, I thought I saw all of them. 'Building' was wrong. Usually judged by the last two letters and the general shape. Couldn't see them, but on a Y, for example, would be white, and some letters are darker. 'Children' is lighter than 'Sometime.' The little card didn't especially help. It might if you didn't know what the type looked like. Couldn't tell whether they were capitals or little letters. They were all the same size, but they could have been big lower case. If you see it once, it was a lot easier the second time. Judged by length. Didn't know they were all the same number of letters. Used open spaces and blackness. A black word would be longer. If it were a short word, the letters would be spread out, and it would be lighter. If it had a lot of letters, it would be darker. (5 right).

S. 48. Got one right. Most of them were long. Were they all the same length? I looked for first and last letters and outstanding letters. Are some of them printed darker than others? There is something that registers in your mind. You look and something stands out, whatever it is. Perhaps the black lines on both sides of the words stands out, but I don't know how. Some look like short words.

One looks like 'Cap,' as if it were centrally spaced. The little card definitely helped. With it you can picture what you are looking for, the size, the color of the print; and they help rest your eyes. You can see there are letters, but can't tell what anything is; it is sort of messed up. They run together and blur. (6 right).

S. 49: Didn't get any right. Don't know how I did it. I tried to visualize how it would end, the LY or whatever it was ending in. I was trying to see what I was imagining. The little card helped because the words between the black lines were so uniform; and I just had one to look at on the little card. Then I tried to visualize it. After seeing the little card, I imagined I saw the word more clearly. Looked like a lot of X's. Now I've gazed at them so long, they look like a lot of letters. It is like teaching a child to read by showing him the whole word when he doesn't know how to spell. (4 right).

S. 50: I looked for shape and open spaces. The Y would have an open space at the top and an O would have an open space in the middle. The C and O would be the most easy to identify. Looked like very thin lines, straight and circular. Don't think the little card helped because I am used to that style of printing. I use it in lettering maps and stuff. (4 right).

S. 51: Got 4 right. With the exception of 'Building,' they looked like it. I went down the list and stopped when I came to the right one. The shape of the letters. I couldn't see them very well. They looked like letters close together far away. Printed card helped. There was something in the outline, only words don't have outlines. (6 right).

S. 52: Couldn't imagine how many right because I couldn't see. 'Although' was easiest because it broke with the L. Spaces were what I was looking for. 'Building' was hard because it was up and down. The fact that I know they are words makes it hard to say what they look like. A design that goes in wallpaper, or rocks may be because of the rough surface, black, white and gray. The little cards didn't help, and that is because of my needs. I didn't feel that I needed to look at them because I know what words look like. (4 right).

S. 53: I think I got four right. I felt fairly sure of some and others were a guess. Configuration and length of the word. The letters were blurred. I squinted at the little card to see how it would look out there. The idea

didn't strike me until afterward that they were all the same length. I tried to pick out letters; identified letters from a blank space with parallel lines. The little cards helped -- gave me a better mental image. They were not words, but conglomerations. After knowing what to look for, I knew that at least one was a word and I looked for it. Didn't know whether they were capitals or little letters. Thought the first letter might be capitalized. (6 right).

S. 54: The little card made it worse. I feel a strain. Maybe I'm getting tired. I have no confidence whatever in what I saw. There was a sort of similarity in the way the words looked. Wouldn't say what it was; may have been the last three letters. I see a dash and a series of verticle black areas and then another dash. Like in the comics when somebody is reading a newspaper, and it consists of a series of black lines. I have a mental picture of what it should look like. I don't know whether they are capitals or little letters. I chose the word because it looked more like the word I was looking for. (3 right).

S. 55: I got six right. Did it by the compression of the black marks. The pattern of dark and light. It wasn't the letters because I couldn't see. The linearity. A series of verticle lines; H, I, P, would make a straight pattern. The relationship of amount of white to dark. Some letters have very little ink in the middle. I matched the striping of the little card & big card for a total perception of the word. I haven't a clear image of the spoken word; the mental image isn't printed in any particular type. Looks like two black lines with a gray column in the middle; uneven gray that is stippled. (6 right).

S. 56: The A shows up, to start with and most of the words don't have an A. The Y shows up better on the end; you don't find them in the middle; you couldn't tell what the middle part was like. Couldn't tell what I was looking at. The A is so different, you just naturally pick them up. Looks like a solid block with spaces going down the side. (S wants to know if the letters were the same size.) They looked high on the ends and slanted in the middle. Picked them out because there was something there that looked familiar. How to say it is beyond me. It looked like a word, but if you had to stop and spell it, you would get all balled up. It was like sight reading. The little card didn't help. When you are ten feet away, the little card can't help. All you can see is that there is printing that is supposed to be a word. Some of them look like a

series of X's. Once you make your mind up, you become more positive. (6 right).

S. 57: I looked to see the contact of the end area with the black area. Whether it was touching or open. Whether the first half of the word or the last half was close together or open, like an O would be open. Whether the letters were spread out. The little cards helped to know what to look for because I couldn't see the letters. I could see black marks going up and down with the slight variations showing between them. (3 right).

S. 58: Don't know how many right, no idea, two or three maybe. The composite of the whole thing: the contour of the groups of letters as they formed part of the word. I glanced down the list real quick and saw the shape of the word. The little card may have helped a little, but don't know whether it helped very much or not. Looked like a bunch of lines, not a solid bar. Sort of looked like Japanese looks up close. (6 right).

S. 59: Spaces at the end of the letter like L, Y, would have more spaces at the end. 'Building' was a lot of straight lines. One or two jumped out. I don't know how, but I thought, 'This is it.' The little card is like when you look at something and it is made bigger as if you had the picture of the word and the spaces in your mind. The little card helped because it was printed like the other one so I knew what to look for. It looked like Hebrew script because there are a lot of lines in Hebrew script. (6 right).

S. 60: Don't know my batting average; they looked so blurred. I looked for the ending of the word. Why pick the tail end of them. I don't know. One ended in G, and I was looking for round corners. I thought there was a pattern in the arrangement of the numbers of the words. I concentrated more on the top of the list. Little card didn't help a bit. The total form of the word. They look indistinct; they are jumbled together. (4 right).