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AN EXPERIMENTAL TEST OF TWO THEORIES OF PERCEPTUAL DEFENSE

by

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TABLE OF CONTENTS

		Page
ACKNOWLEDGMENTS		ii
LIST OF TABLES		v
INTRODUCTION		1
CHAPTER		
I.	BACKGROUND	3
	The Operational Definition of Perceptual Defense...	3
	Points of View and Experimental Findings Concerning Perceptual Defense.....	4
	Verbal Response Suppression.....	5
	Verbal Response Competition.....	13
	A Methodological Note.....	21
	Hypothesis Competition.....	23
	Inhibition of Threatening Perceptual Responses.....	38
	Conclusions.....	54
II.	THE EXPERIMENT	57
	The Purpose of the Experiment.....	57
	The Conditions for the Occurrence of Perceptual Defense.....	57
	The Independent Variables.....	59
	The Hypotheses.....	65
	The Subjects.....	66
	The Stimuli.....	67
	Procedure.....	70
III.	RESULTS AND DISCUSSION	82
	The Subjects' Visual Acuity.....	82
	Data Analysis Techniques.....	83
	The Forgetting Results.....	85
	Summary and Interpretation of the Inhibition Results.....	96
	The Enhancement Results.....	101
	Summary and Interpretation of Enhancement Picture Results.....	111

Page

Results with Neutral Pictures Similar to Enhancement Pictures..... 115
The Anxiety Results..... 117
An Evaluation of the Two Theories..... 122
Suggestions for Further Research..... 125

IV. SUMMARY 128

APPENDIX

A. THE MEASUREMENT OF SIMILARITY AMONG THE BLACKY PICTURES 135

The Relevant Aspects of the Stimuli..... 135
The Measurement Procedure..... 136

B. THE ANXIETY SCORES 146

The Behaviors Measured..... 146
The Intra-individual Nature of the Anxiety Scores..... 147

C. THE FORGETTING SCORES 150

D. THE STIMULUS FILTERS 152

E. THE TACHISTOSCOPE 153

F. EXPERIMENTAL FORMS 155

G. THE DATA 159

BIBLIOGRAPHY 175

LIST OF TABLES

Table		Page
1.	The Four Points of View of Perceptual Defense.....	6
2.	Summary of the Triads.....	63
3.	Ease and Difficulty of Seeing Pictures as Reported by Subjects in Post-experimental Interview.....	69
4.	Subjects' Visual Acuity.....	82
5.	Forgetting Pictures in Triad E vs. Neutral Pictures in Triad C. Picture I.....	86
6.	Forgetting Pictures in Triads E and F vs. Neutral Pictures in Triad C. Picture VI.....	88
7.	Forgetting Pictures in Triad E vs. Neutral Pictures in Triad C. Picture VI.....	89
8.	Forgetting Pictures in Triad F vs. Neutral Pictures in Triad C. Picture VI.....	89
9.	Forgetting Pictures in Triads E and F vs. Neutral Pictures in Triad C. Picture II.....	90
10.	Forgetting Pictures in Triad E vs. Neutral Pictures in Triad C. Picture II.....	91
11.	Forgetting Pictures in Triad F vs. Neutral Pictures in Triad C. Picture II.....	92
12.	Forgetting Pictures in Triads E and F vs. Neutral Pictures in Triad C. Picture V.....	93
13.	Forgetting Pictures in Triad E vs. Neutral Pictures in Triad C. Picture V.....	93
14.	Forgetting Pictures in Triad F vs. Neutral Pictures in Triad C. Picture V.....	94
15.	Forgetting Pictures in Triads A and D vs. Neutral Pictures in Triad C. Picture VII.....	95
16.	Summary of Forgetting Trends.....	97-98

Table		Page
17.	Enhancement Pictures in Triads F and G vs. Neutral Pictures in Triad C. Picture I.....	101
18.	Enhancement Pictures in Triad G vs. Neutral Pictures in Triad C. Picture I.....	102
19.	Enhancement Pictures in Triad F vs. Neutral Pictures in Triad C. Picture I.....	103
20.	Enhancement Pictures in Triads D and G vs. Neutral Pictures in Triad C. Picture VI.....	104
21.	Enhancement Pictures in Triads F and G vs. Neutral Pictures in Triad C. Picture II.....	105
22.	Enhancement Pictures in Triad G vs. Neutral Pictures in Triad C. Picture II.....	105
23.	Enhancement Pictures in Triad F vs. Neutral Pictures in Triad C. Picture II.....	106
24.	Enhancement Pictures in Triads F and G vs. Neutral Pictures in Triad C. Picture V.....	107
25.	Enhancement Pictures in Triad G vs. Neutral Pictures in Triad C. Picture V.....	108
26.	Enhancement Pictures in Triad F vs. Neutral Pictures in Triad C. Picture V.....	109
27.	Enhancement Pictures in Triad B vs. Neutral Pictures in Triad C. Picture VII.....	110
28.	Enhancement Pictures in Triad B vs. Neutral Pictures in Triad C. Picture IV.....	111
29.	Summary of Enhancement Trends.....	112-113
30.	Neutral Pictures Similar to Enhancement Pictures in Triad G vs. Neutral Pictures in Triad C. Picture VI.....	116
31.	Neutral Pictures Similar to Enhancement Pictures in Triad G vs. Neutral Pictures in Triad C. Picture II.....	116
32.	Accuracy vs. Anxiety Among Forgetting Pictures.....	118
33.	Error vs. Anxiety Among Forgetting Pictures.....	119
34.	Median Anxiety Scores.....	121

Table		Page
35.	Weights Used in the Overlap Score	138
36.	Weights Used in Grand Total Score	138
37.	Similarity Index Scores	139
38.	Mean Observed Similarity Ratios	141
39.	The Relationship Between the Two Similarity Measures	142
40.	Rank Order Correlations Between the Two Similarity Measures	143
41.	Confusions Among Pictures as Reported by Subjects in Post-experimental Interview	144
42.	Rules for Scoring Anxiety	148-149
43.	Illumination of Stimuli and Adapting Field	153
44.	Exposure Times	154
45.	Triad Assignments	160
46.	Acuity Data	161-162
47.	Anxiety, Accuracy, and Error Scores	163-174

INTRODUCTION

The processes involved in the receipt of information have always been of interest to social psychologists. Early studies of suggestion and crowd phenomena focussed on the special conditions leading people to accept and act upon communications whose contents they would normally reject. Theorizing about socialization stressed the formation of internalized values and attitudes as a result of information received during interactions with a socializing agent. Propaganda and mass communication occupied a central position in social psychology during the thirties and early forties.

The pioneering studies of suggestion and the more recent investigations of propaganda concentrated on factors which led to the acceptance of information. It soon became clear, however, that there were also many factors which worked in the opposite direction. Levine and Murphy (46), for example, found that learning and memory of communications containing pro and anti-Soviet Union statements were greatly influenced by the attitudes their subjects had prior to receiving the communications. Subjects with pro-Soviet Union attitudes learned and remembered more of the content of a pro-Soviet Union communication than did subjects with anti-Soviet Union attitudes. The two groups behaved oppositely with an anti-Soviet Union communication.

The Levine and Murphy findings were in line with Bartlett's previous work on memory (3). His experiments revealed the operation of variables which had the effect of assimilating stored material to

previously existing attitudes, interests and expectations. Indeed, there appeared to be general acceptance of the view that processes taking place during the storing and recalling of information could facilitate the maintenance of attitudes and values when communications contradictory to the attitudes and values were received.

The calm of consensus was shattered in the late forties when some psychologists began to talk about processes taking place in perception, which, like their cognitive cousins, functioned to defend attitudes and values against disruption by contradictory or threatening information. Theorists who were quite willing to accept attitudes and values as variables in memory rebelled against accepting them as variables in perception. Although active controversy has diminished considerably since the claims for perceptual defense were first put forth, the situation resembles a truce more than a genuine peace settlement. In spite of the lack of agreement about perceptual defense, the controversy has led to theoretical and empirical advances in the area of cognition which hold much promise for social psychology (54).

A generally acceptable explanation of the perceptual defense phenomenon would do much to speed up the rate of progress in the investigation of cognitive processes involved in the defense against anxiety and in the maintenance and change of attitudes and values. The present study is aimed at finding grounds for agreement about the nature of perceptual defense.

CHAPTER I

BACKGROUND

The operational definition of perceptual defense

The operations which have been used to define perceptual defense are all variants of one basic procedure, namely, a comparison of the ease of recognition of neutral and threatening material. Perceptual defense is said to occur if the neutral material is easier to recognize than the threatening material. The specific content of the threatening material has varied from study to study. It has been taboo words, words representing areas on which the subject places little value, trait names, Blacky Pictures, pornographic pictures, pictures of aggressive scenes, and abstract designs or nonsense syllables which had previously been accompanied by shock.

The measures of ease of recognition have generally been of two kinds. The ascending method of limits has been used most frequently. In this method the stimulus is first exposed at sub-threshold intensity or duration. The intensity or duration is increased on successive exposures until the subject recognizes the material. The recognition criterion has varied from the occurrence of one correct identification of the stimulus to the first correct identification response which the subject makes with certainty. Identification has usually meant giving the correct spoken or written verbal label to the exposed material.

With the other method, the ease of recognition measure is the number of responses naming a particular stimulus when the material is exposed at a constant, barely super-threshold level. Some studies have used as a recognition measure the number of times a particular verbal label has been given. In other studies the number of correct verbal labelling responses has been taken as a recognition measure.

Points of view and experimental findings concerning perceptual defense

A warning

Before discussing the specific points of view, it is necessary to state that none of the investigators to be discussed regards perceptual defense as an explanatory concept. It is always treated as a concept which describes a phenomenon to be explained.

The dimensions of the controversy

Most of the variation among the points of view about perceptual defense appears to occur with respect to two questions. The first can be stated as follows: Is perceptual defense a genuine perceptual phenomenon or is it merely a function of variables affecting the verbal responses used as measures of recognition? The investigators choosing the latter alternative strive to show that the differences in verbal responses occurring in the perceptual defense experiments can be explained by generally accepted principles of verbal learning and responding. They argue that using inferred variation in perceptual recognition to account for observed verbal behavior is not parsimonious. Investigators choosing the former alternative attempt to demonstrate that there is variance in verbal responses above and

beyond that accounted for by the verbal response determinants. They claim that variations in the perceptual recognition process itself are necessary to account for the residual variance in verbal responses. Put simply, one group wishes to explain away perceptual defense while the other wishes to explain perceptual defense.

The second question is concerned with the determinants of the lower frequency of responses identifying a threatening stimulus when compared with responses identifying a neutral stimulus. Specifically, the problem is whether the lower frequency is due to competition from stronger identifying responses or whether it is due to some inhibitory process working directly on the responses in question. Using all possible combinations of answers to the two questions yields four points of view (see Table 1). In most of the studies to be described, one or another of the positions is advanced as the only correct one. This does not mean, however, that the various explanations are mutually exclusive. Indeed, the results of the present study will show that two of the explanations, viz., perceptual competition and perceptual inhibition, fit different aspects of the perceptual defense phenomenon. Each of these points of view will be discussed, with a review of relevant research.

Verbal response suppression

Howes and Solomon

The simplest point of view combines the verbal response and inhibition alternatives. It asserts that what appears to be perceptual defense is the result of conscious suppression of unpleasant verbal responses. This position was expressed by Howes and Solomon (37) in

a review of McGinnies' much criticized study (48). McGinnies compared recognition thresholds of taboo words and neutral words, using the ascending method of limits. He also measured the galvanic skin responses (GSR's) to the tachistoscopically flashed words. His subjects required a significantly longer exposure time to make correct identification responses to the taboo words than to the neutral words. They also showed significantly larger GSR drops following pre-recognition flashes of taboo words than they did following flashes of neutral words.

TABLE 1

THE FOUR POINTS OF VIEW OF PERCEPTUAL DEFENSE

	Overt Response Phenomenon	Genuine Perceptual Phenomenon
Competition	Overt responses which identify a threatening stimulus occur relatively infrequently as a by-product of the frequent occurrence of stronger, competing overt responses.	Perceptual recognition of a threatening stimulus occurs relatively infrequently because of the frequent, inappropriate occurrence of stronger, competing perceptual recognition responses.
Inhibition	Overt responses which identify a threatening stimulus occur relatively infrequently because they are consciously suppressed.	Perceptual recognition of a threatening stimulus occurs relatively infrequently because of the effects of an inhibitory process which directly interferes with the activation of the perceptual recognition response.

In an amusing sequence, Howes and Solomon described the possible experiences of a young college student who had just been exposed to the word "penis" flashed at about the threshold speed. They concluded that fear of appearing deviant before the experimenter and his female assistant kept the subject from giving the correct verbal response until he was perfectly certain that "penis" was in fact the word which was flashed. The authors could find no reason for subjects to delay their reports of neutral words so that these words would have been expected to be correctly reported with smaller exposure durations than taboo words. The finding of large GSR drops occurring at more rapid exposures than correct verbal responses was attributed by Howes and Solomon to the conflict about reporting the word experienced by the subject.

McGinnies replied to Howes and Solomon (49) by calling their attention to the fact that the subjects' pre-recognition responses to neutral words resembled the actual words while the pre-recognition responses to taboo words did not resemble the taboo words. McGinnies thought it improbable that the subjects would purposely distort their guesses with taboo words. He therefore concluded that the distorted pre-recognition responses must have stemmed from actual difficulties with recognition. However, it seems likely to the writer that a subject who did not want to say a certain word would have tried to interpret the tachistoscopic blur in a manner allowing him to give a response unlike the response he was attempting to avoid. It therefore seems quite reasonable that the differences in pre-recognition responses found by McGinnies could have been due to verbal response suppression.

Whittaker, Gilchrist and Fischer

There are three studies which report results supporting the response suppression position. The first of these, by Whittaker, Gilchrist and Fischer (69), used the ascending method of limits to assess word recognition thresholds. Both the experimenter and the subjects were Negroes. The threatening words were derogatory terms often applied to Negroes, e.g., "nigger." After finally making the correct verbal response, several subjects admitted having withheld this response after it first occurred to them. Some reported doubt about the correctness of their perception and a determination not to say "that" word until absolutely sure.

Lysak

A carefully designed series of experiments were performed from this point of view by Lysak (47). In his first experiment, the threatening stimuli were nonsense syllables. The subjects were required to learn a list of syllables, half of which were printed in red and half in green. They were instructed to give themselves a moderately painful shock every time red (or green) syllables appeared in the window of a memory drum. The subjects were then presented with the nonsense syllables tachistoscopically, employing the ascending method of limits, under a variety of conditions.

All the subjects were given lists containing all the syllables that were to be flashed. One set of groups (forced choice) was instructed to check one of the syllables after each flash, even if they had to guess. Another set of groups (free choice) was told to check the blank space at the bottom of the list until the syllable became recognizable and then to check the correct syllable. Each of

these sets was further broken down, with one group (punishment) in each set being told that the experimenter would shock them if they checked a syllable which had been a shock syllable during the learning part of the experiment, regardless of whether they were correct or not. The shocks were very painful. Another group (no punishment) in each set was told that there would be no more shocks and the electrodes were removed. Still another group (threat) was told that the "experimenter would handle the shocking key." Lysak found significantly higher thresholds for shock syllables only under the forced choice, shock conditions. He interpreted this as indicating that punishment, forced choice subjects were less willing to make guesses on shock syllables than on non-shock syllables because they wished to cut their shocks down to a minimum. Any incorrect guesses naming shock syllables merely added to the number of painful shocks received.

A second experiment performed by Lysak (47) followed almost the same procedure as the first. The only difference was that four new nonsense syllables were used during the tachistoscopic study in addition to the syllables used in the learning part of the study. Once again, higher thresholds occurred only under the punishment condition. Unlike the previous study, however, the trend was stronger for the free choice than for the forced choice procedure.

Lysak believed that the subjects in McGinnies' experiment were in a situation similar to his punishment condition. He therefore concluded that they suppressed their taboo responses in the same way as the subjects in his experiment had suppressed responses which would have led to shock. Lysak also concluded that experiments reporting the influence of set on perceptual defense (see below) could best be

explained by saying that responses which are not in line with the set are suppressed until relatively great certainty is reached.

Bitterman and Kniffin

Bitterman and Kniffin (6) offered evidence for the operation of response suppression in a study which used taboo and neutral words. The thresholds for four taboo and four neutral words were assessed by the ascending method of limits. Taboo words, taken from McGinnies set (48), and neutral words alternated in the order of presentation. One half of the subjects were presented with one sequence of taboo and neutral words while the other half was presented with the reverse sequence. The data revealed significantly higher thresholds for taboo words than for neutral words. Upon questioning, the subjects, who were women, admitted withholding responses to the taboo words. The thresholds for the taboo words decreased considerably from the first to the fourth taboo words presented. There was no change in the thresholds of the neutral words in different positions in the sequence. This was interpreted by the authors to mean that the subjects decreased their response suppression as they realized that taboo words were being presented. They did note, however, that the fourth taboo word still had a higher threshold than the fourth neutral word. An analysis of Minneosta Multiphasic Personality Inventory scores for subjects who showed the largest threshold discrepancy between the fourth neutral and the fourth taboo words and for subjects who showed the smallest threshold discrepancy yielded only one differentiating score. Subjects who showed the discrepancy had higher Psychopathic deviant (Pd) scores than subjects who did not show the discrepancy.

Bitterman and Kniffin hypothesized that high Pd people were relatively suspicious, independent, and less pliable, and therefore felt under less constraint to obey the experimenter's instructions about immediate truthful reporting of what was seen. They concluded that response suppression is the most reasonable explanation for their data.

Comment

The Lysak, Whittaker et al. and Bitterman and Kniffin studies do indicate that response suppression can lead to behaviors which would be labelled as perceptual defense if the usual operational definitions for this concept were employed. Their conclusions that all phenomena labelled as perceptual defense may be attributed to response suppression can be refuted only if there is good reason to believe that response suppression is not taking place when the threshold difference between neutral and threatening stimuli is observed. Otherwise the simple explanation of response suppression would probably be more parsimonious than any of the others.

McGinnies and Sherman

McGinnies and Sherman (51) performed an experiment designed specifically to get around the response suppression criticism. Their subjects were tested for thresholds of eight neutral words, all equated for Thorndike-Lorge word frequency (see below). Before the exposure series was begun for each word, the subject was required to view with full recognition another neutral word or a taboo word. The words preceded by taboo words had higher thresholds than the words preceded by neutral words. These data were said by McGinnies and Sherman to be

inexplicable in terms of response suppression. Of course the response suppression advocates might argue that the previous exposure of a taboo word led the subjects to expect a taboo word during the threshold series and to report only these words, while withholding their reports of non-taboo words until absolutely sure that a taboo word was not being flashed. If this were so, there would have been a relatively large number of taboo pre-recognition responses given to neutral words which followed taboo words because the subjects were supposedly set to see the taboo words. However, McGinnies and Sherman report that the pre-recognition responses to neutral words following taboo words resembled the taboo words less than the pre-recognition responses following neutral words resembled the neutral words. It therefore seems unreasonable to the writer to attribute the higher thresholds found by these investigators to the operation of response suppression, produced by a set to see taboo words. McGinnies and Sherman concluded that their experiment demonstrated the inapplicability of the response suppression variable to the results obtained in McGinnies' earlier experiment (48).

The "retroactive vindication" practiced by these authors is not justified. The demonstration of the operation or non-operation of a variable in situation B does not automatically prove or preclude the operation of that variable in situation A. In this instance, the fact that McGinnies and Sherman's subjects did not suppress their responses to the nonsense syllables cannot be taken as evidence that McGinnies' earlier subjects did not suppress their responses to taboo words. The way to demonstrate that some variable is or is not operating in an experiment is to repeat the same experiment with additional

operations designed to reveal the effects of the variable in question. The only valid conclusion that McGinnies and Sherman can draw from their experiment is that response suppression is not necessary for the appearance of the threshold differences usually designated as perceptual defense. Lest McGinnies and Sherman be thought the only users of "retroactive vindication," it should be noted that the same censure applies to Lysak, Whittaker et al. and Bitterman and Kniffin.

Verbal response competition

Solomon and Howes

This position has been presented most forcefully by Solomon and Howes (68). These authors argue for a more serious application of the requirements of operational definition to the study of perception. Specifically, they believe that the response properties of the subject being studied must be considered as well as the stimulus properties of the situation in which the subject is placed. They consider linguistic response properties to be very important in the threshold experiments which have been performed in connection with perceptual defense. They write:

> Thus the study of perception becomes in this case a study of the properties of linguistic responses relative to varying stimulus configurations. This paper is an attempt to show that so-called "perceptual phenomena" can sometimes be deduced from the relationship between certain known properties of the linguistic responses of individuals and certain properties of the optic and instructional situation in which those responses occurred.

The specific response variable considered by Solomon and Howes is the frequency of occurrence of a word in a general sample of the English language, as measured by the Thorndike-Lorge word counts. Competition occurs between well practiced verbal responses, i.e., those

made to frequent words, and poorly practiced verbal responses. The former are successful in this competition and are therefore more likely to occur than the latter. It is important to note that Solomon and Howes do not take the position that all perceptual data can be accounted for by response properties. They do believe, however, that the findings used as examples of perceptual defense are best explained through the use of the frequency variable.

The two authors call upon several sources to support their point of view. First, they state that there is an inverse relationship between the log frequencies of occurrence of words in the Thorndike-Lorge word counts and the visual duration thresholds for these words. Secondly, they point to the fact that the taboo words used by McGinnies in his experiment (48) (see above) occurred less frequently than the neutral words he used. They argue that the higher threshold for taboo words can therefore be deduced from the general relationship between word frequency and thresholds without any attention to defensive processes in perception.

The third source of data is an experiment performed by Solomon and Howes in response to an earlier study by Postman, Bruner and McGinnies (58). The latter set of investigators found, among other things, that subjects had higher thresholds for words drawn from areas which they did not value than for words drawn from areas that they valued highly. The values were measured by the Allport-Vernon Study of Values. Solomon and Howes repeated this experiment using two sets of words, one with fairly high frequencies and the other with very low frequencies.

Their results showed a significant inverse relationship between Thorndike-Lorge frequency count and visual duration threshold. There was no overall relationship between value and threshold. A selection of 11 subjects with extreme scores on the values test did reveal a trend for the low value words to have higher thresholds than the high value words, especially among the infrequent words. The authors demonstrated that given the nature of the log frequency-threshold relationship and the assumption that words from highly valued areas have high idiosyncratic frequencies, one would predict that values would affect thresholds for infrequent words more than for frequent words. Solomon and Howes concluded that these data support the view that linguistic frequency is a variable which can lead to the kinds of response differences that would usually be labelled as perceptual defense. It is interesting to note that the authors also tried to demonstrate that linguistic frequency is responsible for the actual value scores of the subjects. They claimed that subjects are more likely to check alternatives containing familiar words than those containing unfamiliar words. If this explanation is accepted, the relation between thresholds and values becomes the relationship between the effects of word frequency on visual thresholds and the effects of word frequency on choices made on a multiple-choice questionnaire.

Postman and Schneider

Solomon and Howes' assumptions and conclusions have been questioned from two quarters. Postman and Schneider (60) performed the same experiment as Solomon and Howes, the only difference being that their low and high frequency words were more frequent than

Solomon and Howes' low and high frequency words. The authors justified this difference on the grounds that it is important to sample the whole range of word frequencies in order to discover the generality of the frequency-threshold relationship, especially as it combines with the value-threshold relationship. They found the same results as Solomon and Howes. They interpreted the threshold difference between high and low value words as being due to the influence of directive factors (e.g., motivation) on the recognition process. According to the authors, Solomon and Howes had no evidence that idiosyncratic word frequencies are correlated with values and that it is therefore just as reasonable to attribute the phenomenon to perceptual variables. No attempt was made by Postman and Schneider to refute the general frequency-threshold relationship advanced by Solomon and Howes; they merely questioned the exclusive use of the frequency variable to account for both the threshold data and the values choices. As support for the operation of directive factors they presented data from their subjects' recalls of the words that were used in the threshold assessment. The recalls were performed after all the thresholds had been measured. There was no significant relationship between word frequency and recall, but there was a significant relationship between values and recall. Very high and very low value words were recalled better than words from the intermediate value areas. On the basis of the S-R theory used by Solomon and Howes, one would predict that high frequency words should be recalled better than low frequency words. The writer believes that the inability of S-R theory to predict behavior in its own "backyard" (recall is within the traditional realm of verbal learning theories)

casts some doubt on its use to explain data in a more remote area. To be sure, the relation between recall and values does not prove that values are also potent variables in the threshold situation. The safest conclusion to draw is that the use of the frequency variable to explain the threshold differences related to values is still to be validated.

McGinnies

The second challenge to the Solomon and Howes position has come from McGinnies (49). He questioned the way in which the word frequency proponents have assigned word frequencies to his taboo words and their method of fitting his data to a theoretical curve representing the relation between frequency and threshold. Taboo words which were not listed by Thorndike and Lorge were automatically assigned an extremely low rank by Howes and Solomon. The words "penis" and "kotex" were assigned the same low rank as a word like "percipience." The words "whore," "bitch" and "belly" were equated in frequency with words like "beautific," "etcher," "elegies" and "vignettes." McGinnies wrote, "The writer has yet to be confronted in drug stores, grocery stores and department stores with stacks of cartons all prominently labelled KOHLRABI." (Kohlrabi has a higher Thorndike-Lorge frequency than that assigned to kotex.) It may well be, according to McGinnies, that the relationship between frequency and threshold that Howes and Solomon found in McGinnies' data was an artifact of the arbitrary (and incorrect?) assignment of frequencies to these words.

McGinnies also noted that even if one accepted the Howes and Solomon assignments of word frequencies, his data did not really fit

the relationship between frequency and threshold. The relationship disappeared when the taboo and neutral words were considered separately. The overall relationship supposedly discovered by Howes and Solomon was shown to be an artifact of the separate relationships between taboo words and threshold on the one hand, and taboo words and frequency (as defined by Howes and Solomon) on the other. According to McGinnies, if the frequency variable were responsible for his results it would have related to thresholds within each of the groups of words. Once again the conclusion appears to be that the word frequency explanation of the perceptual defense phenomenon is not convincing.

Even though the Solomon and Howes position does not achieve its intended result of explaining away perceptual defense, it does perform a valuable function for those who are interested in finding an explanation for the phenomenon. It demonstrates that the variables affecting the responses used to operationalize perceptual defense must be controlled before a significant study of the phenomenon can be performed.

Eriksen and Browne

The most recent proponents of the competing verbal response theory are Eriksen and Browne (28). (Eriksen appears to have changed his position with respect to this question. See below.) According to these investigators, perceptual defense appears to occur because of the restriction in response categories available for description of a perceptual experience. They describe the usual threshold assessment situation as one in which the subject is often aware of part of the stimulus but is forced to respond with labels for complete

stimuli. Under these conditions several labels or verbal responses are equally appropriate for a given perceptual experience. The authors state that the response chosen will be the one which is highest in the subject's response hierarchy for whatever parts of the stimulus he has perceived. Eriksen and Browne add a reinforcement determinant in addition to the traditional frequency and recency determinants of verbal responses. They argue that responses which have in the past led to anxiety are less likely to have been reinforced than those which have not led to anxiety; as a result they are less likely to be high in a subject's hierarchy of responses.

The experimental test of this theory involved giving an anagrams test containing many insoluble problems to two groups of subjects under ego-involving instructions. All subjects were told the correct answer after each problem in order to equalize recency effects. One group of subjects had high scores on the MMPI Psychasthenia Scale, the other group had low scores. The thresholds for the anagram words and for a set of control words, equated for frequency and length with the anagrams, were then assessed, using the ascending method of limits.

The thresholds for the anagrams were lower than the thresholds for the control words. There was also interaction between the recency variable and the psychasthenia variable, with the low psychasthenics having higher thresholds than high psychasthenics on anagram words, but not on control words. On the basis of the inspection of the content of the psychasthenia scale and the correlations of the scale with the Taylor Manifest Anxiety Scale (29), Eriksen and Browne assumed that failure evoked anxiety in people with low psychasthenia

scores, but not in people with high scores. On the basis of this assumption they claim that the data support their theoretical explanation of perceptual defense.

The authors' interpretation of their data is open to question. They admit that other interpretations can be offered. Indeed, one of these other interpretations, which will be described below, is one offered by Eriksen himself in a previous study. Another troublesome spot is the use of the MMPI as a measure of anxiety. If the important motivational variable in this situation is anxiety, it should be measured more directly. The meaning attributed to the psychasthenia scale, by the authors, is very suspect in view of the fact that in a previous article (29) the senior author stated that the psychasthenia scale and the Taylor Scale should not be taken as measures of the drive properties of anxiety (as is done in this study), but rather as measures of defense mechanisms and some other variables.

Furthermore, the theory requires that specific verbal responses be anxiety evoking; therefore, a general measure of anxiety, even if it is a valid measure, is inappropriate to test the theory. A breakdown comparing thresholds for the words which subjects actually failed in the anagrams test with the words which were not failed would be a more appropriate test for the theory than the test which was actually performed. Specifically, Eriksen and Browne should have predicted that the general tendency to view failure as anxiety evoking should differentiate between people's thresholds for failure words only. These data were not presented. In view of the criticisms offered, Eriksen and Browne's new theory cannot yet be considered a serious contender for the explanation of perceptual defense. It does, however, point to

the need for caution in using verbal responses as operations for perceptual variables.

A methodological note

The verbal response suppression and the competition of response points of view have both attempted to reduce the phenomenon of perceptual defense to one involving only or primarily the verbal responses employed to measure the occurrence of perceptual recognition. In both cases the justifications for this approach have been either theoretical parsimony and/or operational rigor. Theoretical parsimony is difficult to judge, e.g., both Solomon and Howes (68) and Postman and Schneider (60) claim that their own explanation is more parsimonious than the other's explanation. Operational rigor, on the other hand, is something about which one can make generally agreed upon statements. It therefore seems appropriate to ask whether experiments investigating the functioning of perceptual variables have, of necessity, less operational rigor than experiments dealing with overt response variables.

Garner, Hake and Eriksen (32) have addressed themselves to this problem in a fairly recent article. They unequivocally reject the position that operational rigor requires one to assume that the overt reaction is the same as the perception and that all one need do is to investigate the conditions under which a discriminatory response is made. Indeed, they label this point of view as a "perversion of the fundamentals of operationism as stated by its originators." The authors go on to specify what they believe to be the kinds of operations which enable the investigator to distinguish perception from overt responses.

The first requirement is the demonstration of a discrimination between stimuli on the basis of the responses of the subjects exposed to the stimuli. Discrimination alone, however, can yield no information about the perception. It merely tells us that some system is operating which is "reliably assigning responses to stimuli." The second requirement is that of "converging operations." These are defined as "any set of two or more experimental operations which allow the selection or elimination of alternative hypotheses or concepts which could explain an experimental result." The authors allow for the use of assumed converging operations in cases where, on the basis of previous knowledge, we know what the results of the converging operation would be. The specific alternative hypotheses to be eliminated in perceptual defense experiments are those which make the phenomena functions solely of verbal responses. The experiments require, in addition to the usual threshold assessment operation, a second operation which, taken in conjunction with the outcome of the assessment operation, would enable us to decide whether the phenomena observed should be referred to the operation of the perceptual system or the verbal response system. Some of the experiments to be described will present examples of converging operations (10, 11, 43, 53). The authors provide several examples of unjustified interpretations due to the lack of converging responses. One of these examples will be considered in detail because it is relevant to several of the experiments to be discussed.

The authors point to many of the experiments which have shown that telling the subject about the stimuli to be flashed tachistoscopically in the threshold assessment situation leads to lower

recognition thresholds than when no advance information is given. Findings of this sort are usually interpreted as the effect of set on perceptual accuracy. However, according to Garner, Hake and Eriksen, the necessary converging operations have not been performed to justify attributing the effect to the perceptual system. These results have an alternative explanation "which requires no assumption about the accuracy of the perceptual process, namely that the amount of error in the response system decreases with a decrease in the number of response categories." The effect of the number of response categories on accuracy has been independently demonstrated. Note that the authors do not state that the number of response categories is the factor which is responsible for the effect; they merely state that until some operation is provided which rules out this factor, it is unreasonable to speak of increases in the accuracy of the subject's perception.

Hypothesis competition

The hypothesis construct

The third point of view combines the competition and perception alternatives. Most of the studies based on this position have tested predictions derived from the general theory of cognition advanced by Postman and Bruner. The central construct of this theory is the hypothesis (54,55). Hypotheses are defined as predispositions or expectancies of a perceiver to select, organize and/or transform stimulus cues in specific ways. Recognition of a stimulus occurs when there is a confirmation of an hypothesis by a stimulus input.

Hypotheses are said to vary in strength; strong hypotheses need less appropriate stimulus input for arousal and confirmation than do weak hypotheses.

Bruner (14) and Postman (54, 55, 61) list several determinants of hypothesis strength. They are: (a) the clarity of previous inputs appropriate to the hypothesis, (b) the frequency of past confirmations, (c) the recency of past confirmations, and (d) the degree to which the confirmation of the hypothesis signifies reward or punishment. Both reward and punishment relevance are said to increase hypothesis strength. Postman also states that the larger the number of alternative hypotheses in any situation, the weaker the hypotheses are.

> Perceptual defense, according to hypothesis theory,
>
> results from the dominance of strong alternative hypotheses rather than from the active repression of the inimical or dangerous. In the presence of partial information, strong hypotheses incompatible with the threatening stimulus may be evoked. If this is the case the subject will appear to be defending.

Postman and Solomon

It should be noted that this explanation bears a strong resemblance to the Solomon and Howes position, the major difference being that Postman et al. place the process responsible for perceptual defense in the perceptual system rather than the response system. It therefore should not be surprising to find that an early study supporting this point of view appears with Postman and Solomon as co-authors (61).

The subjects in this study were presented with a set of anagrams which could be solved to yield words of approximately the same Thorndike-Lorge frequency. The administration was carried out so that each subject solved about half of the anagrams he received. The subjects

were all told the correct solutions after each anagram in order to equate the words with respect to recency and in order to make non-completion look like failure. The visual recognition thresholds were found for the anagram words and a set of control words matched with the anagram words for Thorndike-Lorge frequency and structural characteristics. The subjects had significantly higher thresholds for the control words than for the anagram words. This result is interpreted as showing the effects of recency in perception. No overall difference was found between the thresholds for completed (success) and incompleted (failure) anagram words. However, 10 of the 17 subjects showed significant differences between success and failure thresholds; four of the subjects showed results close to significance.

In the light of the discussion of operational definitions of perception, it must be noted that these data do not unequivocally place the phenomenon in the perceptual system. Indeed, the very argument used by Solomon and Howes could be applied to this study. Comment on the lack of significance for the overall test between success and failure word thresholds will be made below.

Postman and Schneider

The Postman and Schneider study (60) has already been described. It too suffers from the lack of converging operations, so that the authors' claim of dealing with perceptual rather than response phenomena must be questioned.

Postman and Leytham

In a study specifically designed to test some of the propositions of hypothesis theory, Postman and Leytham (59) measured the recognition

thresholds of 12 trait names and five words which were not the names of personality traits. The threshold for three neutral words were assessed first as tachistoscopic training; the 12 trait name thresholds were then measured, followed by the two remaining neutral words. After exposure to the practice words, one group of subjects was given a general set of instructions while another group was given the general instructions and instructions which led them to expect only trait names to be exposed. Following the threshold assessment, the subjects rated the trait names on desirability, rated themselves with respect to the traits and predicted how their friends would rate them on these traits.

The investigators reported the following results. Undesirable traits were recognized more rapidly than desirable traits in the trait set group; the same trend appeared very weakly with the no set group. According to hypothesis theory, positive and negative affect or motivational support should not have differential effects if the intensity of the two kinds of affect is the same. The rating data reported by Postman and Leytham indicated that the desirable traits were accepted and undesirable traits were rejected with approximately the same intensity, so that there should have been no threshold difference for the two classes of traits. The authors interpret these data as contradictory to a simple autistic theory of perception; they neglect, however, to mention that the results are also contradictory to their own theory.

The theory predicts that hypotheses which are confirmed frequently should be stronger than those which are not confirmed frequently. The authors state that hypotheses for traits which the subjects' self ratings and predicted ratings by others are the same have been confirmed

more frequently than hypotheses for traits on which there are discrepancies between self and predicted ratings by others. The data show that the discrepant traits had higher thresholds than the other traits, as predicted. This result does support the theory, but the coordination of the rating scale data to frequency of past confirmation requires a rather large leap from operational definition to conceptual definition. The support for the theory would be more convincing if some independent measure of hypothesis strength for the trait names were included in the study.

Hypothesis theory would predict that the trait set group would have lower thresholds than the non-set group because it had a smaller number of alternative hypotheses against which incoming stimuli had to be checked. The data show no difference between the two groups in thresholds for the trait names. The only indication of the operation of the trait set was the fairly high threshold of the first non-trait word exposed after all 12 trait names had been exposed. They state that the 12 confirmations of trait name hypotheses strengthened the general hypothesis of expectation for trait names in general. The authors claim, therefore, that this result demonstrates the operation of set in the selective strengthening of hypotheses. Pre-recognition responses to the first non-trait word were often trait names which were structurally similar to the non-trait word being exposed.

Postman and Leytham concluded that their hypothesis theory was supported by the data and that the effect of motivational variables in perception could not be identified with wish fulfillment or defense. The justification for this conclusion is open to question. It has already been shown that the predicted motivational effects did not occur.

Furthermore, it will be shown below that the authors' inference that a repression or inhibition theory would necessarily predict high thresholds for undesirable traits is mistaken. Finally, this study suffers from the same lack of converging operations as the two previous ones.

Smith

Several predictions drawn from hypothesis theory have been tested by Smith (65). He predicted that hypotheses for nonsense syllables associated with reward, punishment or an affectively neutral emphasizer would be stronger than hypotheses for syllables without these reinforcements. He also predicted that the more frequently a nonsense syllable was experienced, the stronger the hypothesis for it would be. Smith had his subjects learn lists of nonsense syllables, exposed one at a time in a memory drum. Some syllables were consistently paired with a one cent reward; others were paired with a painful shock; others were accompanied by a loud buzz; and the remaining syllables were presented alone. One half of the syllables in each of the four reinforcement groups were presented twice as often as the other half. Thresholds were assessed for these syllables and for some new syllables by increasing the focus of a blurred projection of the syllables until they were recognized correctly.

Smith reported that there was no relation between the reinforcement variable and thresholds. The thresholds for the completely new syllables were higher than those for the ones used in the learning task, but the differences in frequency within the learning task were not related to thresholds. In order to check on the success of his

manipulation of motivational relevance, Smith had his subjects rate all the nonsense syllables on several scales from the semantic differential. The data indicated significant differences among the ratings for the syllables in directions which would be expected if the manipulations were successful. These data taken with the data reported by Postman and Leytham cast doubt upon the assumed role of motivation in strengthening hypotheses. They also provide only partial support for the effects of frequency of confirmation on hypothesis strength.

Postman and Brown

A study by Postman and Brown (57) attempted to get at motivational determinants of perception by experimentally controlling the motivational relevance and the familiarity of a set of stimuli presented for recognition in the standard ascending method of limits threshold assessment situation. The authors predicted that hypotheses congruent with a motivational context (success or failure) should be more easily confirmed than those which are not congruent. The recognition threshold was the operation used to measure hypothesis confirmation. The authors created three motivational contexts, viz., success, failure, and neutral, through the use of false feedback in a level of aspiration task. Following this manipulation, the thresholds for 12 control, four deprivation, four goal, and four goal-directed words were assessed. Each of the experimental words had a corresponding control word matched with it for frequency. Sensitivity to a word was measured by taking the difference between its threshold intensity and the threshold intensity of its matched control word.

The results of the study indicated that the level of aspiration task did produce the desired motivational context. The success group showed more sensitivity to goal words than to deprivation words. The failure group showed more sensitivity to the deprivation words than to the goal words. The authors' conclusions imply that these results contradict the prediction that would be made by the inhibition theorist, namely, that subjects would always be more sensitive to goal words than deprivation words, especially if their anxiety had been aroused through failure. The results are in line with hypothesis theory. The last two criticisms offered in the discussion of the Postman and Leytham study also apply to this study.

Postman, Bronson and Gropper

The last Postman et al. study to be considered (56) returns to the use of taboo and neutral words as stimuli. The taboo words were the same as those used by McGinnies. Male and female subjects, tested separately, were shown taboo and neutral words matched for Thorndike-Lorge frequency. Some of the males were tested by a male experimenter and some were tested by a female experimenter; a similar arrangement was used for the female subjects. The thresholds were measured by the ascending method of limits under four different conditions. One group (uninformed) was merely told to write down everything they saw, including single letters. A second group (informed) was told that some of the words were ones not commonly used in polite society. A third group (facilitation) was given the same instructions as the second and then told that people who have a hard time seeing these words are maladjusted. The final group (inhibition) was also set for the impolite

words, but they were then told that people who have a hard time seeing the words are normal.

The results of this study showed taboo words to have a lower threshold than neutral words across all conditions. The authors explained this by saying that taboo words were underestimated in frequency in the Thorndike-Lorge word count (see McGinnies' criticism [49] of Howes and Solomon above). Therefore the hypotheses for taboo words were actually stronger than those for neutral words. The uninformed group had the highest threshold for the taboo words. The facilitation group had the lowest threshold for the taboo words. The other two groups had about equal thresholds. Female subjects showed a higher threshold for taboo words than male subjects. The sex of the experimenter was not related to thresholds for taboo words, nor was the interaction between the sex of subjects and experimenters significant. The absence of subject-experimenter sex interaction is somewhat contrary to the response suppression explanation. The higher threshold shown by the females was explained by stating that females use taboo words less than males and therefore have weaker hypotheses for them.

The authors concluded that their experiment did not offer any evidence for the existence of a direct inhibition mechanism in perception. This conclusion cannot be disputed, but it should be pointed out that, as in the previous experiments, the Postman group is reacting against an early form of the inhibition theory, namely, that put forth by McGinnies. It will be shown that results of these experiments are not relevant to later forms of the theory. There can also be no doubt that the Postman experiments demonstrate that the varied situational factors included under the set concept have an effect on the responses of the

subjects. There has not been any clearcut demonstration of the perceptual locus of the set effect because of the inadequate operations used. In all fairness, however, it must be admitted that the experiments have attempted to control the two response variables, viz., frequency and conditions leading to response suppression, most often thought to be capable of producing spurious differences in threshold. It is therefore likely that their results do provide genuine information about the perceptual process.

Freeman

The competition of hypothesis explanation for perceptual defense has been proposed by Freeman (30, 31) in a series of experiments similar to those performed by Postman et al., investigating the influence of set on thresholds. Freeman's first study (30) used taboo and neutral words equated with respect to length but not frequency. An experimental and control group matched for perceptual accuracy on a practice list were exposed to a list containing four neutral words and two taboo words. The experimental group was led to expect some taboo words; the control group was not. The experimental group showed significantly lower thresholds for the taboo words than did the control group. Comparing performance on taboo and neutral words within each of the groups reveals that the control group had much higher thresholds for taboo words than for the neutral words, while the experimental group showed the opposite trend. The effects were stronger for the first taboo word seen by the subjects than for the second. These data were explained by referring to the effects of varying the number of alternative hypotheses on hypothesis strength via the taboo set instructions. Freeman noted that

the control group had received a list of neutral practice words on a previous day but had not received any taboo practice words. He believed that the control group therefore had stronger hypotheses for the neutral words than for the taboo words, and as a result showed lower thresholds for the former than for the latter. It should be noted that Freeman's control group did not behave the same way as Postman, Bronson and Gropper's uninformed group (56), in spite of the fact that the two went through approximately the same procedures. A possible explanation for this difference is in the nature of the taboo words used. Postman et al. used "raped," "belly," "whore," "kotex," "penis," "filth" and "bitch." Freeman does not explicitly state his words but he does write that they are similar to "hiss" and "muck," the only change being in the first letter. It may be that Freeman's words were more taboo than the words used by Postman et al. More shall be said about this difficulty below. This particular experiment by Freeman adds little to what has already been presented. Indeed, it does not deal with frequency and response suppression as adequately as some of the Postman studies. Lacy, Lewinger and Adamson (41) in a very similar study found essentially the same results as Freeman.

A second experiment by Freeman (30) provided data which were intended to embarrass the inhibition theory. Employing the same setup and instructions as the previous experiment, Freeman changed the taboo words to "hiss" and "muck." He stated that the inhibition theory would predict higher thresholds for these words because they are similar to taboo words. His results showed no difference between the taboo set and the non-set groups in the thresholds for hiss and muck. There were also no overall threshold differences for hiss and muck when compared

with the neutral words. It is interesting to note that in spite of the fact that the experimental subjects produced more taboo pre-recognition responses to the two crucial words, their thresholds for these words were not different than the threshold for the neutral words. This finding is very much out of line with the competing hypothesis explanation of perceptual defense. This explanation asserts that the perceptual defense phenomenon will occur when a strong alternative hypothesis monopolizes incoming stimulation which contains information appropriate to it and to the correct hypothesis, thereby hindering confirmation of the correct hypothesis. Freeman's second experiment met the conditions required by the competing hypothesis theory for the occurrence of the perceptual defense phenomenon, but the phenomenon did not occur.

A third experiment by Freeman (31), using both male and female subjects, but otherwise identical with his first experiment, revealed essentially the same results with males as his first study which was also performed on males. However, both the set and the non-set female groups showed higher thresholds for taboo words than for neutral words, although the effect was very slight in the set group and very strong in the control group. This result is similar to Postman, Bronson and Gropper's finding that females had higher thresholds for taboo words than males. Freeman appears to believe that these results support the competing hypothesis theory. However, in view of the criticisms already offered of the experimental design and the lack of positive results with the females, Freeman's conclusions do not seem justified.

Comment

The Postman, Bronson and Gropper (56), Freeman (30, 31) and Lacy, Lewinger and Adamson (41) studies all indicate that informing subjects that they are about to see taboo words either reduces or reverses the usual discrepancy between thresholds for neutral and taboo words. Regardless of whether this effect is interpreted as being consistent with response suppression, verbal response strength or perceptual hypothesis strength, it does argue against an inhibition explanation of perceptual defense. It would seem from these studies that correct (verbal and/or perceptual) recognition responses to threatening stimuli might not occur because they are weak or improbable. The various manipulations of set might be thought of as merely redressing an initial imbalance in response strength and thereby erasing the threshold difference between threatening and non-threatening responses. An inhibition process taking place sometime during recognition would not at all be required as an explanation if perceptual defense occurred only when subjects did not expect to see the threatening material.

Cowen and Beier

A study by Cowen and Beier (22) helps support inhibition theory against the criticisms mentioned above. Male and female subjects, tested individually, had a list of taboo and neutral words read to them by either a male or female experimenter. The subject was informed that he would be asked to decipher some of these words later. The thresholds were measured by using successive carbon copies of words typed one to a sheet, starting with the most blurred copy. The number of successively clearer pages and the time required for a correct recognition were the

threshold scores. The subjects had significantly higher thresholds for taboo than for neutral words. The authors eliminated response suppression as a possible explanation, first by noting that the subjects knew they would see some taboo words. They also point to the lack of sex differences in the results and to the lack of interaction between sex of subject and sex of experimenter. Word frequency did not correlate with threshold in this study so that it too can be dismissed as a variable which might have been responsible for the finding. Were it not for the lack of converging operations, this study would be a demonstration of perceptual defense which could not be explained by any of the three viewpoints discussed above. Indeed, as with several of Postman's studies, the person who would deny perceptual status to the effects shown in this study is hard put to specify what response variables might have led to the obtained results.

Dulany

The explanation of perceptual defense has been approached by Dulany (23) using an avoidance learning situation to create perceptual defense experimentally. Following Blum (9), his subjects were tachistoscopically shown four geometric figures placed in a cross-like arrangement. Subjects were instructed to indicate the position of the figure which was "most recognizable" or "clearest" by pressing one of four buttons. The subjects were shocked if they pressed the button corresponding to a critical figure and avoided shock if they pressed any of the other three buttons. The electrodes were removed for the threshold assessment series and the subjects continued to respond by choosing the clearest of the four stimuli.

The results showed that the critical figure was chosen less often than the other three during the assessment series. It is fairly certain that response suppression was not at work in this study because the subjects had nothing to fear from responding during the assessment session. Furthermore, questioning after the experiment revealed that almost all the subjects were not aware of the pattern of shocking used, so that they could not have used response suppression even if they had wanted to. Dulany did provide a converging operation which eliminated a non-perceptual response interpretation of his data. The position of the critical figure was changed from trial to trial so that the overt response which corresponded to the clearer perception of this figure (i.e., pressing a particular button) also changed from trial to trial. No one overt response was reinforced any more often than any other; it therefore seems very reasonable to attribute the observed response difference to critical and non-critical figures to the perceptual process itself.

Dulany interpreted his results as supporting the following hypothesis: "If one perceptual response is punished while competing perceptual responses are instrumental to the avoidance of punishment and a reduction in anxiety, perceptual defense should be learned, since competing perceptual responses should crowd out the critical response." The similarity between this formulation and the Postman position is striking. Dulany's perceptual responses play the same role as Postman's hypotheses. A major difference between the two is in the effects of reward and punishment on the response or hypothesis. Dulany follows a Hullian reinforcement theory while Postman follows a Tolmanian emphasis theory. Although his data were consistent with his theory, Dulany

admits they would have been just as consistent with a theory which postulates an inhibition of the perceptual response to the critical stimulus.

Comment

By way of summary of the competing hypothesis (or perceptual response) explanation of perceptual defense, it can be noted that most of the experiments did not unequivocally locate the phenomena they were studying in the perceptual systems of their subjects. The predictions made about the effects of motivation on perception were supported in only two experiments, namely, Postman and Brown (57) and Dulany (23). In the case of the former, the motivation acted like a situationally aroused set, while in the latter the results were as easily explainable by an inhibition theory as by a competition theory. The major advance made by these studies has been to point to the importance of controlling the expectation that subjects have about the nature of the stimuli they are about to receive. Most of the studies reported lower thresholds for stimuli which the subjects expected than for stimuli which were not expected. Cowen and Beier, however, have shown that the perceptual defense phenomenon can occur even when the subjects expect to receive threatening material.

Inhibition of threatening perceptual responses

The nature of perceptual inhibition

Perceptual inhibition has sometimes been offered as an explanation by default for perceptual defense. Investigators implicitly or explicitly ruled out the three explanations which have been discussed above and

thereby concluded that the correct explanation must be perceptual inhibition. In itself, this form of proof is as correct as any other, provided all possible alternatives have indeed been ruled out before accepting the last applicable alternative. Practically, however, this kind of explanation is unsatisfying because it points to no creative research which might yield more information about the phenomenon under study. Early discussions of perceptual defense suffer from explanation by default more than later ones (16, 48). Under the pressure from critics (see above), the proponents of a perceptual inhibition explanation of perceptual defense have begun to specify the antecedents of the phenomenon to a degree which allows for respectable predictions properly derived from a set of assumptions and/or postulates.

In its original form, the theory stated that thresholds for threatening stimuli would be raised through the action of some kind of inhibitory process. Presumably this process was thought to take place whenever any threatening material was shown to any person. Fairly frequent findings of lowered thresholds for threatening material (30, 41, 56) have demonstrated the untenability of the original formulation. In an article written before his conversion to the competing verbal response position, Eriksen offered two major criticisms of early perceptual defense studies. The first has to do with the nature of the threatening material used. Taboo words or words from areas which are not valued by a subject should not be automatically assumed to be threatening. Eriksen argues for the independent assessment of the degree to which a stimulus is likely to be regarded as threatening by a subject. A similar stand has been taken by Blum (9). Eriksen also argues that the personality theory from which the defense concept is

drawn does not state that everyone should show the same kind of defense to a threatening stimulus. Some people might defend by becoming more sensitive to threatening material. Individual differences in the kinds of defense mechanisms used have long been of interest to personality theorists. Lazarus (42) has advanced similar arguments in his reply to the study by Postman, Bronson and Gropper (56). Two experiments will serve to illustrate studies undertaken by the Eriksen and Lazarus group.

Lazarus, Eriksen and Fonda

Lazarus, Eriksen and Fonda (43) used two groups of neurotic patients as their subjects. One group, the intellectualizers, tended to be ruminative about emotional matters; the other group, the repressors, tended to become blocked in the presence of sexual or aggressive material. The subjects performed an auditory task which required the deciphering of recorded, spoken sentences presented against a background of 50 percent noise. Repressors deciphered fewer sexual and/or aggressive sentences than intellectualizers. The difference between the two groups could not be attributed to differences in the overt response strength of sexual and aggressive sentences because there was not a significant correlation between the incorrect production of sexual and aggressive responses and the correct production of these responses, as would be the case if the variance in responses could be accounted for by verbal response strength. The lack of correlation between correct and incorrect responses also rules out response suppression as an explanation. The reason for this is that if the subjects were consciously withholding particular responses, they would have given these responses less frequently, regardless of whether or not the appropriate stimulus was present. Such behavior would have led to a positive correlation between

the correct and incorrect responses. As was mentioned above, this correlation did not appear.

The results do not allow for a test between the competing hypothesis and the inhibition explanations. Although the experimental selection of subjects was made in terms of the latter theory, proponents of the former could state that the repressors actually had weaker hypotheses for sexual and aggressive material than did the intellectualizers because they thought about it so little. On the other hand, it could be argued that the hypotheses for sexual and aggressive material should have been stronger than those for neutral material in both groups because they were more motivationally relevant. Unfortunately, the data do not permit the weighing of the relative effects of frequency of confirmation and motivational relevance as determiners of hypothesis strength.

The investigators also had their subjects complete sexual, aggressive and neutral sentence stems. They report a positive correlation between thresholds for sex sentences and indicators of disturbance on the completions of sex sentence stems; the same relationship occurred with the aggressive material. Significant correlations were also found among the performances on the different tasks across the two areas. The authors interpreted this as evidence for general styles of defense which were used in different conflict areas. Correlations between the two tests within an area, partialling out the performance in other areas, were also significant, indicating variance due to the specific conflict content as well as to the general style of defense. The relevance of these correlational findings will be discussed below.

Eriksen

A second experiment by Eriksen (25) also studied the relationship between an individual's style of defense and his performance in a perceptual defense situation. The first part of the experiment presented two groups of subjects with scrambled sentences which the subjects were told to unscramble. Half of the sentences used were soluble, the other half were not. One group of subjects was given ego-involving instructions, the other was not. Following a brief, unrelated interpolated task, the subjects were asked to recall the sentences on which they had previously worked. The results show that the ego-involved subjects on the whole remembered more completed (success) than incompleted (failure) sentences, while the non-ego-involved remembered more incompleted sentences. The ego-involved group also showed six times as much variability as the other group. The same result occurred in the Postman and Solomon (61) study reported above. This was interpreted as the result of the operation of repressive defenses on the one hand and intellectualizing defenses on the other. Subjects using the former are more likely to remember successes than failures, while subjects using the latter are likely to do just the reverse.

The second part of the experiment employed subjects who showed extreme differences in memory for the success and failure sentences in part one. The subjects were presented with a 93 item word association test from which 25 words showing a wide range of reaction times were selected for each subject. Two weeks after the word association test the subjects' thresholds for the 25 chosen words were assessed by the ascending method of limits. The subjects were told that some of the

words might be swear words or "dirty" words. All of the subjects who recalled more success than failure sentences showed significant positive correlations between their reaction times on the word association test and their recognition thresholds. This relationship did not show up for the subjects recalling a preponderance of failure sentences. Using reaction time to a word as a measure of threat, this result was interpreted to mean that high success recall subjects showed raised thresholds to threatening words while high failure recall subjects did not.

Eriksen presented data to show that the perceptual difference between the two groups was not due to differences in their performances on the word association test, or to structural or frequency characteristics of the particular words chosen for each subject. Response suppression does not seem to have been active, because the subjects were warned about the occurrence of the few taboo words that were used and because the acceptability of saying such words was implied by the experimenter's having previously read them to the subjects in the word association test.

Eriksen concluded that his results demonstrated the operation of consistent modes of defense against threat in memory and perception. He suggested that the subjects who recalled more success than failure sentences and showed the raised thresholds for threatening words were using the mechanisms of repression and denial, while the others were using intellectualizing and/or rationalizing mechanisms. These suggestions fit the data reported above in the Lazarus, Eriksen and Fonda study (43). Eriksen also noted that subjects showed intra-individual consistency in spite of the fact that the study made use of threatening material from several different areas. This too parallels the finding of Lazarus et al.

Eriksen's study falls short of the Lazarus et al. study in not providing a converging operation which clearly demonstrates the perceptual locus of the phenomena reported. As in the case of some of the studies reviewed above, this criticism smacks of methodological fastidiousness because there are no response variables in sight which could account for the results, unless we allow for the variable discussed by Eriksen in his new approach to perceptual defense (see Eriksen and Browne [28]). If the perceptual nature of the phenomenon is accepted, the competing hypothesis theory would have difficulty accounting for the relationship found between the performance on the memory task and on the perception task. Postman claims that merely pointing to personality variables (e.g., a tendency to use repression) which relate to perceptual defense does not preclude the operation of competing hypothese as the process responsible for the perceptual defense. In this situation Postman would have to say that the high success recall people had weak hypotheses for the threatening words on the word association test while the high failure recall people did not. However, if this were the case, the performance on the word association test should have been different for the two groups. The high failure recall people should have shown shorter reaction times to their high threat words, assuming that frequently confirmed hypotheses are more likely to be closely associated with other responses than infrequently confirmed hypotheses. The data revealed neither a difference in the mean reaction times of the two groups nor a difference in the variability of the reaction times of the two groups. It therefore seems reasonable to conclude that the data from this study appear to be more consistent with an inhibition explanation than with a competing hypothesis explanation of perceptual defense.

The two studies described above both yielded evidence for generality of defense mechanisms across areas of conflict. The studies to be described below do not assume that the same defense will be used for different conflict areas, but rather they predict to perceptual defense only when there is evidence for conflict and repression or avoidance defense for the specific material in question. All the studies use Blacky Pictures (7, 8) as stimuli,[1] although conflict and defense are assessed somewhat differently from study to study. All present the subject with four pictures simultaneously flashed in a tachistoscope at a fixed, very rapid speed. The pictures are arranged at the top, right, left and bottom of the screen. After each exposure the subject is asked to name the picture which appeared in a particular position.

Blum

The first study in this group to be discussed is reported by Blum (10). The subjects in Blum's study were all graduate students "thoroughly familiar with the Blacky pictures." Each student was seen individually over a period of several weeks. During this time the subject was administered a series of recall tests for the Blacky Pictures. He was also asked to rank the picture problem areas in terms of how he saw them as problems in himself. A variety of indicators from the recall tests and the picture problem rankings were used to construct a measure of conflict for each of the Blacky picture areas. A subject

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[1]The Blacky Pictures are a set of projective cartoons depicting a dog in a variety of situations corresponding to psychosexual problems encountered in development. Subjects tell stories and answer a series of questions in response to each picture. These responses can be coded to arrive at a measure of conflict for each of the problems represented by the pictures.

was considered to use repression in an area if he forgot a picture or its label in any of the recalls, provided he also showed conflict in that area.

The perceptual part of the experiment sometimes preceded the several recall sessions, sometimes followed them and sometimes came between them. In it, the subjects were first read all the Blacky areas and the picture labels for each area. The subjects were told that these pictures would be presented tachistoscopically and that their task would be to name the picture in each of the four positions. They were told that the same picture would never appear twice in one pattern and that the patterns would be different from flash to flash. Actually, the same four pictures were always shown, with positions rotated.

The data showed that subjects named repression pictures less often than neutral pictures when these pictures were among the four that were actually shown. There was no difference between the mean number of responses naming a repression picture and the mean number of responses naming a neutral picture when the picture was not one of the four that were flashed. A comparison of responses naming pictures in areas which showed conflict, but no repression, with responses naming neutral pictures revealed no difference.

The results of this study are similar to those reported by Eriksen (25). In both cases a relationship was discovered between forgetting of threatening material and the occurrence of perceptual defense. The major difference is that the Blum study assessed the repression tendency and the perceptual defense on the same material, while Eriksen used different materials. Blum's absent pictures condition provides a converging operation which permits the location of the phenomenon in the

perceptual system. If conflict and repression worked on the verbal responses rather than on the perceptions, a difference would have been found between responses naming repression pictures and responses naming neutral pictures even when these pictures were not shown; this difference did not occur. In a discussion of his results, Blum argues that each subject was equally familiar with all the pictures and that each subject was set to see all the pictures, so that these factors could not be used to support a competing hypothesis argument for the observed perceptual defense effect. Once again, the competing response theorist is placed in the position of having to search for factors which could make hypotheses for non-repression pictures stronger than hypotheses for repression pictures. It might be argued that the subject's forgetting was itself an indication of a weak hypothesis, so that pictures which were forgotten would be more likely to suffer from competition than pictures which were not forgotten. The obvious test for this suggestion is to see if responses naming forgotten pictures for which there is no conflict show the same trends as forgotten pictures for which there is conflict. If they do, then the weak hypothesis explanation would fit the data better than the defensive inhibition explanation. Unfortunately, only one subject showed forgetting without conflict, so that this test could not be made. However, the fact that the forgotten pictures which were undercalled were also high conflict pictures, i.e., had high motivational support, is not in line with the competing hypothesis theory.

Blum also found that the subjects named repression pictures which were actually shown less often than repression pictures which were not shown. He argued that this result was incompatible with the competing

hypothesis point of view because the stronger hypotheses, namely, those for which there was appropriate information, resulted in fewer responses than the weaker hypotheses. He concluded that this reversal of the competing hypothesis theory gave strong support to the inhibition theory. The author suggested that the only escape for the former theory was to propose the existence of a strong hypothesis not to perceive the forgetting pictures.

Proponents of the Postman position might be able to oppose the implication of Blum's study by denying the validity of the comparison of calls of pictures which were shown and pictures which were not shown. They might claim that the latter calls were not determined by hypothesis strength but rather by verbal response strength because there was never any input which could fully confirm an hypothesis for an absent picture. It should be noted that the overall accuracy of the subjects was slightly, but significantly, better than chance, so that it is reasonable to assume that many of the calls of absent pictures were determined by factors other than some incorrectly confirmed hypothesis. This assumption is supported by some subjects' reports that they tried to call each of the 11 pictures equally. Presumably this attempt would affect responses only when insufficient material was received for hypothesis confirmation. The Postman group would still have to explain the significantly greater response strength for absent repression pictures than for present repression pictures. Blum's data provide no clues about where this explanation might be found.

Nelson

The next study in this series was reported by Nelson (53). He assessed conflict by using the standard content analysis of the

Blacky Pictures responses and the subjects' ranking of the pictures in terms of how they saw them as problems in themselves. The repression defense preference was measured in two ways. The first was made up of the subjects' performances on four recall tests of the Blacky Pictures. The second consisted of the subjects' choices on two separate administrations of a Defense Preference Inquiry which is designed to be used with the Blacky Pictures; their picture problem ranks; their Blacky stories; and their responses to certain items on an inquiry which is included in the standard Blacky.

Nelson's tachistoscopic procedure differed somewhat from the one used by Blum. His subjects were prepared to see only six of the 11 pictures, although only four pictures were actually shown to each subject. The specific choices for each subject were made in order to secure wide variation in conflict and defense preferences in the pictures used. The subjects were asked to name the pictures in only two of the four positions shown in each flash.

Nelson's original data analysis revealed that, regardless of the measure of repression used, subjects called repression pictures less often than other pictures, when these pictures were actually shown. The differences did not occur for pictures which were not shown. The conflict variable did not relate to thresholds when taken alone or in combination with the repression variable.

A continuation of the analysis of Nelson's data was performed by the writer. Nelson had pooled responses to all pictures in his calculations; the writer made comparisons within each picture and then pooled the results, using a sign test. The second analysis found that the relationship between the recall measure of repression and thresholds

was weaker than the relationship between the other measure of repression and thresholds. With each of the two measures of repression there was a trend for the difference between repression and non-repression pictures to be more significant with high conflict pictures than with low conflict pictures.

If the trends revealing an interaction between conflict and defense are accepted, the results of Nelson's study replicate those of Blum's earlier study (10). Nelson's results have somewhat wider generality than Blum's results because two alternative operations for the repression defense preferance related to the occurrence of perceptual defense, and because a variety of pictures were used in threshold assessment. As in Blum's study, the fact that no differences were found between calls of absent repression pictures and of other absent pictures can be taken as evidence against a verbal response interpretation of the results.

The competing response theory might hold that pictures which were forgotten or which met the other set of repression criteria had weaker hypotheses than non-repression pictures. Nelson's data provide two sources of tentative evidence which can be used to meet the competing hypothesis argument. The first is the interaction trend between conflict and repression described above. High conflict pictures should have shown the perceptual defense effect less strongly than low conflict pictures because high conflict should provide motivational support, according to hypothesis theory, and thereby increase the strength of hypotheses for high conflict pictures. Pictures with strong hypotheses are supposed to be more resistant to being blocked through competition. The second source is data collected in another part of Nelson's experiment. He asked his subjects to respond merely by indicating the position of the

picture which stood out the most. Neither forgetting nor avoidance pictures were underchosen as pictures which stood out as being clear. If we assume that pictures for which there are weak hypotheses should not stand out as much as other pictures, then these data indicate that the hypotheses for the avoidance and forgetting pictures were no weaker than those for other pictures. This evidence must be considered tentatively, however, because the relationship between standing out (but not necessarily being recognized) and hypothesis strength is open to question. In support of the assumed relationship between the degree to which a picture stands out and its hypothesis strength, it should be observed that Nelson's subjects reported high conflict pictures as standing out significantly more often than low conflict pictures.

The third study in this group is a partial replication of Nelson's study, and was performed by Blum in Italy (11). The subjects in this study were not administered the regular Blacky; they received only the Defense Preference Inquiry. No recall data were collected. The tachistoscopic part of the study was the same as in Nelson's study. Blum added the procedure of dividing his subjects into overall low accuracy and overall high accuracy groups. The high accuracy group showed no difference between the number of responses naming avoidance pictures and the number of responses naming other pictures when these pictures were actually shown. The low accuracy group did show a significant undercalling of avoidance pictures when compared with other pictures when the pictures were shown. Neither group showed any differences in calls of pictures which were not shown. Blum interpreted the finding with the low accuracy group in the same way as similar previous findings have been interpreted. He suggested that the lack of results with the

high accuracy group might have been due to new defenses having been brought into play by the increased level of awareness.

Comment

Although most of the studies described in this section support the inhibition explanation, none of them is very explicit about the mechanism whereby perceptual defense takes place. All assume that some kind of inhibition process occurs, following the receipt of threatening stimuli, which interferes with the recognition of these stimuli. The usual objection raised to this position (see Howie [36], for example) is that it is impossible to avoid something before it is perceived and once it is perceived it is too late to avoid perceiving it. As stated, this criticism does make the inhibition explanation of perceptual defense look like a logical absurdity. The difficulty stems from the critics having an oversimplified conception of the perceptual process. They appear to view perception as an immediate, unitary response to some stimulation. Recent formulations of perceptual theory suggest that perceptual recognition is either a continuous or a multi-stage process which begins with the stimulation of sensory receptors and ends with an awareness of the identity of the stimulus (5, 15, 17, 27, 33). All that is required by the inhibition theorists is that an early stage of the perceptual recognition process cue off some kind of response which interferes with the continuation of the process to the point where final identification of the stimulus is achieved.

It is incorrect for the inhibition theorist to claim that his subjects are not aware of the stimulus as the result of perceptual defense. While it seems possible for the defense to occur early enough in the

perceptual process to prevent any awareness at all of the stimulus, there seems to be no reason for assuming that the defense always occurs that early. Eriksen's point about the limitations we place on the subject's response categories (28) is quite relevant here. If the subject is allowed to say only A, B or C, and he sees something that is not quite A, B or C, he may not respond or may give an incorrect response, not because he was not aware of anything, but because he was unable to identify his vague awareness using the permissible response categories.

On the other hand, given adequate converging operations and no evidence for the operation of strong, competing hypotheses, it does seem safe to say that differences in the recognition thresholds among different subjects responding to the same set of stimuli with the same set of response categories can be attributed to interference with some stage in the perceptual recognition process. From a functional point of view, perceptual defense performs its job of avoiding the anxiety that would follow upon recognition of a threatening stimulus regardless of the stage at which the recognition is interfered with. The specific point in the recognition process at which the inhibition occurs, if indeed there is any one specific point, will remain unknown until our techniques for the investigation of perceptual recognition provide more information than they now do.

Lazarus and McCleary

There are several studies which present data relevant to the conception of perception as a gradual recognition process. The most familiar of these studies is by Lazarus and McCleary (45). This does not

demonstrate an interference effect but it does show that affective processes, as measured by the galvanic skin response, can be aroused by a stimulus before a subject is able to identify the stimulus correctly. If Lazarus and McCleary's subjects had repression or avoidance defense preferences, it is easy to see how these defenses might have been cued off by the pre-recognition affective response and thereby have interfered with the completion of the recognition sequence. In the light of the preceding discussion, this last statement should not be taken to mean that the pre-recognition affective responses occurred before the subject had any awareness of any part of the threatening stimulus, as was originally claimed by Lazarus and McCleary. Indeed, data reported by Boardman (12), by Bricker and Chapanis (13) and by Murdock (52) indicate that subjects are aware of some aspects of a tachistoscopically flashed stimulus before they are able to identify it correctly. All these investigators collected their data by allowing the subjects a greater range of responses than is usually the case in perceptual defense or subception experiments. The two studies which bear most directly upon the occurrence of interference during the recognition process (35, 48) do not possess converging operations, so that some uncertainty remains about whether the interference actually occurs during recognition or during the verbal response to the recognized stimulus.

Conclusions

The theorists who would reduce all perceptual defense phenomena to the effects of variables influencing the verbal responses of subjects should be thanked for the service they have performed in showing investigators the way to design better experiments about perception.

However, enough studies using adequate precautions against verbal response suppression, and providing adequate converging operations, have found the defense effect to refute the arguments of the verbal response proponents.

The perceptual defense explanations offered by the hypothesis theorists and the inhibition theorists have each been supported in some studies. Investigations concerning the effects of recency, set, and familiarity on hypothesis confirmation have produced results which were in line with hypothesis theory. However, the predictions made by hypothesis theory about motivational influences on perception have received little support. In contrast, predictions derived from inhibition theory about motivational influences have been supported by the data from several experiments. Furthermore, the operations of the inhibition investigators have pointed to perceptual phenomena more unambiguously than have the operations of the hypothesis investigators. In general, the hypothesis theorists' aim of explaining all perceptual defense in terms of competing hypotheses has not been achieved. On the other hand, in spite of the success of many of their predictions, the inhibition theorists have not shown, beyond all reasonable doubt, that inhibition can be a factor in perceptual defense.

A logical strategy for the inhibition theorist would seem to be first the clear demonstration that perceptual defense can occur under conditions in which the only possible explanation is inhibition of the threatening perceptual recognition response. Note that the inhibition theorist need not prove that competition of hypotheses cannot lead to perceptual defense because his theory does not deny the operation of this factor. He need prove only that perceptual defense can occur when

the conditions for the hypothesis competition explanation are not met. Indeed, it does seem quite likely that perceptual defense is a phenotypic concept which may cover several genotypically different phenomena. The second step in the strategy, once the first has been accomplished, is to examine the recognition process more closely so that more information can be gained about the way the inhibition works. The present study is a step toward the accomplishment of the first objective. It is part of a larger project which has the accomplishment of the second objective as one of its goals.

CHAPTER II

THE EXPERIMENT

The purpose of the experiment

This experiment is designed to test the explanations of perceptual defense which have been proposed by hypothesis theorists on the one hand and inhibition theorists on the other. The several experimental treatments are intended to create the conditions required by each of the theories for the occurrence of perceptual defense. It is hoped that the results will help to decide whether hypothesis competition is the only necessary explanation of perceptual defense, as is implied by the hypothesis theorists, or whether the inhibition theorists' explanation must also be accepted.

The variables employed in this investigation are similarity among the stimuli; strength of negative affect evoked by the stimuli; and whether there are strong hypotheses or repression tendencies for the stimuli. The remainder of this chapter will discuss the following topics: (a) the conditions for the occurrence of perceptual defense, (b) the variables and the operations used to measure them, (c) the experimental conditions, (d) the hypotheses, and (e) the procedures.

The conditions for the occurrence of perceptual defense

The material in the preceding chapter has shown that the inhibition and competing hypothesis theories postulate different conditions under

which perceptual defense should occur. The inhibition theory requires that the recognition, which is supposed to be defended against, arouse some kind of negative affect in the perceiver; and that the perceiver have a tendency to use either a general repression type defense or a repression type defense specific to the content of the recognition. A repression type defense is usually defined as one which functions to keep threatening material completely out of awareness or at least from being clearly recognized.

Hypothesis theory requires that the perceiver have, in addition to a correct hypothesis, at least one incorrect hypothesis which is available for use in recognizing a stimulus. Information appropriate to the additional hypothesis must be similar to information appropriate to the correct hypothesis in order for the former to be aroused by the same input that arouses the latter. The incorrect hypothesis must also be stronger than the correct hypothesis in order for it to be confirmed when there is input either more or equally appropriate to the correct hypothesis. In other words, in order for an incorrect, competing hypothesis to compete successfully, it must be strong enough to outweigh either the initial advantage held by the correct hypothesis by virtue of its greater relevance to the stimulus input, or to tip the balance in its favor when it and the correct hypothesis are equally relevant to the information received. The more practiced a subject is in correctly recognizing a stimulus, the greater the additional strength of the competing hypothesis must be to interfere with the confirmation of the correct hypothesis.

The independent variables

Similarity

The role of similarity in the competing hypothesis explanation of perceptual defense has been described in the preceding section. Smock (66) has presented evidence which supports this role. In an experiment using Blum's threshold assessment technique, he found that variation in similarity among the stimuli presented to a subject was an important determiner of the frequency of the correct recognition responses. Smock concluded that control of the similarity variable is essential before any differential response tendencies can be taken as perceptual defense.

Smock depended upon his impressions in measuring the similarity among his stimuli. The present study relied upon a more objective measure. The experimental stimuli were Blacky pictures; two techniques were used to assess their similarity relations. The first was an index using the proportion of objectively measured, identical elements shared by any pair of pictures; the second was based on the amount of generalization shown by a group of pre-test subjects who identified the pictures tachistoscopically. Appendix A contains a full description of the techniques. Using a combination of the two procedures, two groups of three pictures each were selected such that two pictures in each group were similar to each other and dissimilar to the third. One group contained the Oral Eroticism (I), Castration Anxiety (VI) and the Identification Process (VII) pictures, with I and VI being the similar pictures. The other group contained the Oral Sadism (II), Oedipal Intensity (IV) and Masturbation Guilt (V) pictures, with II and V being similar. Informal questioning after the experiment indicated

that the subjects did indeed confuse the pictures which were supposed to be similar (see Table 41, Appendix A). Several subjects also reported confusion between IV and II. Fortunately, picture IV was not involved in any tests of the major hypotheses of the study so that its not being as dissimilar as it should have been did not have any effect.

Negative affect

Negative affect was measured with an anxiety score constructed from several blocking and galvanic skin response (GSR) measures and from the subject's choices of Blacky pictures he disliked. Appendix B presents the specific procedures used in computing the anxiety score.

Picture type

The three types of pictures employed were enhancement pictures, forgetting pictures and neutral pictures. Each of these will be described briefly.

Enhancement pictures. These were pictures which had strong hypotheses. Motivational relevance and emphasis were employed as the determinants of hypothesis strength. They were manipulated artificially through an enhancement procedure to be described below, which was supposed to create distinctive, positive affect for a specific picture (the enhancement picture).

Forgetting pictures. These were pictures for which there was a repression tendency. The ability to recall Blacky pictures, during an assessment session which preceded the present experiment, served as the operational definition of the repression tendency. The forgetting measure was chosen for several reasons. First, it possessed face validity. Secondly, relationships found among the forgetting of

different kinds of threatening material (26, 44) and between forgetting and personality measures which are theoretically related to the use of repression as a defense mechanism (18) also lend support to the validity of the forgetting operation. Finally, the fact that forgetting had related to perceptual defense in several studies (10, 25, 53) added empirical support to the theoretical reasons just mentioned.

The specific criteria used in categorizing pictures as ones for which a subject showed a repression tendency are given in Appendix C. In each of the studies referred to above, it was the forgetting of threatening material which was used as the measure of repression. In the present study, a measure of the degree of threat posed by each picture, i.e., the anxiety score, was not available at the time the categorization of repression tendency pictures was made. It was therefore necessary to make the assumption that all of the Blacky Pictures were more or less threatening to the subjects, so that for every subject any picture which met the forgetting criterion could be labelled as a picture for which there was a repression tendency. The validity of this assumption was tested using the anxiety score which was made available after the completion of the experiment. In order to take account of the incompleteness of forgetting per se as a measure of repression, and for linguistic convenience, pictures which satisfied the forgetting criterion were called "forgetting pictures" rather than "pictures for which there is a repression tendency."

Neutral pictures. These were pictures which did not fall into either the enhancement or forgetting categories.

The specific variable combinations

The similarity and picture type variables were used to construct one control and six experimental picture triads or treatments (see Table 2). As was mentioned above, the affect variable was used in the data analysis but did not play a part in creating the experimental conditions. Each of the triads will be described below, with a statement of its purpose.

The first triad (A) was one in which the dissimilar picture was a forgetting picture and the two similar pictures were neutral. Responses to the forgetting picture in this triad were used to test the importance of similarity in the operation of inhibition.

The second triad (B) was one in which the dissimilar picture was an enhancement picture and the two similar pictures were neutral. Responses to the enhancement pictures were employed in a test of the importance of similarity for the occurrence of hypothesis competition.

The third triad (C) was one in which all the pictures were neutral. All the responses to pictures in this triad served as controls in testing the effects of forgetting and enhancement.

The fourth triad (D) was one in which the dissimilar picture was a forgetting picture; one of the similar pictures was an enhancement picture and the other was neutral. This triad was intended to provide a direct comparison of responses to forgetting pictures with those similar to enhancement pictures.

The fifth triad (E) was one in which the dissimilar picture was neutral; one of the similar pictures was a forgetting picture and the other was neutral. The responses to the forgetting picture in this triad served to test the major inhibition prediction.

The sixth triad (F) was one in which the dissimilar picture was neutral; one of the similar pictures was a forgetting picture and the other was an enhancement picture. The responses to the forgetting and enhancement pictures in this triad were used first to test the major inhibition and hypothesis theory predictions. They were also employed to discover whether or not the effects of inhibition and competition were additive.

TABLE 2

SUMMARY OF THE TRIADS

Triad	Dissimilar Picture	Similar Pictures
A	F[a]	N N[b]
B	E[c]	N N
C	N	N N
D	F	E N
E	N	F N
F	N	E N
G	N	E N

[a]F represents a forgetting picture.

[b]N represents a neutral picture.

[c]E represents an enhancement picture.

The original design called for only these six triads. However, the scarcity of subjects whose forgetting scores and dislike scores (see below) allowed them to be used with triad D led to the creation of

a seventh triad (G). In this triad the dissimilar picture was neutral; one of the similar pictures was an enhancement picture and the other was neutral. The enhancement and similar neutral pictures in this triad served to test the hypothesis theory explanation of perceptual defense.

Each of the two groups of pictures used (VII, VI, I; IV, V, II) was assigned to one of the seven triads for each subject. The major determinant of the triad to which a subject's pictures were assigned was his pattern of forgetting scores for the pictures, which was obtained during a previous personality assessment session. With the few cases in which two of the three pictures in a triad met the forgetting criterion, the picture with the stronger forgetting score was designated as the forgetting picture. This procedure seemed justified because the experimental task, to be described fully below, required the subject to choose among the three pictures in a triad. Under these circumstances, it was felt that the picture with the strongest forgetting would be the most likely to suffer from the repression effect. Inspection of the data revealed no consistent difference between forgetting pictures occurring with one other weaker forgetting picture and those occurring with only neutral pictures.

In choosing pictures to be subjected to the enhancement manipulation, care was taken to use pictures which were not chosen as disliked, which did not have an avoidance defense preference on the Defense Preference Inquiry (DPI) and which were not forgotten. Pictures meeting each of these criteria were thought to be ones which would "take" the enhancement manipulation easily. An attempt was also made to employ pictures which received a projection choice on the DPI because it was

believed that the readiness to perceive, which is an aspect of projection, would strengthen the effect of the enhancement procedure. Unfortunately, in most cases it was not possible to select projection pictures for the enhancement manipulation. A final consideration in assigning a subject's pictures to a triad was that of having sufficient number of cases for each of the kinds of triads.

The hypotheses[1]

Inhibition theory

The one major hypothesis which can be derived from the inhibition theory states that correct responses which name forgetting pictures in triads A, D, E and F should occur less frequently than correct responses which name corresponding neutral pictures in triad C. This hypothesis is qualified by a second which states that the lower accuracy should occur most strongly with forgetting pictures which evoke the most negative affect. Inhibition theory makes no predictions concerning the effects of similarity or enhancement.

Competing hypothesis theory

Competing hypothesis theory predicts that correct and incorrect responses which name similar neutral pictures in triads D and G and similar forgetting pictures in triad F should occur less frequently than correct responses which name corresponding neutral pictures in triad C. Competing hypothesis theory also predicts that both correct

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[1]The theoretical rationales for the two sets of hypotheses have been presented in the inhibition and competing hypotheses sections of Chapter One. They have also been summarized briefly at the beginning of this chapter.

and incorrect responses naming similar enhancement pictures in triads D, F and G should occur more frequently than correct or incorrect responses naming corresponding neutral pictures in triad C. A third prediction by the theory is that correct and incorrect responses which name high negative affect pictures should occur more frequently than correct or incorrect responses which name low negative affect pictures.

A crucial test

Triad D provides the setting for a direct comparison of hypotheses derived from each of the two theories. Inhibition theory would predict that correct responses naming the forgetting picture in this triad should occur less often than correct responses naming the neutral picture. The hypothesis competition theory would predict the reverse. The lack of success in equating the visibility of the pictures prevented the testing of these contradictory predictions.

The subjects

The present study made use of 33 female and 32 male paid volunteers, recruited through advertisements. They were white, native born students at the University of Michigan, with no more in psychology than an elementary course. The subjects were taken from a larger group participating in a project of which the present study was a part. The project ran three groups of subjects. The first group was seen in the spring, the second in the summer and the third in the fall of 1957. All the summer and fall subjects and part of the spring group participated in the present study. Some of the spring subjects were used as pre-test subjects for this study, but time pressures, namely, the end of the semester, prevented the use of some of the remaining subjects.

In all but one case the experimental spring subjects were chosen on the basis of their ability to fit into the experimenter's time schedule. The one exception was a male subject who had proved fairly uncooperative during other parts of the project procedures and was thought to be a bad risk in view of the limited time available for running subjects. Five of the subjects chosen for the present study had to be rejected. One male was dropped because he removed his glasses during the threshold assessment session without informing the experimenter; it was not possible to determine the exact point at which the glasses had been removed so that his data could not be used. The second subject, a female, was rejected because a bulb in the tachistoscope went out sometime during the threshold assessment session. Two subjects, one male and one female, were rejected after they had developed stereotyped response patterns which persisted over many exposures and remained unchanged in spite of slowing down the exposure speed. The fifth subject, a male, was rejected because it was not possible to find a speed which allowed him to respond within the permissible accuracy range (see below for description of permissible range criteria).

The stimuli

The stimuli were photographic copies of the pictures, measuring two by two and one half inches, printed on glossy paper measuring four by five inches, and dry mounted on sheets of white semi-gloss poster-board. An attempt was made to equate the visibility of the pictures by placing them behind filters. Appendix D presents details of filter construction. The light figures were outlined with black china marking pencil to increase their visibility at the speeds used in the present

study. It should be noted that flashing the pictures one at a time required more rapid exposures and less intense illumination to arrive at accuracy levels slightly above chance than did the technique of flashing the pictures four at a time which was used in the Blum, the Nelson, and the Smock studies (9, 10, 11, 53, 66). This probably means that the light figures were more difficult to see in this study than they were in the previous tachistoscopic studies using the Blacky Pictures.

Mama's and papa's tails were made somewhat less visible in picture IV by coating them with a thin layer of white ink because several subjects had indicated that the positions of the tails in IV made it difficult to distinguish it from II. This alteration was made for the fall subjects only. Ordinarily, a change would not have been made in the course of the study, but it was quite important for one of the tests involving the forgetting variable that picture IV be seen as dissimilar to either of the other two pictures. Fortunately, none of the spring or summer subjects had forgotten IV, so that any of the data from IV which was relevant to perceptual defense would have come only from the fall subjects. The alterations proved to be unnecessary because none of the fall subjects met the forgetting criterion for IV.

The data reported in Table 3 indicate that the attempt to equalize the visibility of the pictures was only partly successful. Picture VI was more difficult to see than either of the other two pictures in its group. Picture VII appeared to be the easiest picture to see in its group. The data do not reveal whether the differences in the reported ease or difficulty of the pictures were due to confusions among similar pictures or to characteristics of the pictures themselves. The discrepancy between the reports about VI and I, which are quite

similar to each other, suggests that the characteristics of the pictures themselves were responsible for their unequal visibility. The behavior of the subjects during the threshold assessment showed that the discrepancies in visibility among the pictures were rarely great enough to result in almost perfect accuracy for one or two pictures in a group and almost no accuracy for the remaining picture.

TABLE 3

EASE AND DIFFICULTY OF SEEING PICTURES AS REPORTED BY SUBJECTS IN POST-EXPERIMENTAL INTERVIEW[a]

Picture	Easy		Difficult	
	Spring and Summer Subjects	Fall Subjects	Spring and Summer Subjects	Fall Subjects
VII	14.0[b]	6.5	1.5	0.0
VI	0.0	0.0	13.0	6.0
I	10.0	4.5	1.5	1.0
IV	8.0	5.0	12.0	3.0
V	5.0	3.0	0.0	1.0
II	6.5	2.0	3.0	1.0

[a]The subjects were asked to name any of the pictures which were particularly easy or particularly difficult. They were free to name as many or as few pictures as they pleased.

[b]The entries were tabulated as follows: 1 was assigned to a picture if it was the only picture in its group to be named as easy or to be named as difficult; 0.5 was assigned to each of two pictures in a group if they were both named as easy or both named as difficult; no scores were assigned if all three pictures were named as easy or all three were named as difficult.

Procedure

Personality assessment

Each of the subjects employed was first seen individually in a two to three hour assessment session which was connected with the larger project of which this study was a part. The spring and summer subjects went through the same procedure during the assessment session; the procedures for the fall subjects were slightly different. The session was conducted in a small room with either three (spring and summer) or two (fall) experimenters present. After being shown the experimental equipment in the room, the subject was connected to a Fels Dermohmmeter, manufactured by the Yellow Springs Instrument Company. Electrodes were placed on the palm and forearm of the subject's non-preferred side. Twenty minutes were required before valid readings could be taken from the dermohmmeter. This time was used to give the subject a steadiness test and a written analogies test (spring and summer) or a vocal analogies test in which the subject was asked to verbalize his thoughts as they occurred (fall).

The subject was then asked to tell stories to each of the Blacky Pictures presented in the customary order. The stories were given vocally and were tape recorded. The next task required the subject to go through the pictures again, in a different order, giving human experiences which corresponded to the experiences Blacky was having, and providing illustrations, wherever possible, from his own first-hand experiences. The Defense Preference Inquiry (DPI) was then administered.

Following the administration of the DPI, the subject was asked to name all the Blacky Pictures in any order as rapidly as he could. The subject was allowed to refer to the pictures in any way he liked as long as the reference was clear to the experimenter. The recall period was divided into 15-second units and was stopped after all the pictures had been named or after two complete units passed without any new pictures being recalled. The subject was then told that he would go through the pictures a third time in order to find out how much insight he had into his own personality. His task was to name a problem area which was represented by each picture, to rate his degree of disturbance with respect to the problem he named and to give the reasons for his rating. It was explained that the pictures would be presented intermittently while he was performing other tasks. A second recall was administered at this point. Before beginning the first task, the experimenter showed the subject the picture which would be the first to be presented. His instructions were to think of the picture and the information he was supposed to give about it while performing the task. At several points during the task he was interrupted and asked if he were ready or if he remembered the picture. Following his set of responses to the first picture, the preliminary instructions were given for the second picture, and so on. There were also periods (viz., free periods) during which no insights were required of the subjects. These were alternated with periods in which the procedure just described was used. The sequence of free-insight procedures was different for different subjects. However, the order of the pictures during insight periods was the same for all subjects. After all the pictures had been used in the insight procedure, a third recall test was administered.

The fall subjects were given picture XI twice during the insight procedure, while the other subjects received each picture only once. The spring and summer subjects went on to do more tasks with additional interruptions for insights. These interruptions required the subject to tell more about why he rated himself as he did. Pictures II, III, V, VII, and X were used during this part. The tasks performed by the spring and summer subjects during the insight procedure were the following: word associations; locating a gap in the perimeter of a circle which was flashed tachistoscopically; a steadiness test using a Whipple board; and an analogies test in which the response choices were Blacky pictures (the Blacky Analogies Test, form D1G or D2G). The fall subjects were given the Blacky Analogies Test, with instructions to verbalize their thoughts as they solved the analogies, and a picture association test using Blacky pictures as stimuli.

The assessment session ended by having the subject choose the three Blacky pictures he disliked most and then asking him to rank the pictures first in terms of how much they were problems for himself and then how much they were problems for people in general.

Inquiry and ambivalence test

Each of the spring and summer subjects was seen in a second session during which an augmented Blacky Inquiry was administered. He was also given an ambivalence test composed of a controlled word association test and a semantic differential questionnaire, both using authority figures as stimuli. The subjects were not seen in the original assessment room. Problems of scheduling made it difficult to insure that all subjects were seen for these tests before being used in the present study.

The enhancement manipulation

The data to be reported in the present study were collected in one session which took place in the original personality assessment room. The session began with the following instructions being given to the subject in a conversational tone; they were given from memory.

> You remember that last time you were here you were shown a set of pictures and asked to tell stories, human experiences and to give insights about them. The comments you made were tape recorded and analyzed to provide information about your personality. The things you are going to do today are aimed at finding out some more about the kind of person you are.
>
> By this time you must be getting tired of taking psychological tests. I know that it is hard to keep answering questions and performing tasks without knowing why you are doing it or what the results are. So to keep your interest up I am going to tell you something of what we have found out about your adjustment in the areas represented by the Blacky Pictures. One of the things you did last time you were here was to evaluate and discuss your disturbances in the areas represented by the Blacky Pictures. We used this information, the content of the stories, your galvanic skin response, and your performance on the various tasks you did to arrive at an adjustment score in each of the areas. Now of course, our data are incomplete; we obviously are still collecting information about you. Therefore there will be some areas for which we don't have any scores at all.
>
> Before I give you the scores, let me give you an idea of how to interpret them. Let me say that everyone has some troubles. Almost no one is free from something that worries or concerns him. So if I say that you are below normal in adjustment in an area, it does not mean that you are about to crack up and be carted off to a mental institution. It does mean that you do have a serious problem which you are not handling as well as you might. If I say that you are normal in an area it means that you have a problem, which may or may not be severe, but which you are handling o.k.; you aren't being disorganized by it. If I say that you are better than normal in an area it may mean either that you have a minor problem which you are handling very well or that as far as we can tell you have no problem at all in the area. Is that clear?

The subject was then allowed to see a dittoed sheet on which a list of numbers and dashes were written in a column labelled "Adjustment Score." Appendix F presents a sample. The pictures were

signified by letters rather than numbers in order to keep the subject in suspense about which score went with each picture. Numbers ranging from 25 to 37 were placed next to five or six of the experimental pictures (I, II, IV, V, VI, VII). Picture VIII (Sibling Rivalry) also had a "score" written next to it. The enhancement picture always had a score of 55. A large red check was placed next to the 55. The remaining pictures had dashes in the adjustment score column. The subject was shown the Blacky Pictures one at a time. The pictures were presented in a systematically varied order, with the facilitation picture always coming fourth from the last. The experimental pictures were always in the second, third, fourth, sixth, seventh, and either the eighth or ninth positions. The positions of each of the pictures were varied so that each picture occurred approximately equally often in each of the positions mentioned. This was done to equalize recency and primacy effects among the pictures. When none of the six experimental pictures was scheduled to receive the enhancement manipulation, picture VIII was chosen as the enhancement picture. This was done so that every subject had one and only one enhancement picture. The choice of VIII was made because it was thought to be one for which the subject would accept the enhancement manipulation.

As each Blacky picture was shown to the subject, the experimenter "searched" down the list of numbers on the dittoed sheet until the appropriate number was found. The experimenter looked at the number, then at the subject, and told him that he was normal in the area represented by the picture. If there was a dash next to the picture letter, the subject was told that there was not enough information to give him a score on that picture. When the enhancement picture was shown,

the subject was told:

> Now on this picture you were better than normal. That's quite good. It means that either you have a minor problem that you are handling very well or that you have no problem at all in that area, as far as we can see.

Approximately standard responses were prepared to several questions that occurred from time to time. If the experimenter was asked why he could not say anything about one of the dash pictures, he replied:

> As I said before, our data are incomplete and a dash means that there were not enough indicators in your story to make a decision one way or the other. ...You see, we code what you say for indicators of adjustment or maladjustment...you can say a great deal without any indicators being present.

If after hearing a score the subject said, "But I didn't say anything in response to that picture," the experimenter said:

> We do not use only the stories; we also make use of your galvanic skin response which tells us something about you even though you do not say anything at all.

If the subject stated that he didn't understand what the problem area was for a particular picture, he was told:

> Each picture calls out a general area. The specific problem is somewhat different for every person. I don't have your actual responses with me so I cannot tell you what the problem is for you. But after the study is over we will send you a letter telling you what we did, why we did it, and what we found; at that time, if you want to find out anything more about the study or about your responses, we will be happy to speak with you about them.

The actual responses made by the experimenter to the subject did vary somewhat from the standard responses described, depending upon the wording of the question.

It was believed that the general situation of being informed about their adjustment would arouse mild anxiety in the subjects. The statement about everybody having problems was meant to maintain this anxiety. It was also believed that the sight of the red check next to

the deviant score would arouse apprehension about adjustment in whatever area the picture represented. It was hoped that the apprehension would be more or less focussed on the red-checked picture so that the anxiety would be low until the experimenter began to talk about that picture. The "normal" feedback for the other pictures was also aimed at focussing whatever anxiety was present primarily on this picture. It was expected that the false feedback given would lead to strong feelings of relief. The apprehension followed by relief was supposed to provide more motivational support for the enhancement picture than for any of the other pictures. It was also thought that the clearly different feedback for this picture would serve to emphasize it in contrast to the other pictures. In accordance with hypothesis theory, the greater motivational support and emphasis received by the enhancement picture should have served to strengthen its hypothesis so that it would have been stronger than the hypotheses for the other pictures.

Threshold assessment

A modified form of the method of single stimuli was the threshold assessment technique employed in the present experiment. The assessment session consisted of two series, training and test, separated by a rest of a few minutes. No distinction was made between the training and test periods in the instructions given to the subject. The following instructions were read at the beginning of the training series:

> You remember that this machine is used to flash pictures very rapidly. I am going to show you several series of Blacky pictures in it and ask you to identify the pictures you see. The pictures will be flashed one at a time and after each flash you will be asked to say which picture you saw. The pictures will be flashed very rapidly, so that they will be quite difficult to see. If you aren't sure which picture you saw, I want you to guess.

> Suppose you look into the machine now to get an idea of how it feels. You should see a white screen. I want you to look at the center of that screen whenever it appears. In that way you will see the pictures most clearly. During the series of flashes I want you to continue looking into the machine and I want you to keep your eyes open. When I say that you may rest I want you to lean back and close your eyes. Is that clear?
>
> Each series will contain only three pictures and I will show you the three pictures you will see full view before each series. This will make your task somewhat easier.

The training series was expected to accomplish three purposes. The first was to build a connection between the full view Blacky picture and the fleeting, black blur which the subject saw when the picture was flashed tachistoscopically. It did not seem reasonable to expect that a blur would evoke sufficient anxiety in the subject to lead to perceptual defense. Once again it must be noted that the subjects in this study saw much less of the stimuli than did the subjects in previous investigations using the Blacky Pictures because of the impoverished exposure conditions required to arrive at the desired level of accuracy. It was believed that the flash would elicit the same affective response as the picture seen under more adequate conditions as a result of the training.

The second purpose of the training was to insure equal familiarity with all the stimuli. The previous experiences of the subject with the Blacky Pictures should have made each of them quite familiar to him. However, if some uncontrolled variable did lead to differential familiarity with a picture, it was believed that this effect would be greatly diminished after the many, approximately equally frequent exposures to all the stimuli. The final purpose was to discover the speed at which the subject attained 50 percent accuracy in identifying the pictures flashed.

Training was carried out on one picture group at a time. Approximately half of the subjects first received training on the VII, VI, I group while the other half first received training on the IV, V, II group. The pictures were arranged in a partially randomized order in which each picture appeared equally often in each series of 18 exposures.[2] There were four different series of 18 exposures constructed for each group of pictures. Appendix F gives a sample data recording sheet. The subject received a short rest after each series of 18 exposures.

The three pictures flashed in each series were presented simultaneously for ten seconds at the beginning of each series and for five seconds after the sixth and twelfth exposures. The simultaneous presentations were made by placing the pictures in special frames having four openings. Three frames were prepared for each set of pictures, with the pictures in different positions in each frame. The frames were systematically varied so that each frame occurred at each stage in the sequence approximately equally often, over the four series of 18 exposures.

Each training set of exposures was started at a speed which enabled the subjects to attain 100 percent accuracy. Appendix E provides the details of tachistoscopic timing and lighting. If a subject made any errors during the first six exposures, the speed was decreased to allow him to reach perfect accuracy. The exposure speed was increased after each set of six exposures until the fastest speed

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[2]An unspotted error in drawing up the dittoed form used to guide the presentation led picture VII to be presented eight times and picture I only four times in one of the series of 18 exposures. In all of the other series, each picture appeared six times.

was reached at which the subject had about 50 percent accuracy over a series of 18 exposures. The lowest acceptable accuracy was defined as no less than seven correct responses in 18 exposures, where no one series of six had less than two correct responses and no two adjacent series of six had only two correct responses. The highest acceptable accuracy was defined as no more than 11 correct responses, where no series of six had more than four correct responses and no two adjacent series of six had four correct responses. Frequently, more than four series of 18 exposures were required before the acceptable accuracy range was reached. In these cases the sequence was started at the beginning again.

Occasionally, under the pressure of time, the spirit rather than the letter of these rules was followed. This probably had little effect in the few cases in which it occurred because of the speed adjustments made during the test series.

The 50 percent accuracy level was chosen because it was believed that perceptual defense was most likely to occur at levels of accuracy slightly above chance. Chance accuracy in this case would be 33 1/3 percent. It will be remembered that Blum's (11) subjects showed defense only if they had slightly better than chance accuracy. The standard error of 33 percent, with an N of 54 (the number of exposures of pictures in one group during half of the test session) is 2 percent. If a subject responded consistently at the lower accuracy limit (seven out of 18 correct in any one sequence), his accuracy for a half of the test session would be 38 percent. This level of accuracy could have occurred by chance only 1.24 times out of 100.

The test series was begun after the proper speed had been discovered for each of the picture groups. Sequences of 18 exposures of each group were alternated. The procedure of showing the three pictures full view at the beginning and during each sequence was continued, as was the rest after each set of 18 flashes. The test series was divided into two halves, separated by a short break which allowed the subject to open his eyes and relax.

Three 18 picture sequences of each group were shown during each half. The specific order of the pictures in each sequence was different than in the training series, but was constructed using the same criteria. There were three different orders for each set of pictures. The test series always started with a group of pictures which was used first during the training session. The second half of the test series was a mirror image of the first half. Appendix F shows sample stimulus presentation sheets.

It was hoped that the subject's accuracy would remain stable throughout the test session as a result of the training. Pre-test subjects showed the hope to be false. It was therefore necessary to adjust the exposure speeds during the test series in order to maintain the 50 percent accuracy level. The following criteria were employed: If any sequence of six had more than four or less than two correct responses, the speed was respectively raised or lowered one unit; if two consecutive series of six had four or two correct, the speed was respectively raised or lowered one unit. Usually one adjustment would bring the accuracy within the permissible limits, but occasionally the accuracy would still be beyond the desired range and a second adjustment would be made following the same rules as the first.

Liking and inquiry

Following the test series, each subject was given the Blacky cards for the six pictures they had seen and the card for picture VIII,[3] and was asked to pick and order the three he liked the best. This procedure was instituted after the first few subjects had been run as a check on the adequacy of the enhancement manipulation. It was thought that the enhancement pictures should have been chosen as among the three best liked more often than the other pictures.

The session ended with an informal inquiry. The subject was asked if any of the pictures had been particularly easy or difficult to see and if any of the pictures tended to be confused with each other.

CHAPTER III

RESULTS AND DISCUSSION

The subjects' visual acuity

The experimental design called for a 50 percent level of accuracy over all the pictures. The reasons for this particular accuracy level were discussed in Chapter II. Table 4 presents the acuity data for males and females separately during each half of the assessment session and for the total session.

TABLE 4

SUBJECTS' VISUAL ACUITY
(in Percents)

Sex	Picture Group	Part of Session					
		1st Half		2nd Half		Total	
		M[a]	S.D.[b]	M	S.D.	M	S.D.
Male	VII-VI-I	52.4	3.4	49.4	2.8	50.3	3.6
	IV-V-II	51.0	3.1	51.9	3.2	49.7	3.5
Female	VII-VI-I	50.3	3.8	49.9	2.7	51.0	1.9
	IV-V-II	45.2	3.3	49.3	2.7	47.2	1.7

[a]M denotes median.

[b]S.D. denotes standard deviation.

It can be seen that the acuity levels approached the desired 50-percent level quite closely. The only appreciable discrepancy (4.8 percent) between the desired and obtained acuities occurred among

the females for the IV-V-II group during the first half. This discrepancy was due primarily to a few subjects whose performance did not exceed chance accuracy. There were a few other cases in which a subject's performance on a picture group was not significantly better than chance during one of the halves of the assessment session. There was also one male whose performance on the VII-VI-I group for the total session did not significantly exceed chance accuracy. In each of these instances the relevant data were inspected and, if necessary, reanalyzed, eliminating the subjects whose accuracy was not significantly better than chance. In all but a few cases there were no differences between the results including the low accuracy subjects' responses and those without them. The findings to be presented in the rest of this chapter will incorporate the low accuracy subjects' responses. The results of tests made without these subjects will be presented wherever they revealed a different trend than the complete tests and wherever the difference in significance levels of the complete and special tests exceeded 5 percent.

Data analysis techniques

Accuracy and error scores

It is necessary to describe the data analysis techniques employed in the present study before giving the results. It has already been mentioned that the threshold data for each picture were treated separately in order to control for the differential visibility of the stimuli. Another control was required before the data could be subjected to statistical tests. Individual differences among the subjects' visual acuity prevented the use of the raw number of correct and incorrect responses in testing the hypotheses.

An accuracy score for a subject's responses to each picture was formed in order to eliminate the effect of inter-subject variability in visual acuity. It was computed by dividing the number of correct responses a subject made naming a particular picture by the total number of correct responses he made to all three pictures in the relevant group. The same procedure was followed in constructing an error score; the number of incorrect responses made by a subject which named a given picture was divided by the total number of incorrect responses made to all three pictures in the relevant group. In other words, the accuracy score was the proportion of the correct responses made to a group of three pictures which named a particular picture. The error score was the proportion of the incorrect responses made to a group of three pictures which named a particular picture.

An example will serve to make the nature of the two scores clear. Subject X made 54 correct responses to the 108 exposures of pictures from the VII-VI-I group. Eighteen of those responses named picture VI. Subject X's accuracy score for picture VI was .333. The identical operations performed with incorrect responses to picture II would have given the error score for that stimulus. Error and accuracy scores were computed separately for each half of the test session and for the total session.

The Mann-Whitney U Test

The large number of variables and the small number of subjects made it impossible to use appropriate parametric statistical tests. The analysis of the effects of forgetting and enhancement on thresholds

was carried out with the non-parametric Mann-Whitney U Test (2, 64).[1] U is an index of the degree to which one array of scores is stochastically greater than another. It is surprisingly powerful and can yield significant results with very small samples if the difference between them is quite large. Because U does not test the significance of the difference between the means of two arrays, the mean accuracy scores will not be presented in the tables of results[2]; the direction of the stochastic difference will be given instead. The .05 level of confidence will be considered significant, but trends with significance levels which reach the .20 level of confidence will be reported because most of the comparisons involved so few cases that fairly large differences often failed to reach the .05 criterion. Separate tests were performed with the male and female data. Tests were made on the combined male-female scores only if the separate sex comparisons showed similar trends.

The forgetting results

The data relevant to the inhibition theory prediction that there will be fewer correct responses naming forgetting pictures than neutral

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[1]The formula for this statistic is $U = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$, where n_1 is the number of cases in one group, n_2 is the number of cases in the other and R_1 is the sum of the ranks of the scores in one group when the scores in both groups have been pooled and ranked.

[2]It is possible to get a rough impression of the size of the discrepancy between two arrays of scores by comparing the obtained U with $\frac{n_1 n_2}{2}$, where n_1 and n_2 are the number of scores in the two groups, respectively. When $U = \frac{n_1 n_2}{2}$, there is no difference between the groups; when $U = n_1 n_2$ or zero, there is no overlap at all between the two sets of scores, i.e., all the scores in one group are higher than all the scores in the other.

pictures will be presented below. It should be remembered that the theory made no predictions concerning differences among the correct responses to similar and non-similar pictures, nor did it make any prediction about incorrect responses.

Table 5 presents the forgetting data for picture I when it occurred in triad E (i.e., where it was similar to a neutral picture).

TABLE 5

FORGETTING PICTURES (F) IN TRIAD E VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE I

Sex	n_F[a]	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	6	1st	8.5	N>F	NS	4.0	N>F	NS
			2nd	9.0	N=F	NS	0.0	N>F	.02[b]
			Tot.	8.5	N>F	NS	0.0	N>F	.02[b]
Females	2 (2)[e]	8 (6)[e]	1st	2.0	N>F	.09[c]	5.0	N>F	NS
			2nd	9.0 (5.0	F>N N>F	NS[d] NS)	2.0	N>F	.18[b]
			Tot.	6.0	N>F	NS	5.0	N>F	NS
Combined	5	14	1st	27.5	N>F	NS	20.0	N>F	.20[b]
			2nd	35.5	F>N	NS[d]	6.0	N>F	.005[b]
			Tot.	32.5	N>F	NS	16.0	N>F	.09[b]

[a]In this and all following tables, n denotes the number of people in the group symbolized by the subscript.

[b]Two tailed test.

[c]One tailed test.

[d]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

[e]Data are from tests performed without low accuracy subjects.

The females showed a moderate trend, during the first half of the test session, in which forgetting pictures had lower accuracy scores than neutral pictures. The males and the two sexes combined had significantly lower forgetting error scores (i.e., made proportionately fewer responses naming the picture incorrectly) during the second half of the session. The female, second half scores and the combined, total scores showed weak and moderate trends, respectively, in the same direction.

It is interesting to note that the low accuracy and the low error trends did not occur at the same point, so that the results obtained with the accuracy scores cannot be attributed to the weakness of the overt response naming picture I. Conversely it appears that the weakness of the overt response naming forgetting pictures was not a sufficient condition for the production of perceptual defense. There were no cases of picture I occurring in triad F (i.e., where it was similar to an enhancement picture).

Table 6 presents the forgetting data for picture VI. Each sex showed a weak trend in which the total accuracy with forgetting pictures was lower than the total accuracy with neutral pictures; the combined sex test also displayed this trend. Females and the combined sexes had similar trends during the first half as well. There were no trends with the incorrect response data.

Tables 7 and 8 present picture VI forgetting data separately for triads E and F. The females had lower forgetting accuracy during the first half with triad E and for the total session with triad F. There may also have been a trend in this direction during the second half with triad F; the complete test revealed this trend at better than the

TABLE 6

FORGETTING PICTURES (F) IN TRIADS E AND F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE VI

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	6	1st	8.5	N>F	NS	11.0	F>N	NS
			2nd	6.0	N>F	NS	10.0	F>N	NS
			Tot.	4.0	N>F	.13[a]	9.0	F=N	NS
Females	5 (5)[b]	8 (6)[b]	1st	11.0	N>F	.11[a]	17.0	N>F	NS
			2nd	19.0	N>F	NS	18.0	N>F	NS
				(16.0	F>N	NS[c])	(17.0	F>N	NS)
			Tot.	12.0	N>F	.14[a]	17.0	N>F	NS
Combined	8	14	1st	39.0	N>F	.13	53.0	N>F	NS
			2nd	48.5	N>F	NS	54.0	N>F	NS
			Tot.	41.5	N>F	.17	54.0	N>F	NS

[a]One tailed test.

[b]Data are from tests performed without low accuracy subjects.

[c]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

20 percent level, but the test omitting low accuracy subjects did not. However, the difference between the two tests may well have been due to the decreased sample size in the latter test. As in the overall test, the incorrect responses showed no trends. No test was made for the combined sexes with triad E because there were differences in the directions for the two sexes. Male data were not presented for triad F because there was only one case.

TABLE 7

FORGETTING PICTURES (F) IN TRIAD E VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE VI

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	2	6	1st	8.0	F>N	NS[a]	8.0	F>N	NS
			2nd	3.0	N>F	NS	4.0	N>F	NS
			Tot.	3.0	N>F	NS	6.0	N=F	NS
Females	3	8	1st	6.0	N>F	.14[b]	12.0	N=F	NS
			2nd	16.0	F>N	NS[a]	12.0	N=F	NS
			Tot.	9.0	N>F	NS	11.0	N>F	NS

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

[b]One tailed test.

TABLE 8

FORGETTING PICTURES (F) IN TRIAD F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE VI

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Females	2	8	1st	5.0	N>F	NS	5.0	N>F	NS
	2	8	2nd	3.0	N>F	.13[a]	6.0	N>F	NS
	(2)[b]	(6)[b]		(3.0	N>F	NS)	(12.0	N=F	NS)
			Tot.	3.0	N>F	.13[a]	6.0	N>F	NS
Combined	13	14	1st	13.0	N>F	NS	15.0	N>F	NS
			2nd	13.5	N>F	NS	24.0	F>N	NS
			Tot.	12.5	N>F	NS	17.0	N>F	NS

[a]One tailed test.

[b]Data are from tests performed without low accuracy subjects.

The overall forgetting data for picture II appear in Table 9. Neither males nor females showed any trends in which forgetting picture accuracy was lower than neutral picture accuracy. Indeed, definite trends in the opposite direction appeared in the female data. Males had lower error scores for neutral pictures than for forgetting pictures during the second half. No tests were made with combined male and female data because the two sexes showed opposite directions.

TABLE 9

FORGETTING PICTURES (F) IN TRIADS E AND F VS. NEUTRAL PICTURES (N) IN TRIAD C

PICTURE II

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	9	9	1st	33.5	N>F	NS	36.0	N>F	NS
			2nd	35.0	N>F	NS	58.5	F>N	.12[a]
			Tot.	37.0	N>F	NS	51.0	F>N	NS
Females	10	7	1st	53.0	F>N	.10[b]	40.0	F>N	NS
			2nd	45.0	F>N	NS[b]	31.0	N>F	NS
			Tot.	48.5	F>N	NS[b]	35.0	N=F	NS

[a]Two tailed test.

[b]The two tailed significance test reported is technically invalid because the trend tested is contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

The results of tests performed separately with forgetting pictures in triads E and F are given in Tables 10 and 11. The females revealed essentially the same results with the separate tests as they did with the overall test. The only difference was a weak trend in which

TABLE 10

FORGETTING PICTURES (F) IN TRIAD E VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE II

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	6	9	1st	28.5	F>N	NS[a]	26.0	N>F	NS
			2nd	21.0	N>F	NS	31.5	F>N	NS
			Tot.	27.0	N=F	NS	29.0	F>N	NS
Females	7	7	1st	37.0	F>N	.13[a]	32.0	F>N	NS
			2nd	30.0	F>N	NS[a]	27.0	F>N	NS
			Tot.	32.5	F>N	NS[a]	30.0	F>N	NS

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

forgetting error scores were lower than neutral error scores during the second half with triad F. The male data yielded no relationships with forgetting pictures which were similar to neutral pictures (i.e., those in triad E), but there was a weak trend in which forgetting pictures in triad F had lower accuracy than neutral pictures during the first half of the test session. The males also had significantly more incorrect calls of forgetting than neutral pictures in triad F during the second half.

Table 12 presents the overall forgetting data for picture V. Each sex had lower accuracy for forgetting pictures than for neutral pictures during the first half of the test session; this trend was significant for the males and was weak for the females. The combined

TABLE 11

FORGETTING PICTURES (F) IN TRIAD F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE II

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	7	1st	5.0	N>F	.13[a]	10.0	N>F	NS
			2nd	14.0	F>N	NS[b]	0.0	F>N	.02[c]
			Tot.	10.0	N>F	NS	5.0	F>N	NS
Females	3	7	1st	16.0	F>N	NS[b]	8.0	N>F	NS
			2nd	15.0	F>N	NS[b]	4.0	N>F	.18[c]
			Tot.	17.0	F>N	.18[b]	5.0	N>F	NS

[a]One tailed test.

[b]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

[c]Two tailed test.

sex test was also significant for the first half. There was a weak trend among the males and among the females for lower forgetting picture accuracy during the total session and a trend approaching significance in this direction in the combined sex, total session data. The error scores showed no trends.

The results of separate tests with pictures in triads E and F are shown in Tables 13 and 14. The findings with pictures in triad E were essentially the same as with the overall test. With triad F forgetting pictures, males showed a trend approaching significance in which forgetting pictures had lower accuracy than neutral pictures

TABLE 12

FORGETTING PICTURES (F) IN TRIADS E AND F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE V

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	6	9	1st	9.0	N>F	.02[a]	26.0	N>F	NS
			2nd	26.0	N>F	NS	26.5	N>F	NS
			Tot.	19.0	N>F	.19[a]	22.5	N>F	NS
Females	8	7	1st	17.0	N>F	.12[a]	27.0	N>F	NS
			2nd	30.0	F>N	NS[b]	36.0	F>N	NS
			Tot.	16.0	N>F	.10[a]	31.0	F>N	NS
Combined	14	16	1st	54.5	N>F	.01[a]	106.5	N>F	NS
			2nd	123.0	F>N	NS[b]	117.0	F>N	NS
			Tot.	74.0	N>F	.06[a]	111.0	N>F	NS

[a]One tailed test.

[b]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

TABLE 13

FORGETTING PICTURES (F) IN TRIAD E VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE V

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	9	1st	4.0	N>F	.05[a]	13.0	F>N	NS
			2nd	12.0	N>F	NS	9.0	F>N	NS
			Tot.	9.0	N>F	NS	13.0	F>N	NS
Females	6	7	1st	12.0	N>F	.12[a]	19.0	F>N	NS
			2nd	19.5	N>F	NS	20.0	F>N	NS
			Tot.	10.0	N>F	.07[a]	18.0	F>N	NS
Combined	9	16	1st	34.5	N>F	.02[a]	78.5	F>N	NS
			2nd	69.5	N>F	NS	78.0	F>N	NS
			Tot.	44.0	N>F	.06[a]	80.5	F>N	NS

[a]One tailed test.

TABLE 14

FORGETTING PICTURES (F) IN TRIAD F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE V

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	9	1st	5.0	N>F	.07[a]	12.0	N>F	NS
			2nd	11.0	N>F	NS	8.5	N>F	NS
			Tot.	10.0	N>F	NS	8.5	N>F	NS
Females	2	7	1st	5.0	N>F	NS	4.0	N>F	NS
			2nd	10.5	F>N	NS[b]	9.0	F>N	NS
			Tot.	6.0	N>F	NS	6.0	N>F	NS
Combined	5	16	1st	20.0	N>F	.05[a]	28.0	N>F	NS
			2nd	53.5	F>N	NS[b]	38.0	N>F	NS
			Tot.	30.0	N>F	NS	30.5	N>F	NS

[a]One tailed test.

[b]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

during the first half. The combined test revealed a significant trend in the predicted direction for the first half.

The results for picture VII are given in Table 15. The males had lower accuracy (weak trend) with forgetting pictures than neutral pictures during the first half. The males' incorrect responses revealed significant trends in the opposite direction for the first half and the total session. The females showed a decided trend in which forgetting pictures had higher accuracy scores than neutral pictures during the first half. There were no trends with the female incorrect responses. All the female forgettings of picture VII occurred in triad A.

TABLE 15

FORGETTING PICTURES (F) IN TRIADS A AND D VS. NEUTRAL PICTURES (N) IN TRIAD C

PICTURE VII

Sex	n_F	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	10	6	1st	19.0	N>F	.13[a]	49.0	F>N	.04[b]
			2nd	25.5	N>F	NS	40.0	F>N	NS
			Tot.	31.0	F>N	NS[c]	49.0	F>N	.04[b]
Females	8	8	1st	48.0	F>N	.10[c]	37.0	F>N	NS
			2nd	30.0	N>F	NS	30.0	N>F	NS
			Tot.	41.0	F>N	NS[c]	36.0	F>N	NS

[a]One tailed test.

[b]Two tailed test.

[c]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

A combined test was not performed because of the opposite trends for the males and females. There were no instances of picture IV, the other dissimilar picture, reaching the forgetting criterion, so that no tests could be performed with this picture.

Even though the male accuracy score trend did not reach significance, it was probably more reliable than its level of confidence would indicate, because it occurred in spite of a contrary significant trend with the error scores. For some reason the forgetting males showed a tendency to respond incorrectly by guessing picture VII. This may have been because VII was fairly easy to discriminate from VI and I

(see Chapter II, Table 3). As a result of the training session, the subjects probably came to expect picture VII as often as the other two. The forgetting males saw VII relatively infrequently during the first half of the test session. They therefore may have guessed VII more frequently in order to keep their responses in line with their expectations. Regardless of the reason for the frequent guessing of VII, it must have detracted from the perceptual defense effect. There must have been times when a male subject did not see VII clearly enough to make a correct response but responded with VII anyway either as a result of his expectations or some other overt response determinant.

Summary and interpretation of the inhibition results

A summary of the trends found with the forgetting scores is presented in Table 16. The first inhibition theory prediction about responses to forgetting pictures was supported by significant trends in the data from picture V, males, first half, and in the combined sex data, first half. The picture V data showed moderate predicted trends with the combined sexes, total session tests; the female, total session tests; and the males, first half test on triad F. There were also weak picture V trends in the predicted direction among the male, total session and female, first half data.

The tests with pictures other than V did not reach significance. There were, however, several weak trends among the male and female data on picture VI. The picture I data revealed only one moderate trend among the females in the predicted direction. The males showed weak predicted trends on pictures II and VII. These weak trends are noteworthy only insofar as they fit into the same predicted pattern of results

TABLE 16

SUMMARY OF FORGETTING TRENDS[a]

Trends Predicted by Inhibition Theory (Accuracy Scores)									
Picture	Triad	Sex	Part	P[b]	Picture	Triad	Sex	Part	P
I	E	F	1st	.09	V	E+F	M+F	1st	.01
						E+F	M+F	tot.	.06
VI	E+F	M+F	1st	.13					
	E+F	M+F	tot.	.17	V	E+F	M	1st	.02
						E+F	M	tot.	.19
VI	E+F	M	tot.	.13					
					V	E+F	F	1st	.02
VI	E+F	F	1st	.11		E+F	F	tot.	.10
	E+F	F	tot.	.14					
					V	E	M+F	1st	.02
VI	E	F	1st	.14		E	M+F	tot.	.06
VI	F	F	2nd	.13[c]	V	E	M	1st	.05
	F	F	tot.	.13					
					V	E	F	1st	.12
II	F	M	1st	.13		E	F	tot.	.07
VII	A+D	M	1st	.13	V	F	M+F	1st	.05
					V	F	M	1st	.07

Trends Contrary to Inhibition Theory (Accuracy Scores)									
Picture	Triad	Sex	Part	P[d]	Picture	Triad	Sex	Part	P
II	E+F	F	1st	.10	VII	A	F	1st	.10
II	E	F	1st	.13					
II	F	F	tot.	.18					

[a]Trends reaching the .20 level or better will be reported. In reading this table, it must be remembered that often several of the trends reported for any one picture are based in part on the same data. The trends have been listed in order of inclusiveness with the most inclusive one presented first.

TABLE 16—Continued

Trends Irrelevant to Inhibition Theory
(Error Scores)

Picture	Triad	Sex	Part	P[e]	Picture	Triad	Sex	Part	P
I	E	M+F	1st	.20	II	E+F	M	2nd	.12
	E	M+F	2nd	.005					
	E	M+F	tot.	.09	II	F	M	2nd	.02
I	E	M	2nd	.02	II	F	F	2nd	.18
	E	M	tot.	.02					
I	E	F	2nd	.18	VII	A+D	M	1st	.04
						A+D	M	tot.	.04

[b]All values reported in this part of the table are taken from one tailed tests.

[c]The test made without the low accuracy subjects was not significant.

[d]The two tailed significance tests reported in this part of the table are technically invalid because the trends tested were contrary to the predictions made. They are presented to provide approximate information about the extent of the contradiction to the prediction.

[e]All values reported in this part of the table were taken from two tailed tests.

as the significant trends. There were four instances in which the results displayed weak trends contrary to the prediction. Three of these were with the female, picture II data. The other was with the female, picture VII responses. The writer was unable to discover any explanation for these contradictory findings. Although they are not strong or numerous enough to outweight the predicted results, they do indicate that variables, other than those postulated by the two theories under consideration, were operative in the threshold assessment situation.

The fact that the forgetting accuracy scores were significantly lower than neutral accuracy scores with only picture V need not be taken as evidence against inhibition theory. It will be remembered that the theory asserts that the degree of perceptual defense shown should vary with the degree of threat aroused by the stimuli. Data relevant to this prediction will be presented later.

The difference between forgetting pictures in triads E and F is irrelevant to inhibition theory which does not predict differences between the outcomes of tests involving forgetting pictures similar to neutral pictures and those similar to enhancement pictures. On the whole, the triad E results did not differ from the triad F results. The triad F forgetting results for the males on picture II were more significant than those with triad E. The opposite occurred even more strongly for both males and females on picture V.

An inspection of the loci of the forgetting trends indicates that the forgetting effect was strongest during the first half of the test session. This appears to be the same adaptation phenomenon that was reported by Freeman (29) and by Lacy et al. (40). The subjects may have become used to the threatening stimuli so that there was no longer sufficient anxiety aroused to result in inhibition. It is difficult to tell in the present situation whether the adaptation was the result of some kind of reactive inhibition, i.e., fatigue, or whether it was due to extinction of the anxiety response as a result of repeated presentations of the stimulus without any negative reinforcement.[3]

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[3]The training session data were analyzed in order to check on the possibility that these data were less affected by the supposed adaptation. Only one test, of the many performed, reached a significance level of better than .20. This was most probably because the subjects were

The error scores provide data which act as a converging operation, leading to the elimination of an overt response interpretation of the data. If the lower accuracy with forgetting pictures were due to response suppression or to the use of an unpracticed response, both the accuracy and error scores would have shown the same significant trends because the same overt responses were involved in both scores. In no case, however, were significantly lower accuracy scores accompanied by significantly lower error scores. Furthermore, the instances of significant error score trends were not accompanied by similar moderate or strong accuracy score trends. Indeed, the males on picture VII, first half, showed a moderate accuracy score trend in a direction opposite to that shown significantly by the error scores. The highly practiced nature of the verbal responses required and the fact that they were certainly acceptable in the experimental situation make the lack of overt response suppression or competition quite understandable.

Set can also be eliminated as a factor responsible for the forgetting results because the subjects knew which pictures were being shown. Moreover, this knowledge was repeatedly reinforced through the full view exposures which preceded each sequence of six flashes.

In addition to the predicted and contrary trends which appeared among the accuracy scores, there were several significant trends occurring among the error scores, which were irrelevant to the inhibition theory predictions. These occurred in opposite directions in the data from different pictures. It is possible that they reflect factors which were specific to each of the pictures and which operated on the overt responses.

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responding at a very high level of accuracy during most of the training procedure. It will be remembered that the perceptual defense phenomenon occurs only when subjects respond at slightly better than chance accuracy.

The enhancement results

The data relevant to the hypothesis theory prediction that enhancement pictures would be named correctly and incorrectly more often than neutral pictures will now be presented. Following these data, results will be given which are relevant to the hypothesis theory perceptual defense prediction that pictures which are similar to enhancement pictures would be named correctly and incorrectly less often than pictures which are similar to neutral pictures.

Enhancement picture data

Table 17 presents the enhancement data for picture I.

TABLE 17

ENHANCEMENT PICTURES (E) IN TRIADS F AND G VS. NEUTRAL PICTURES (N) IN TRIAD C

PICTURE I

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	2	6	1st	4.0	N>E	NS[a]	0.0	N>E	.07[a]
			2nd	5.0	N>E	NS[a]	0.0	N>E	.07[a]
			Tot.	3.5	N>E	NS[a]	0.0	N>E	.07[a]
Females	4 (4)[c]	8 (6)[c]	1st	20.0	E>N	NS[b]	20.0	E>N	NS
			2nd	23.0	E>N	.14[b]	14.0	N>E	NS[a]
				(16.0	E>N	NS)			
			Tot.	22.0	E>N	.18[b]	17.0	E>N	NS

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

[b]One tailed test.

[c]Data are from tests performed without low accuracy subjects.

The males' accuracy scores did not conform to the prediction. Their error scores showed trends in a direction opposite to that predicted. The second half and total tests for the females, however, did show weak trends in which enhancement pictures had higher accuracy scores than neutral pictures. A separate test for the females, second half, which eliminated low accuracy subjects, did not show the moderate trend that was present in the complete test. The female error scores revealed no trends.

Separate analyses of the picture I enhancement data from triads F and G are given in Tables 18 and 19. In each half and in the total session, the females and the combined males and females showed weak trends in which triad G enhancement pictures (i.e., those similar to neutral pictures) had higher accuracy scores than neutral pictures.

TABLE 18

ENHANCEMENT PICTURES (E) IN TRIAD G VS. NEUTRAL PICTURES (N) IN TRIAD C

PICTURE I

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Females	2 (2)[c]	8 (6)[c]	1st	12.0	E>N	.20[a]	13.0	E>N	.13[a]
			2nd	13.0	E>N	.13[a]	6.0	N>E	NS[b]
				(9.0	E>N	NS)			
			Tot.	13.0	E>N	.13[a]	9.0	E>N	NS
Combined	3	14	1st	30.0	E>N	.15[a]	23.0	E>N	NS
			2nd	30.0	E>N	.15[a]	7.5	N>E	.10[b]
			Tot.	32.0	E>N	.10[a]	11.0	N>E	NS[b]

[a]One tailed test.

[b]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

[c]Data are from tests performed without low accuracy subjects.

When low accuracy subjects were eliminated from the female, second half accuracy test, the trend disappeared. The error scores displayed this trend only with the female, first half data. The second half, combined test showed a definite trend in a direction opposite to the prediction. Separate male data were not presented because there was only one case with triad G. The triad F combined, second half and total data contained weak trends contrary to the hypothesis theory prediction.

TABLE 19

ENHANCEMENT PICTURES (E) IN TRIAD F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE I

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Females	2	8	1st	7.0	N>E	NS[a]	7.0	N>E	NS[a]
			2nd	10.0	E>N	NS	8.0	E=N	NS
			Tot.	9.0	E>N	NS	8.0	E=N	NS
Combined	3	14	1st	16.0	N>E	NS[a]	13.0	N>E	NS[a]
			2nd	28.0	E>N	NS	10.0	N>E	.20[a]
			Tot.	25.5	E>N	NS	8.0	N>E	.12[a]

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

Triad G enhancement data for picture VI are given in Table 20. They showed no trends. A combined test was not performed because the separate sex tests revealed opposite directions. There were no cases of VI occurring as the enhancement picture in triad F.

TABLE 20

ENHANCEMENT PICTURES (E) IN TRIADS D AND G VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE VI

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	2	6	1st	9.0	E>N	NS	6.0	E=N	NS
			2nd	6.0	E=N	NS	3.0	N>E	NS[a]
			Tot.	7.5	E>N	NS	4.0	N>E	NS[a]
Females	3	8	1st	10.0	N>E	NS[a]	11.0	N>E	NS[a]
			2nd	11.0	N>E	NS[a]	13.0	E>N	NS
			Tot.	11.0	N>E	NS[a]	11.0	N>E	NS[a]

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

Triad F and triad G enhancement data for picture II are presented in Table 21. Neither the accuracy nor error scores displayed any trends. A combined test was not performed because the sexes showed opposite directions.

Table 22 gives the picture II enhancement data for triad G. There were no trends shown with either the accuracy or the error scores. A combined test was not performed because the sexes showed opposite directions.

The results for enhancement pictures which were similar to forgetting pictures appear in Table 23. The male and female, second half and total accuracy tests showed appreciable trends opposite to the hypothesis theory prediction. The error scores revealed no trends. The combined sex, second half and total accuracy tests showed very strong contradictory trends.

TABLE 21

ENHANCEMENT PICTURES (E) IN TRIADS F AND G VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE II

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	5	9	1st	23.0	E>N	NS	20.0	N>E	NS[a]
			2nd	15.0	N>E	NS[a]	21.5	N>E	NS[a]
			Tot.	16.0	N>E	NS[a]	23.0	E>N	NS
Females	5	7	1st	16.0	N>E	NS[a]	9.5	N>E	NS[a]
			2nd	10.0	N>E	NS[a]	15.5	N>E	NS[a]
			Tot.	11.0	N>E	NS[a]	12.0	N>E	NS[a]

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

TABLE 22

ENHANCEMENT PICTURES (E) IN TRIAD G VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE II

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	2	9	1st	12.0	E>N	NS	12.0	E>N	NS
			2nd	10.5	E>N	NS	6.0	N>E	NS[a]
			Tot.	11.0	E>N	NS	4.0	N>E	NS[a]
Females	3	7	1st	14.0	E>N	NS	5.5	N>E	NS[a]
			2nd	10.0	N>E	NS[a]	8.5	N>E	NS[a]
			Tot.	11.0	E>N	NS	5.0	N>E	NS[a]

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

TABLE 23

ENHANCEMENT PICTURES (E) IN TRIAD F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE II

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	9	1st	10.0	N>E	NS[a]	8.0	N>E	NS[a]
			2nd	4.5	N>E	.12[a]	15.5	E>N	NS
			Tot.	5.0	N>E	.14[a]	13.0	N>E	NS[a]
Females	2	7	1st	2.0	N>E	NS[a]	4.0	N>E	NS[a]
			2nd	0.0	N>E	.06[a]	7.0	N=E	NS
			Tot.	0.0	N>E	.06[a]	7.0	N=E	NS
Combined	5	16	1st	26.0	N>E	NS[a]	24.0	N>E	NS[a]
			2nd	7.5	N>E	.005[a]	44.5	E>N	NS
			Tot.	13.0	N>E	.02[a]	38.0	N>E	NS[a]

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

Picture V enhancement results are given in Table 24. The male, first half accuracy scores showed a weak trend in the predicted direction. The combined, first half test yielded a moderate trend in the same direction, while the second half and total tests revealed similar, weak trends. The male error scores showed no trends, but the female, second half and total session error scores revealed significant trends supporting the hypothesis theory position. The combined, total test was significantly in line with the prediction. Similar weak and moderate trends occurred with the combined first and second half tests, respectively.

TABLE 24

ENHANCEMENT PICTURES (E) IN TRIADS F AND G VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE V

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	4	9	1st	27.0	E>N	.10[a]	22.0	E>N	NS
			2nd	22.0	E>N	NS	12.0	N>E	NS[b]
			Tot.	25.0	E>N	.17[a]	21.0	E>N	NS
Females	5	7	1st	20.5	E>N	NS	23.0	E>N	NS
			2nd	21.0	E>N	NS	30.0	E>N	.02[a]
			Tot.	18.5	E>N	NS	28.0	E>N	.05[a]
Combined	9	16	1st	97.5	E>N	.08[a]	95.0	E>N	.10[a]
			2nd	89.0	E>N	.18[a]	96.0	E>N	.09[a]
			Tot.	90.0	E>N	.16[a]	102.0	E>N	.04[a]

[a]One tailed test.

[b]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

The results with triad G enhancement pictures are presented for picture V in Table 25. The enhancement accuracy scores were significantly greater than the neutral accuracy scores for the females, second half and total session, and for the combined sexes during the first half. The female, first half test displayed a weak trend in this direction, as did the combined, total session test. The enhancement error scores were almost significantly higher than the neutral error scores for the females, second half and total session. There were weak trends in this direction for the females and combined sexes, first half.

The combined sexes, total session test yielded a trend approaching significance which was also in this direction. No male tests were made because there was only one male case for triad G with this picture.

TABLE 25

ENHANCEMENT PICTURES (E) IN TRIAD G VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE V

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Females	2	7	1st	12.0	E>N	.11[a]	11.0	E>N	.17[a]
			2nd	14.0	E>N	.03[a]	13.0	E>N	.06[a]
			Tot.	14.0	E>N	.03[a]	13.0	E>N	.06[a]
Combined	3	16	1st	40.0	E>N	.04[a]	36.0	E>N	.11[a]
			2nd	32.0	E>N	NS	37.0	E>N	.10[a]
			Tot.	35.5	E>N	.12[a]	38.0	E>N	.07[a]

[a]One tailed test.

Triad F enhancement data are given in Table 26. The males showed trends approaching significance in which enhancement accuracy scores were higher than neutral accuracy scores with all three tests. The female accuracy data showed no trends. The female error data, however, did reveal the predicted trend weakly in the second half and total tests. No trends appeared in the male error data. No combined tests were performed because the separate sex tests revealed different directions.

According to hypothesis theory, similarity between competing hypotheses is necessary for the occurrence of perceptual defense. The enhancement tests involving dissimilar pictures provide information about this aspect of the theory.

TABLE 26

ENHANCEMENT PICTURES (E) IN TRIAD F VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE V

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	9	1st	22.0	E>N	.07[a]	16.0	E>N	NS
			2nd	21.0	E>N	.10[a]	9.0	N>E	NS[b]
			Tot.	21.0	E>N	.10[a]	15.0	E>N	NS
Females	3 (3)[c]	7 (5)[c]	1st	8.5	N>E	NS[b]	12.0	E>N	NS
			2nd	7.0	N>E	NS[b]	17.0	E>N	.09[a]
							(11.0	E>N	.20[a])
			Tot.	4.5	N>E	NS[b]	16.0	E>N	.13[a]

[a]One tailed test

[b]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

[c]Data are from tests performed without low accuracy subjects

Table 27 presents the enhancement results for picture VII. The only trend which appeared with this picture was a moderate one in which enhancement error scores were higher than neutral error scores for the males, total session test. A combined test was not performed with these data because of the different directions appearing in the separate sex tests.

TABLE 27

ENHANCEMENT PICTURES (E) IN TRIAD B VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE VII

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	4	6	1st	7.0	N>E	NS	16.0	E>N	NS
			2nd	7.0	N>E	NS	18.0	E>N	NS
			Tot.	5.5	N>E	NS	19.0	E>N	.17[a]
Females	3	8	1st	15.0	E>N	NS	9.0	N>E	NS
			2nd	9.5	N>E	NS	16.0	E>N	NS
			Tot.	12.0	E=N	NS	13.0	E>N	NS

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

Picture IV enhancement data appear in Table 28. The males showed a moderate trend during the first half in which enhancement pictures received higher accuracy scores than neutral pictures. The error scores showed a similar trend for the total session. There were no trends in the combined data. No tests were made for the females because there was only one case.

TABLE 28

ENHANCEMENT PICTURES (E) IN TRIAD B VS.
NEUTRAL PICTURES (N) IN TRIAD C

PICTURE IV

Sex	n_E	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Males	3	9	1st	22.0	E>N	.14[a]	6.0	N>E	NS
			2nd	16.0	E>N	NS	7.0	N>E	NS
			Tot.	20.0	E>N	NS	5.0	N>E	.14[a]
Combined	4	16	1st	41.0	E>N	NS	24.0	N>E	NS
			2nd	33.0	E>N	NS	16.0	N>E	NS
			Tot.	41.0	E>N	NS	21.0	N>E	NS

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

Summary and interpretation of enhancement picture results

Table 29 presents a summary of the trends found in the enhancement picture data. As with the forgetting data, the picture V data provided the only significant support for the prediction. There were also some weak supporting trends with picture I, but these occurred with even stronger contradictory trends. The strongest contradictory trends occurred with picture II when it was similar to a forgetting picture (V, in triad F).

The few weak trends found with pictures VII and IV were also not in line with hypothesis theory. These pictures were supposed to be dissimilar to the other pictures in their groups and should not therefore have been able to compete successfully with them. This finding cannot

TABLE 29

SUMMARY OF ENHANCEMENT TRENDS[a]

Trends Predicted by Hypothesis Theory

Pict.	Triad	Sex	Part	Score	P[b]	Pict.	Triad	Sex	Part	Score	P
I	F+G	F	2nd	Acc.	.14[c]	V	G	M+F	1st	Acc.	.04
	F+G	F	tot.	Acc.	.18		G	M+F	tot.	Acc.	.12
I	G	M+F	1st	Acc.	.15	V	G	M+F	1st	Err.	.11
	G	M+F	2nd	Acc.	.15		G	M+F	2nd	Err.	.10
	G	M+F	tot.	Acc.	.10		G	M+F	tot.	Err.	.07
I	G	F	1st	Acc.	.20	V	G	F	1st	Acc.	.11
	G	F	2nd	Acc.	.13[c]		G	F	2nd	Acc.	.03
	G	F	tot.	Acc.	.13		G	F	tot.	Acc.	.03
I	G	F	1st	Err.	.13	V	G	F	1st	Err.	.17
							G	F	2nd	Err.	.06
V	F+G	M+F	1st	Acc.	.08		G	F	tot.	Err.	.06
	F+G	M+F	2nd	Acc.	.18						
	F+G	M+F	tot.	Acc.	.16	V	F	M	1st	Acc.	.07
							F	M	2nd	Acc.	.10
V	F+G	M+F	1st	Err.	.10		F	M	tot.	Acc.	.10
	F+G	M+F	2nd	Err.	.09						
	F+G	M+F	tot.	Err.	.04	V	F	F	2nd	Err.	.09[d]
							F	F	tot.	Err.	.13
V	F+G	M	1st	Acc.	.10						
	F+G	M	tot.	Acc.	.17						
V	F+G	F	2nd	Err.	.02						
	F+G	F	tot.	Err.	.05						

[a]Trends reaching the .20 level or better will be reported. In reading this table, it must be remembered that often several of the trends reported for any one picture are based in part on the same data. The trends have been listed in order of inclusiveness, with the most inclusive one presented first.

[b]All the values reported in this part of the table are taken from one tailed tests.

[c]Tests made without low accuracy subjects were not significant.

[d]A test made without low accuracy subjects was significant at the .20 level of confidence.

TABLE 29--Continued

Trends Contrary to Hypothesis Theory

Pict.	Triad	Sex	Part	Score	P[e]	Pict.	Triad	Sex	Part	Score	P
I	F+G	M	1st	Err.	.07	VII	B	M	tot.	Err.	.17
	F+G	M	2nd	Err.	.07						
	F+G	M	tot.	Err.	.07	IV	B	M	1st	Acc.	.14
							B	M	tot.	Err.	.14
I	G	M+F	2nd	Err.	.10						
I	F	M+F	2nd	Err.	.20						
	F	M+F	tot.	Err.	.12						
II	F	M+F	2nd	Acc.	.005						
	F	M+F	tot.	Acc.	.02						
II	F	M	2nd	Acc.	.12						
	F	M	tot.	Acc.	.14						
II	F	F	2nd	Acc.	.06						
	F	F	tot.	Acc.	.06						

[e]The two tailed significance tests reported in this part of the table are technically invalid because the trends tested were contrary to the predictions made. They are presented to provide approximate information about the extent of the contradiction to the prediction.

be given much weight because of the relative nature of similarity. In spite of the elaborate measures of similarity employed, one can say only that VII and IV were less similar to the other two pictures in their group than the latter pictures were to each other. They may well have been similar enough to the other pictures to allow competition to have occurred as described by hypothesis theory.

The opposing trends found in the data make it difficult to draw any conclusions about the tenability of the enhancement prediction. It may have been that the enhancement procedure did not always result

in more motivational support and emphasis for the enhancement picture. Data relevant to this possibility were provided by the subjects' choices of pictures they liked. Neither the males nor the females showed any tendency to choose enhancement pictures more often than non-enhancement pictures. Of course, it may also be that the choice of liked pictures was not a proper operation to measure the success of the enhancement manipulation. The Masturbation Guilt picture (V), for example, may have been difficult to choose as a liked picture because the subjects might have feared that its choice would have labelled them as masturbators. The fact that picture V did show significant results does indicate that the manipulation did work with it. A likely explanation of the probable success of the manipulation with V and its failure with the other pictures lies with the threatening nature of this stimulus. The enhancement manipulation was designed to build up and then reduce anxiety. Perhaps picture V was the only one with which sufficient anxiety was created to allow the false feedback to have its intended effect.

While the above explanation might account for the predicted results with picture V, it does not explain the contradictory trends found with II and I. A possible explanation for the picture II results relies on the fact that the contrary trends occurred only when II was similar to forgetting pictures. These were the forgetting pictures (V) which showed the perceptual defense effect significantly. It may be that the similarity between II and V made II subject to the inhibition effect as well as V, when the latter was a forgetting picture. The generalization of the forgetting effect would be similar to the phenomena discussed by McGinnies and Sherman (see above [51]). It must be noted, however, that the contradictory trends with II did not occur at the

same points as the significant trends with V so that the present explanation may well be mistaken. No rationale could be found for the picture I trends.

Results with neutral pictures similar to enhancement pictures

Hypothesis theory predicts that perceptual defense for a picture will occur when it is similar to another picture with a stronger hypothesis. The data from pictures similar to enhancement pictures were intended to test this aspect of the theory. An adequate test of the prediction requires that the enhancement pictures actually have strong hypotheses. Therefore, tests were made only with neutral pictures which were similar to pictures showing trends in the direction of the enhancement prediction.

Table 30 presents the picture VI data for neutral pictures similar to enhancement pictures (triad G). There were no trends with either accuracy or error scores. No tests were made for the males because there was only one case.

The picture II data appear in Table 31. There were weak trends in the combined, second half and total session tests in which neutral pictures similar to enhancement pictures had lower accuracy scores than neutral pictures similar to other neutral pictures. The second half error score tests revealed the same trend. No test was made of the male data because there was only one case.

There is hardly enough data to allow a fair test of the hypothesis theory prediction to be made. The results with picture II are too weak to provide anything but mild support for the theory; nevertheless, they were in the predicted direction. Further support for hypothesis theory is provided by the fact that the only point at which picture II forgetting

TABLE 30

NEUTRAL PICTURES SIMILAR TO ENHANCEMENT PICTURES (NE) IN TRIAD G VS. NEUTRAL PICTURES (N) IN TRIAD C

PICTURE VI

Sex	n_{NE}	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Females	2	8	1st	7.0	N>NE	NS	6.0	N>NE	NS
			2nd	7.0	N>NE	NS	7.0	N>NE	NS
			Tot.	6.0	N>NE	NS	6.0	N>NE	NS
Combined	3	14	1st	25.0	NE>N	NS[a]	21.0	NE=N	NS
			2nd	18.0	N>NE	NS	21.0	NE=N	NS
			Tot.	24.0	NE>N	NS[a]	17.5	N>NE	NS

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

TABLE 31

NEUTRAL PICTURES SIMILAR TO ENHANCEMENT PICTURES (NE) IN TRIAD G VS. NEUTRAL PICTURES (N) IN TRIAD C

PICTURE II

Sex	n_{NE}	n_N	Part of Session	Accuracy			Error		
				U	Dir.	P	U	Dir.	P
Females	2	7	1st	8.0	NE>N	NS[a]	10.0	NE>N	NS[a]
			2nd	5.0	N>NE	NS	5.0	N>NE	NS
			Tot.	6.0	N>NE	NS	8.0	NE>N	NS[a]
Combined	3	16	1st	18.0	N>NE	NS	27.0	NE>N	NS[a]
			2nd	15.0	N>NE	.18[b]	14.0	N>NE	.15[b]
			Tot.	15.0	N>NE	.18[b]	20.0	N>NE	NS

[a]The two tailed significance test reported is technically invalid because the trend tested was contrary to the prediction made. It is presented to provide approximate information about the extent of the contradiction to the prediction.

[b]One tailed test.

accuracy scores were lower than the neutral accuracy scores at better than p = .20 was when they were similar to enhancement pictures (see Table 11, males, first half). The enhancement test also approached significance at this point (see Table 26). This was the only instance in which forgetting pictures were similar to successful enhancement pictures and therefore provided the only test of the influence of competition on the operation of the forgetting variable.

The anxiety results

An extension of the median test, described by Siegel (64), was used to analyze the anxiety data. Tests were performed separately for each picture. The data were also analyzed separately for each sex and for each part of the assessment session.

Hypothesis theory predicts that the accuracy and error scores for high anxiety pictures will be higher than the corresponding scores for low anxiety pictures. The anxiety data provide no support for this hypothesis. Out of 72 tests (six tests for each sex on each picture), one trend in the predicted direction reached the .17 level of confidence in a one tailed test. The only other appreciable trend occurred in a direction opposite to the prediction. If the anxiety score is taken as a measure of the motivational relevance of the pictures, the lack of results is quite embarrassing to hypothesis theory.

The fact that the high anxiety scores did not go with low accuracy scores is not at all contradictory to inhibition theory. The position held by this theory is that anxiety and the repression tendency interact to produce perceptual defense. It predicts that anxiety and accuracy should be inversely related among forgetting pictures, that is, that the perceptual defense effect should occur most strongly with high anxiety pictures.

Tables 32 and 33 present the anxiety accuracy data and the anxiety error data for the forgetting pictures. A few comments will be made on the data analysis procedure before commenting upon the results.

TABLE 32

ACCURACY VS. ANXIETY AMONG FORGETTING PICTURES

Picture	Accuracy	Part of Session					
		First		Second		Total	
		Anxiety		Anxiety		Anxiety	
		Low	High	Low	High	Low	High
I and VI	Low	5[a]	3	4[a]	4	3[a]	4
	High	4	1	4	1	5	1
II and V	Low	8[b]	9	9[a]	6	11[c]	6
	High	12	4	11	7	9	7

[a]This two by two table is not significant with Fisher's exact test.

[b]This two by two table is significant at the p = .10 level, one tailed test, with Fisher's exact test.

[c]This two by two table cannot be tested for significance because its direction is opposite to the prediction.

In general, the technique involved dichotomizing the distributions, composed of the responses of all the subjects, for each of the variables and then constructing two by two contingency tables. The tables were tested for significance with Fisher's exact test. The accuracy scores were always split at the median into a high and a low group.[4] It was

[4]The female group contained an odd number of cases; it was therefore necessary to assign the middle case to one or another half by flipping a coin. This accounts for the change in the number of high accuracy cases in the II-V data (see Table 30).

believed, however, that anxiety scores of one or zero were too low to be categorized as high even if they did fall above the median. The anxiety scores were therefore split either at the median or at two, whichever was higher. The use of a high-low break for the accuracy scores partialled out the effects of the differential visibility of the pictures so that it was possible to combine data gathered from responses naming different pictures. The data from pictures I and VI and from II and V were combined. An overall combination could not be made because some of the data in the I-VI group and the II-V group came from the same subjects. Picture VII was not included in any of the tests because there were no males and only two females who had anxiety scores of higher than two on it.

TABLE 33

ERROR VS. ANXIETY AMONG FORGETTING PICTURES

Picture	Accuracy	Part of Session					
		First		Second		Total	
		Anxiety		Anxiety		Anxiety	
		Low	High	Low	High	Low	High
I and VI	Low	5[a]	2	5[a]	1	4[a]	3
	High	3	3	3	4	4	2
II and V	Low	9[a]	8	11[a]	6	12[a]	5
	High	11	5	9	7	8	8

[a]This two by two table is not significant with Fisher's exact test.

The II-V data for the first half reveals a weak trend in the predicted direction. All of the I-VI tests showed very weak trends in this direction. While these data provide only weak support of the inhibition theory prediction, they are clearly out of line with hypothesis theory. There were no strong or consistent trends among the error scores.

The anxiety measure, as it was used in this study, contained at least two important sources of error. The first stemmed from the less than perfect validity of the component variables in the score. Although all the variables loaded on the same factor, the original correlations were not high enough to account for most of the variance in the scores. For example, a subject may have paused during a story because he was blocked (as is assumed in using pauses as a measure of anxiety), or he may have paused for some non-motivational reason. This means that the anxiety scores received by some people may have been based on behaviors which did not stem from anxiety. On the other hand, it is also likely that some subjects did not display their anxiety along the channels which were tapped by our measures. This would result in low scores being received by a few people who had high anxiety.

The second source of error stems from the inter-individual use of the anxiety scores, which were designed to be used intra-individually. Subjects who had pauses, GSR drops, etc. on many pictures received high scores only on the most anxiety-arousing ones (see Appendix B). Conversely, subjects who had very few indicators of anxiety might still have received a moderate score on their most anxiety arousing-picture. It would therefore be possible, though unlikely, for a person with a low score on a picture to have more anxiety than a person with a high score.

There is no reason to believe that error contributed by each of the two sources described was biased. If the assumption of random error is correct, then pooling the anxiety scores of the subjects for a particular picture might provide a purer measure than using the individual scores. Proceeding on this assumption, the median anxiety score for each experimental picture was computed for each sex. These data appear in Table 34. Picture V clearly had the highest median anxiety score for both sexes. In fact, it was the only picture whose median anxiety score exceeded two, which was the boundary set between the low and high anxiety scores. It will be remembered that this was the picture which showed the most significant perceptual defense effect.

TABLE 34

MEDIAN ANXIETY SCORES

Picture	Male	Female
VII	1.0	0.7
VI	1.4	1.7
I	1.6	1.4
IV	1.1	0.9
V	2.8	2.8
II	0.9	1.0

Pictures II and VII had the two lowest anxiety scores of the forgetting pictures. These were the pictures on which the females showed trends contrary to perceptual defense. The only instances in which the perceptual defense effect did not occur as the inhibition theorist would have predicted were with picture I male data where the effect did not appear when it should have, and perhaps the male picture VII data where the effect may have appeared when it shouldn't have.

In conclusion, the anxiety data mildly contradict hypothesis theory and do provide some support for inhibition theory.

An evaluation of the two theories

The results presented above appear to provide some support for both the inhibition and competing hypothesis explanations of perceptual defense. As predicted by inhibition theory, the phenomenon did occur with anxiety-arousing pictures for which there was a repression defense preference. It did not seem to require the presence of a strong, similar competing hypothesis.

There is, however, one argument which the hypothesis theorist might offer to explain the forgetting results, which do not require the acceptance of the inhibition factor. He might propose that forgetting was not a measure of repression tendency but merely an indication that the hypothesis for the forgotten picture was weak. If this were the case, he would continue, the conditions for perceptual defense specified by hypothesis theory would have been met. There would have been a weak hypothesis, i.e., the one for the forgetting picture, which was interfered with by a stronger hypothesis. It would not have been necessary for the stronger hypothesis to be exceptionally powerful, as was supposed to be the case with the enhancement pictures. The weakness of the forgetting-picture hypothesis would have been enough to allow any competing hypothesis to have its effect. This argument was presented in Chapter I in connection with the hypothesis theory critique of Blum's study (10).

The inhibition theorist would, of course, have to admit that forgetting is not always the result of repression. Indeed, this was the reason that the weakness or absence of the perceptual defense effect on pictures other than V was not necessarily embarrassing to inhibition theory.

The forgetting of II and VII most often probably occurred as the result of weak hypotheses, rather than repression. This may also have been the case with some of the instances in which VI and I were forgotten. It will be remembered that these pictures had low anxiety scores, so that there would not have been much occasion to use repression with them. The forgetting of picture V, however, can probably be attributed to repression because V was a vivid, anxiety-provoking picture. This was the picture on which perceptual defense occurred most significantly.

There are three additional arguments which allow the inhibition theorist to refute the weak hypothesis explanation of his results. The first of these is that the hypothesis strengths of the forgetting pictures were most probably equal as a result of the many practice exposures in the training series and the full view of the three pictures in each group before each sequence of six flashes. There do not seem to have been any factors which would have led the hypothesis for one of the forgetting pictures to be different in strength than that for any other. Any imbalance in the hypothesis strengths that might have led to forgetting would certainly have been removed by the time the test series was begun.

The second argument against attributing the perceptual defense effect to weak hypotheses is that the defense effect did not occur with all the pictures. If the raised thresholds of forgetting pictures were due simply to weak hypotheses, as measured by forgetting, picture II, for example, should have shown the effect as strongly as picture V. This would have been so because the subjects forgot II as strongly as they forgot V. Inhibition theory can account for the difference between pictures II and V by noting that the former had low anxiety scores while

the latter had high anxiety scores. The theory asserts that perceptual defense should occur most clearly with high anxiety pictures. Hypothesis theory has no way of explaining the differences in the extent of perceptual defense among the experimental pictures.

Inhibition theory finds its final defense against the hypothesis theory critique in the relation between the anxiety scores and the strength of the defense effect. According to hypothesis theory, high anxiety pictures should have stronger hypotheses than low anxiety pictures. The anxiety-forgetting interaction trend which occurred with pictures II and V indicated just the opposite. On the group level, pictures which had stronger hypotheses tended to show the defense effect to a greater extent than did the pictures which had weaker hypotheses. The effect of anxiety, which is very damaging to hypothesis theory, was predicted by inhibition theory.

Although the fact that hypothesis theory cannot account for the forgetting results in no way impugns its ability to explain the enhancement results, the support for the enhancement prediction was somewhat equivocal. This may well have been due to the experimental conditions falling short of those required to create an adequate manipulation of hypothesis strength. As a result of this deficiency there were few data available for testing the hypothesis theory, perceptual defense prediction. The trends that did emerge, however, were in line with the theory.

The data did not support the hypothesis theory prediction about the effects of negative affect. This lack of support may have been due to the nature of the anxiety score used as the measure of negative affect (see above). On the other hand, it is consistent with the results

of most of the relevant studies described in Chapter One. The hypothesis theory predictions involving familiarity, recency and set were supported much more often than those involving motivation.

In conclusion, the present results suggest that the phenomenon of perceptual defense can occur through the operation of at least two different sets of factors. They appear to indicate the phenotypic nature of the concept. Under these circumstances, the proper move for each of the two groups of theorists would appear to be the acceptance of the validity of the other's concepts and principles and the further investigation of the conditions under which each of the explanation applies.

Suggestions for further research

The continuation of research on perceptual defense can take two directions. On the one hand it can move to a more molecular analysis of the cognitive operations involved in the phenomenon. With respect to inhibition, this would require a more precise operationalization of the anxiety variable than was the case in the present study. Indeed, the best strategy would appear to be the artificial manipulation of the anxiety aroused by specific recognition responses. The next step would be the dissection and temporal extension of the recognition response so that the point at which inhibition takes place can be studied. Work in this direction is currently being carried out by Blum and his associates as a continuation of the project of which this experiment was a part.

Another problem on the molecular level would be the one of trying to differentiate between perceptual defense, as it results from

competition of hypotheses and as it results from inhibition. Is one more easily eliminated than the other? Do they occur differentially with various degrees of threat?

On the other hand, the study of perceptual defense can be pursued on more molar levels. Accepting the proposition that people tend to use relatively unified cognitive styles in handling information, one could study the kinds of cognitive behaviors which appear to accompany perceptual defense. For example, it might be predicted that the processes involved in cognitive rigidity bear a close resemblance to both hypothesis competition and perceptual inhibition. One would therefore expect to find that people who showed perceptual defense would also show a greater inability to change their categorization of stimuli than other people. As with perceptual defense, this relationship might hold only for specific areas of threat or across all content areas.

Another area of research on the molar level is the study of the acquisition of perceptual defense and related cognitive styles. Dulany (23) has demonstrated the laboratory acquisition of perceptual defense. It is now necessary to study the child rearing practices which predispose an individual to manifest this kind of behavior in the face of threatening stimuli.

Finally the problem with which this paper was started deserves further study. How does perceptual defense and related characteristics of cognitive functioning affect the process of attitude change and communication of threatening information? For example, one might hypothesize that people who tend to use perceptual defense in an area will be more prone to misinterpret a threatening communication than will other people. It may be that attitude change techniques which

depend heavily upon using new information to change old concepts will be less effective with these people than with others. Perhaps techniques which aim at reducing the threatening aspects of the information to be received would be of greater value with perceptual defenders than with others. Indeed, it may well be that the inhibition and competition processes involved in perceptual defense are the basic ones employed by people to maintain stable orientations in an inconstant, threatening environment.

CHAPTER IV

SUMMARY

The study of perceptual defense has grown out of psychological interest in the way in which people receive information contradictory to their expectations and values. The phenomenon has been defined as a raised recognition threshold for threatening stimuli. It has usually been operationalized by comparing the ease of recognition of neutral and threatening material.

The controvery aroused by early experiments on perceptual defense has given rise to four alternative explanations of the phenomenon:

1. Response Suppression. This position holds that perceptual defense is a function of the conscious suppression of the verbal responses which are used to identify threatening stimuli.

2. Response Competition. Perceptual defense is attributable, by this point of view, to the relatively frequent occurrence of stronger, competing, overt responses.

3. Hypothesis Competition. Unlike the preceding explanations, this one holds that perceptual defense is a genuine perceptual phenomenon. It postulates that the perceptual recognition of threatening stimuli occurs relatively infrequently because of the frequent, inappropriate confirmation of stronger, competing hypotheses.

4. Inhibition. This point of view holds that the perceptual recognition of threatening stimuli occurs relatively infrequently

because of the effects of an inhibitory process which directly interferes with the activation of perceptual recognition responses.

Experiments by the proponents of the last two points of view have shown that perceptual defense can occur under conditions which clearly demonstrate the perceptual locus of the phenomenon. Studies by Eriksen (25), Blum (10, 11) and Nelson (53) have provided data which are generally more consistent with the inhibition explanation of perceptual defense than with the hypothesis competition explanation.

The present study assessed the thresholds for six Blacky pictures under a variety of conditions designed to meet the requirements for the occurrence of perceptual defense set by the inhibition and the competing hypothesis theories. The former theory states that perceptual defense should occur when a subject with a repression defense preference is exposed to threatening material. One form of inhibition theory (see Blum, 10, 11; and Nelson, 53) has held that the repression defense must relate specifically to the material being defended against. The other form (see Lazarus, Eriksen and Fonda, 43; and Eriksen, 25) postulates that the tendency to use a repression type defense is generalized across all kinds of threatening material. Hypothesis theory asserts that perceptual defense for a given stimulus will occur when it is similar to another stimulus for which there is a stronger hypothesis.

Two groups of three pictures were prepared so that in each group two pictures were similar to each other and dissimilar to the third. One group consisted of picture VII (Identification Process) as the dissimilar picture and pictures I (Oral Eroticism) and VI (Castration Anxiety) as the similar ones. The other consisted of picture IV (Oedipal Intensity) as the dissimilar stimulus and pictures II (Oral Sadism) and V (Masturbation Guilt) as the similar ones.

The repression defense tendency for each of the Blacky Pictures was measured using the subjects' performances on three Blacky picture recall tests administered during a three hour personality assessment session. Hypothesis strength was manipulated by providing false feedback to the subjects about their adjustment in the area represented by the pictures. One picture was selected for each subject as an enhancement picture and it alone was accompanied by feedback designed to produce feelings of relief. It was expected that this distinctive feedback for the enhancement picture would serve to emphasize it and increase its motivational relevance, thereby raising its hypothesis strength.

The fourth experimental variable, degree of threat, was operationalized via an anxiety score constructed from measures of verbal blocking, galvanic skin responses and choices of disliked Blacky pictures.

One control and six experimental conditions were created. In the first (triad A), the dissimilar picture was a forgetting picture, while the two similar pictures were neutral, i.e., neither forgetting nor enhancement. In the second condition (triad B), the dissimilar picture was an enhancement picture, while the two similar ones were neutral. The third condition (triad C) was the control condition in which all three pictures were neutral. The fourth condition (triad D) presented the dissimilar picture as a forgetting picture, one of the similar pictures as an enhancement picture, and the other as a neutral picture. In the fifth condition (triad E), the dissimilar picture was neutral; one of the similar pictures was a forgetting picture, while the other was neutral. The sixth condition (triad F) had a neutral dissimilar picture, one similar enhancement picture and one similar forgetting picture. In the seventh condition (triad G) the dissimilar picture was neutral; one of the similar pictures was an enhancement picture while the other was neutral.

Two sets of hypotheses were tested, one drawn from inhibition theory and the other drawn from hypothesis theory. Inhibition theory made the following predictions:

1. Forgetting pictures should be named correctly less often than neutral pictures.

2. The perceptual defense effect, referred to in the previous hypothesis, should occur most strongly with high anxiety pictures.

Hypothesis theory predicted the following:

3. Enhancement pictures, similar to other pictures should be named correctly and incorrectly more often than neutral pictures.

4. Neutral pictures similar to enhancement pictures should be named correctly and incorrectly less often than neutral pictures similar to other neutral pictures.

5. Correct and incorrect responses naming high anxiety pictures should occur more frequently than responses naming low anxiety pictures.

The data analyzed in the present study were collected from 30 males and 31 females. The subjects were drawn from a larger sample participating in a project of which this study was a part. They were seen in either one or two personality assessment sessions in addition to the experimental session of the present study. Following the enhancement procedure and a fairly long tachistoscopic training session, the six pictures were exposed one at a time, in a randomized order, at a speed which allowed for approximately 50 percent accuracy. The test period was divided into two parts, both containing 18 exposures of each picture. Each group of three pictures was presented in sequence of 18 exposures. The series containing the two groups were presented in a counterbalanced order. The three pictures shown in each sequence were periodically exposed full view so that the subject had equal expectations of seeing each of the pictures.

All the statistical tests were performed on accuracy and error scores computed from the subjects' responses. The former were the proportions of correct responses which named particular pictures. The latter were the proportions of incorrect responses which named particular pictures. Three sets of statistical tests were made for each sex separately and for the combined sexes. One test was performed with the data from the first half of the assessment session, one with the second half data and one with the total session data.

Prediction (1) was supported by significant trends among the males and among the combined males and females during the first half of the test session. Weak to moderate, insignificant trends also supported prediction (1) on pictures: a) I, females, first half; b) II, males, first half; c) V, females, first half and total; d) V, combined sexes, total; e) VI, female and combined sexes, first half; f) VI, males, females and combined sexes, total; and g) VII, males, first half. Weak contradictory trends appeared in the female data on pictures VII, first half; and II, first half and total. Arguments were presented which eliminated overt response variables as the determinants of the observed perceptual defense effect.

Two sources of data were presented in support of prediction (2). The first was a weak trend on pictures II and V in which high anxiety, forgetting pictures had lower accuracy scores than low anxiety, forgetting pictures during the first half of the test session. The second was the relation between the median anxiety scores of each of the experimental pictures, across subjects, and the degree to which the perceptual defense effect with the picture reached significance. Picture V was the only picture whose median anxiety score was above the low range; its median score was considerably higher than that for any of the other

pictures. It was also the picture with which perceptual defense occurred most significantly. It was noted that these data were contradictory to prediction (5), based on hypothesis theory.

Prediction (3) was significantly supported by accuracy score trends on picture V, females, second half and total session; and combined sex, first half. There were also significant error score results with this picture which were in line with the prediction for the females, second half and total tests; and combined sexes, total session. Weak to moderate, insignificant, supporting trends occurred with pictures: a) I, females, second half and total session, correct responses; b) I, combined sexes, first, second and total tests, correct responses; c) I, females, first half, incorrect responses; d) V, males, first, second and total tests, correct responses; and e) V, combined sexes, first and second tests, incorrect responses.

There were strong trends contrary to the hypothesis theory prediction (4) in the data on picture II, combined sexes, second and total accuracy scores. Moderate contrary trends appeared in the data on pictures: a) I, males, first, second and total error scores; and b) II, females, second and total accuracy scores. Weak contrary trends were found with pictures: a) I, combined sexes, second and total error scores; b) II, males, second and total accuracy scores; c) VII, males, total accuracy scores; and d) IV, males, first and total error scores. The fact that the enhancement manipulation was successful only with V was attributed to the anxiety-arousing nature of this picture.

The little available data which was relevant to prediction (4) provided some support for it. There was a weak, insignificant trend with II, in which pictures similar to enhancement pictures had lower accuracy scores than neutral pictures similar to other neutral

pictures. This trend occurred with the combined sexes, second half and total tests. The picture II error scores showed the same trend during the second half. The only point where trends in which picture II forgetting accuracy scores were lower than neutral accuracy scores occurred when the former were similar to successful enhancement pictures.

Prediction (5) received no support at all from the data. Indeed, the trends among the forgetting pictures were in a direction opposite to that predicted. It was noted that the inability of hypothesis theory to predict to motivational effects was consistent with the findings of previous studies.

Several arguments were offered which demonstrated the inapplicability of hypothesis theory to the relationship between forgetting and accuracy. It was therefore concluded that the inhibition explanation of perceptual defense had been supported by the experimental results. The data also provided support for the hypothesis theory explanation of perceptual defense. The fact that the conditions specified by each of the theories could lead to the phenomenon was taken as an indication of the phenotypic nature of the perceptual defense concept.

It was suggested that further investigations be made of the conditions under which one or the other theory could provide a tenable explanation of the phenomenon.

APPENDIX A

THE MEASUREMENT OF SIMILARITY AMONG THE BLACKY PICTURES

The relevant aspects of the stimuli

Several techniques of assessing similarity had been tried before deciding upon the ones chosen for the present study. The comments of the subjects during these pre-test runs indicated that most of them depended upon only a few characteristics to identify the tachistoscopically flashed pictures. The size and the location of the black figure and the location of black tails appeared to be the three properties used in deciding which picture was flashed. A method was therefore constructed which gave great weight to these properties in assessing the similarity among the pictures.

Krauskopf, Duryea and Bitterman (40) provide support for the particular picture characteristics which were emphasized in the measurement of similarity. In a study which assessed the recognition thresholds for simple geometrical shapes, e.g., crosses, X's and T's, the authors found that the amount of area and the magnitude of critical detail, e.g., the length of the arms of the figures, were inversely related to the threshold. In the present experiment the sizes of the Blacky figures correspond to the areas of the Krauskopf et al. figures, and the tails are equivalent to their critical details. It therefore seems likely that the reports of the pre-test subjects

in the present study were valid indicators of the aspects of the flashed Blacky Pictures which were employed in the recognition process.

The measurement procedure

Scoring the overlap

The similarity measurement technique was inspired by Attneave and Arnoult's (1) method of generating random figures. A sheet of tissue paper, divided into quarter inch squares, was placed over each Blacky picture. Every cell in the grid was marked to indicate whether it was filled by part of a white figure, a black figure, a border of a black figure or a tail of a black figure. The cells filled by the white background were left blank. A "center of gravity" was then chosen for each picture by locating the center square in the largest black area.

The similarity between any pair of pictures was measured by placing the scored grid of one picture over that of another. The grids were first lined up so that the boundaries of the pictures coincided. The pictures were then moved according to a previously determined criterion so that the two centers of gravity came as close as possible to being superimposed. The criterion was that the pictures could not be displaced more than one half inch in one direction and one quarter inch in another.

The purpose of attempting to superimpose the centers of gravity was to reflect what was believed to take place in the subject's perception of the flash. It was not possible for the subjects to make precise localizations of the black flashes on the tachistoscopic screen. The black figures were small enough to be quite far away from

the black borders of the screen, so that distance from the edge was difficult to judge precisely. Nevertheless, this distance was the only cue available to a subject for localization. It was believed that the subject's gaze was probably drawn toward the black figure during the flash because that was what stood out most, in spite of the fact that the subject was asked to keep looking at the center of the screen. This probably had the effect of making the black figure appear to be closer to the center of the screen than it actually was. In other words, it was believed that subjects shifted the centers of gravity of the pictures they saw toward the center of the screen. The procedure of adjusting the alignment of the grids was thought to duplicate the shifting that probably took place during the tachistoscopic flashes.

The similarity index

A similarity index was constructed by first assigning a weight to each combination possible (see Table 35) when a cell from one grid was superimposed over a cell from another grid. The number of each of the kinds of superimpositions was then counted for each pair of pictures; these were combined, using the weights, into a total overlap score.

A grand total score was constructed by simply counting the number of each kind of cell in both pictures and by getting a weighted sum of the frequencies (see Table 36). The final index was formed by dividing the overlap score by the grand total score. Using this technique, the maximum similarity index score possible was .50, the minimum was .0.

TABLE 35

WEIGHTS USED IN THE OVERLAP SCORE

Kind of Cell	Kind of Cell				
	Black	Light	Border	Tail	Blank
Black	2.00[a]	0.00	0.50	0.00	0.00
Light		0.25	0.00	0.00	0.00
Border			1.00	0.50	0.00
Tail				2.00	0.00
Blank					0.00

[a]This should read: A score of 2.00 was given for each case in which a black cell in the grid corresponding to one picture was superimposed over a black cell in the grid corresponding to another picture.

TABLE 36

WEIGHTS USED IN GRAND TOTAL SCORE

Kind of Cell	Weight
Black	2.00
Light	0.25
Border	1.00
Tail	2.00
Blank	0.00

Table 37 presents the similarity index scores. In general it can be said that most of the picture pairs did not differ greatly from each other with respect to similarity. It is comforting to note that the maximum score occurred for the X-XI pair, which contains pictures which are almost identical. The II-VII pair, commented upon by Smock (66) also had a relatively high similarity score.

TABLE 37

SIMILARITY INDEX SCORES

Pictures	Pictures										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
I		.22	.06	.15	.25	.26	.20	.28	.26	.18	.18
II			.02	.11	.30	.17	.27	.20	.22	.21	.21
III				.07	.03	.05	.03	.02	.06	.02	.02
IV					.16	.28	.23	.08	.13	.18	.18
V						.21	.32	.18	.20	.15	.16
VI							.10	.15	.23	.13	.13
VII								.23	.25	.22	.24
VIII									.13	.22	.21
IX										.18	.16
X											.44

The observed similarity ratio

The large number of arbitrary (but reasonable) decisions made in constructing the similarity index made it desirable to find some empirical support for the index scores. This was done employing generalization as an operational definition of similarity. The similarity index was used to construct several groups of four pictures in which two of the pictures were similar to each other, but not to the other two, and two of the pictures were not similar to any of the other pictures. In the procedure followed, the subjects were shown the four pictures for ten seconds and were then exposed to 20 tachistoscopic

flashes, each consisting of one of the four pictures. Their task was to identify the picture which was flashed. It was expected that more confusions would occur between pairs of pictures with high similarity indices than between pictures with low indices. Data were collected from 15 subjects on 48 of the 55 possible pairs. The choice of pairs to be examined was determined by the way in which the groups of four were made up. Data obtained from each of the 15 subjects were used to compute an observed similarity ratio which was the number of times two pictures were actually confused divided by the total number of times the two might have been confused. The ratios of the several subjects tested for each pair of pictures were combined to yield the mean observed similarity ratios found in Table 38. An example will serve to clarify the computation of the ratio. Let us say that pictures II and V were part of the same group and that picture V was flashed 20 times. Eight out of those 20 times the subject identified the picture as II. The observed similarity ratio for II's similarity to V would be 8 divided by 20, or .40. In other words, out of the 20 times the subject might have said II when V was flashed, he said it eight times.

The relationship between the index and the ratio

Time pressure made it necessary to get information about several pairs of pictures from each subject. This procedure prevented the appropriate application of statistical tests to the relationship between the mean observed similarity ratios and the similarity index scores because the condition of independence of observations was not met. Nevertheless, it is possible to describe the relationship found,

TABLE 38

MEAN OBSERVED SIMILARITY RATIOS

Pictures Shown	Pictures Named: I		II		III		IV		V		VI		VII		VIII		IX		X		XI	
	R[a]	n[b]	R	n	R	n	R	n	R	n	R	n	R	n	R	n	R	n	R	n	R	n
I	.47[c]	18	.27	3	.20	8	.18	7	.30	3	.31	3	.16	8	.19	6	.14	4	.12	9	.14	3
II	.21[d]	3	.50	12	.10	5	.13	3	.21	3	.23	9	.46	3	.12	3	[e]		.13	3	.17	3
III	.12	8	.14	5	.62	12	.14	3	.02	2	.15	8	.05	8	[e]		.08	3	.01	2	[e]	
IV	.26	7	.17	3	.15	3	.50	12	.30	2	.23	3	.17	2	.04	3	.10	4	.11	9	[e]	
V	.24	3	.34	3	.09	2	.02	2	.55	13	.31	3	.20	8	.09	6	.07	3	.08	7	.20	2
VI	.38	3	.07	9	.10	8	.33	3	.06	3	.39	15	.10	6	.08	4	.16	3	.02	6	[e]	
VII	.11	8	.20	3	.13	8	.17	2	.12	8	.14	6	.57	16	.20	3	.10	3	.09	7	[e]	
VIII	.24	6	.29	4	[e]		.13	3	.22	6	.17	4	.20	3	.62	15	.13	6	.14	8	.12	5
IX	.12	4	[e]		.08	3	.18	4	.17	3	.13	3	.06	3	.13	6	.67	10	.08	4	[e]	
X	.09	9	.17	3	.20	2	.17	9	.11	7	.24	6	.15	7	.12	8	.08	4	.68	19	.33	2
XI	.14	3	.12	3	[e]		[e]		.12	2	[e]		[e]		.11	5	[e]		.23	2	.50	5

[a]R denotes ratio.

[b]n denotes number of pairings. Number of pairings indicates the number of picture groups in which a pair appeared together. This number can be greater than 15 because sometimes the same pair appeared in two groups for the same person.

[c]Ratios in the diagonals indicate average percent correct responses.

[d]This should be read: The proportion of the number of times I was named when II was shown to the number of times I could have been named when II was shown is .21.

[e]This pair never was used in a group of pictures.

even if it cannot be tested for significance. Table 39 presents a contingency table in which each of the similarity variables was independently trichotomized. The high, medium and low cutting points were chosen to select the two highest and two lowest scores for each picture. However, where the data provided a natural cutting point which yielded only one high or one low score, it was used in place of the arbitrary criterion.

TABLE 39

THE RELATIONSHIP BETWEEN THE TWO SIMILARITY MEASURES

Mean Observed Similarity Ratios	Similarity Index Scores			
	High	Medium	Low	Total
High	12[a]	6	2	20
Medium	9	35	12	56
Low	1	13	6	20
Total	22	54	20	96[b]

[a]This entry should be read as follows: Twelve pairs of pictures received high similarity index scores and high mean observed similarity ratios.

[b]If data had been collected on all 55 possible pairs of pictures, there would have been 110 entries because there were two mean observed similarity ratios for each pair of pictures. The similarity index provided only one score for each pair. There are 96 entries in the table because data were collected on only 48 pairs.

Rank order correlations were also run between the two similarity measures for each picture. They appear in Table 40.

TABLE 40

RANK ORDER CORRELATIONS BETWEEN THE TWO SIMILARITY MEASURES

Picture	Number of Pairs	Rho
I	10	.35
II	9	.60
III	8	.12
IV	9	.48
V	10	.39
VI	9	.37
VII	9	.69
VIII	9	.70
IX	8	.42
X	10	.91
XI	5	.21

The contingency table and the rank order correlations reveal a positive relationship between the two measures of similarity. This relationship supported the assumption that the index and ratio were actually measuring similarity. Enough uncertainty about which of the two measures was most valid remained to suggest that the safest procedure to follow would be to use a combination of both techniques in assessing the similarities among the pairs of Blacky pictures. Therefore, three classes of picture pairs were formed: pairs which were either high or low in similarity on both measures, pairs which were either high or low on one measure but not on the other, and pairs which were medium on both.

The two groups of three pictures chosen for the experiment were among the groups of three which came closest to satisfying the criteria of having two pictures similar to each other and one picture dissimilar

to the other two. The similarity criterion was met more adequately than the dissimilarity criterion. Pairs I-VI and II-V were highly similar on both measures. The dissimilar pairs ranged from VI-VII, which was very dissimilar on the index (see Table 37) and moderately dissimilar on the ratio (see Table 38) to IV-V, which was very dissimilar on the index and dissimilar on the ratio in one direction but similar in the other direction.

The reported similarity relations

The experimental subjects' reports of confusions among the pictures, given in Table 41, provide data which support the choice of pictures made. A surprising lack of discrimination occurred between II and IV. The attempt to lessen the similarity between II and IV has been described in Chapter Two.

TABLE 41

CONFUSIONS AMONG PICTURES AS REPORTED BY SUBJECTS IN POST-EXPERIMENTAL INTERVIEW

Picture Pair	Spring and Summer Subjects			Fall Subjects		
	Male	Female	Total	Male	Female	Total
I-VI	2	6	8	4	0	4
I-VII	0	0	0	1	0	1
VI-VII	0	2	2	0	3	3
II-IV	4	7	11	1	0	1
II-V	7	5	17	5	4	9
IV-V	0	0	0	0	1	1

The purposes of the study were not at all affected by the unexpected similarity relationship. Picture IV was never forgotten sufficiently to be used as a dissimilar forgetting picture. The added similarity relationship involving II merely provided another hypothesis to compete with the hypothesis for II. Indeed, if the competing hypothesis explanation applied to the forgetting data in this study, one would expect to have found II showing more of this effect than any of the other pictures because it had more similar competing hypotheses than others. The results reported in Chapter Three show the opposite to have been the case.

Pictures VI and VII also show somewhat more similarity than was expected. All of the subjects reporting confusion between VI and VII were females. The data presented in Chapter Three indicated that the males revealed a perceptual defense trend with picture VII. It therefore appears that the lack of discrimination between VI and VII that did occur does not force a reinterpretation of the results obtained with VII.

APPENDIX B

THE ANXIETY SCORES

The behaviors measured

Three major classes of variables chosen on the basis of a factor analysis of a large number of negative affect indicators were combined to construct the anxiety score. The first class consisted of a variety of verbal behaviors which occurred during the subjects' telling of the Blacky stories and corresponding human experiences. Pauses during the stories and human experiences, short talking time during these two procedures and the reaction time between the presentation of a picture and the beginning of a story were scored. All of these behaviors were interpreted as blocking in the presence of anxiety. Galvanic skin response (GSR) measures comprised the second class of variables included in the anxiety score. The size of the GSR drop during the story reaction time period and the size of the drop at the point in the insight procedure at which the subjects were required to talk about a picture's problem area, etc., were the two measures employed. The third kind of measure consisted of the subjects' choice of disliked pictures.

The score was composed in order to allow comparisons among different pictures with respect to the amount of anxiety they evoked in any particular subject. The scores on a particular component variable were weighted in accordance with the loading of that variable

on the anxiety factor. The weighted measures on each of the variables were added to yield an anxiety score. Table 42 lists the specific variables which were included in the anxiety score.

The intra-individual nature of the anxiety scores

The nature of the anxiety score raises an important problem for the present study. The score should be used to compare the anxiety aroused by different pictures shown to the same person. In this study, comparisons were always made within pictures and across people because of the inability to equate the visibility of the pictures. In an attempt to justify the inter-individual use of the anxiety scores, a distribution was made of the scores received by all pictures across all people for each variable included in the anxiety measure. In general, it was found that pictures which were high intra-individually were also high inter-individually. This result provides some support for the procedures employed in the present study. It must be remembered that the factor analysis, which served as the basis for the selection of measures included in the anxiety score, was performed on intra-individual scores. It may be that different factors might have emerged had inter-individual scores been used. Therefore, in spite of the encouraging correspondence between the inter-individual and intra-individual results, the findings obtained with the anxiety scores across people must be regarded as tentative.

TABLE 42

RULES FOR SCORING ANXIETY

Variable	Weight	Scoring
Blacky story Pause	2[a]	(a) Picture with largest absolute sum of pauses, provided sum is greater than 10 seconds and ratio of pauses to the amount of actual talking time (pauses not included) is 0.8 or more. (b) Picture with largest ratio, provided it is at least 0.8. (c) When (a) and (b) coincide, only 1 picture is scored; when (a) and (b) differ, 2 pictures are scored; no ties are scored for either (a) or (b).
Blacky story Talk time (short)	2[a]	Picture with shortest amount of actual talking time (pauses not included), provided the amount is less than 25 seconds and at least 2 seconds less than the next shortest picture.
Human experiences Talk time (short)	2	Same as story-talk time (short)
Human experiences Pause	1	Same as story-pause
Blacky story Reaction time	1	(a) Picture with longest time between presentation and beginning of talking--must be at least 2 seconds longer than second longest picture, or else must be of 10 seconds duration or more. (b) Two ties can be scored provided both are of 10 seconds duration or more; in case of 3 or more ties, none is scored.

[a]In those instances when Blacky story-pause and Blacky story-talk time (short) are both scored for the same picture, assign a combined weight of 3 instead of 4.

TABLE 42 —Continued

Variable	Weight	Scoring
Blacky story Initial drop (GSR)	1[b]	(a) Picture with largest drop between presentation and beginning of talking; ties are scored. (b) Picture with second largest drop, provided the absolute magnitude of the drop is more than 3; ties for second are not scored; if ties exist for first, do not score any for second.
Disliked pictures	1	Three pictures chosen as most disliked.
Insight-"Now" drop	1[c]	(a) Two pictures with largest drops (b) No more than 2 pictures can be scored; if 2 pictures are tied for second, neither is scored.

[b]Rules for measuring GSR initial drops are as follows:
(a) If several drops occur, only the largest is recorded.
(b) The end of a drop is indicated by a discernible leveling off (horizontal or upward direction).
(c) Drops which begin during the initial period and continue into the talking period are counted in their entirety.

[c]Rules for measuring Insight-"Now" drop are as follows:
(a) Score the first drop which occurs after presentation, provided the drop begins within 5 seconds; if there is no drop within the 5 second period, go back to 2 seconds before presentation.
(b) Score the whole drop even if it continues into talking period.
(c) The end of a drop is indicated by a discernible leveling off (horizontal or upward direction).
(d) If picture is forgotten, do not score drop at "now." Score drop at reminder presentation of picture. If remembering occurs spontaneously, score first drop after remembering, provided it is close (2 seconds).

APPENDIX C

THE FORGETTING SCORES

The subjects recalled the Blacky Pictures at three points in the personality assessment session. They were allowed to name the pictures in any way they liked, as long as the referents of the labels chosen were clear to the experimenter. Each of the recall periods was divided into 15-second units. Scores were assigned as follows: pictures named during the first 15-second period received a zero; pictures named during the second recall period received a one, and so on. A picture which was not recalled before two successive 15-second periods passed without any new pictures being named was considered completely forgotten. It received a score equal to one greater than the total number of 15-second periods elapsed during the recall test.

A specific cutoff point was chosen to differentiate forgetting pictures from neutral pictures. The choice of this point depended in part upon the recall performance of a set of pre-test subjects. A distribution was made of the forgetting scores of the pre-test subjects on all pictures. Inspection revealed that a score of ten with one complete forgetting or any score with two complete forgettings served to differentiate between the highest quarter and the rest of the distribution.

After many of the experimental subjects had been run, it became evident that forgetting criteria were too strict. The subjects were not forgetting the pictures often enough to provide an adequate number of forgetting pictures for the purposes of the study. It was therefore decided to lower the criteria. The new criteria for designating a picture as a forgetting picture were as follows: two or more complete forgettings; one complete forgetting with a total score of nine; one or more complete forgettings with a total score of eight, if the picture was remembered last on one of the recall tests, or if it had the highest recall score of all the pictures.

APPENDIX D

THE STIMULUS FILTERS

The filters were constructed by cutting a four by five inch area from the center of a sheet of white, semi-gloss posterboard so that the open space would lie directly over a picture when the filter was placed in front of a card bearing the stimulus. The filtering was accomplished by placing varying numbers of sheets of translucent plastic, known as typing plate, over the opening, with the glossy side toward the subject. Four filters were prepared. Filter A had one sheet; B had three sheets; and C and D had four sheets. Pictures II, V, and VII were always shown behind both filters A and B; picture VI was shown behind filter C; IV was shown behind filter B; and I was shown behind filter D.

APPENDIX E

THE TACHISTOSCOPE

A Gerbrands tachistoscope was used in the present study. The illumination of the adaptation and the test fields was calibrated at two points in the course of the experiment. Sometime after the completion of the study the writer learned that the first calibration had been improperly performed, so that the only valid illumination data were those collected after all the subjects had been tested. A Macbeth Illuminometer was used in making the measurements, which are presented in Table 43. The readings were taken from the white areas of the pictures. The black areas were too dim to be measured.

TABLE 43

ILLUMINATION OF STIMULI AND ADAPTING FIELD

Target	Illumination (in Foot Lamberts)
Adapting Field	4.61
VII	0.28
VI	0.29
I	0.29
IV	0.28
V	0.30
II	0.29

The tachistoscope timer was also checked twice during the study. It will be remembered that the exposure time was varied for each subject in order to achieve a 50 percent level of accuracy in identifying the pictures. The dial settings used in the test series varied from 0.075 seconds to 0.11 seconds. The adjustment unit mentioned in the threshold assessment section was a dial reading of 0.005 seconds. The actual exposure time is difficult to discover because two calibration reports, one during and one after the study, gave widely differing results. The speed-of-exposure data are presented in Table 44.

TABLE 44

EXPOSURE TIMES

Dial Setting	Actual Exposure Duration (in Seconds)	
	First Calibration	Second Calibration
0.06	0.020	0.042
0.07	0.025	0.031
0.08	0.030	0.061
0.09	0.035	0.072
0.10	0.040	0.081
0.11	0.045	0.090

The uncertainty about the actual exposure times does not affect the validity of any of the procedures in the present study because it did not serve as the basis for any decisions. Dial settings were regulated in accordance with the subjects' responses and not in accordance with any absolute exposure criterion.

APPENDIX F

EXPERIMENTAL FORMS

This appendix contains the false feedback form used with the enhancement manipulation, and the data recording forms employed in the training and assessment procedures.

TRAINING DATA RECORDING FORM

S[a]	R[b]	S	R	S	R	S	R	S	R	S	R
K[c]		5	—	4	—	A	—	6	—	6	—
2		2	—	5	—	1	—	7	—	7	—
5	—	4	—	2	—	7	—	6	—	6	—
2	—	2	—	5	—	7	—	1	—	7	—
4	—	4	—	K	—	6	—	1	—	N	—
4	—			5		1	—			6	
5	—	P		4	—	6	—	N		1	—
Q		2		5	—	V		6		6	—
5	—	5	—	2	—	6	—	1	—	7	—
2	—	4	—	4	—	1	—	7	—	1	—
5	—	2	—	2	—	7	—	6	—	7	—
4	—	4	—			1	—	7	—		
5	—	5	—			6	—	1	—		
2	—	Q	—			1	—	A	—		
P		5	—			N	—	6	—		
4	—	2	—			7	—	6	—		
2	—	4	—			6	—	7	—		
4	—	5	—			7	—	1	—		
2	—	4	—			6	—	7	—		
4	—	5	—			7	—	6	—		
5	—	K	—			1	—	V	—		
		2						1			
Q		4	—			V		6	—		
5	—	5	—			1	—	7	—		
2	—	4	—			1	—	1	—		
5	—	2	—			7	—	7	—		
2	—	2	—			6	—	1	—		
4	—					7	—				
5	—	Q				6	—	A			
K		5				A		1	—		
2	—	4	—			7	—	7	—		
4	—	2	—			1	—	6	—		
2	—	4	—			6	—	7	—		
4	—	2	—			7	—	6	—		
5	—	4	—			6	—	7	—		
5	—	P	—			7	—	V			
P		2				N		1			
4	—	5	—			1	—	7	—		

[a]S denotes stimulus.

[b]R denotes response.

[c]The letters appearing on this sheet designate which of the several boards containing the three experimental stimuli were shown full view to the subject.

ASSESSMENT DATA RECORDING FORM

S[a]	R[b]	S	R	S	R	S	R	S	R	S	R	S	R
K[c]		1	—	1	—	1	—	6	—	V		1	—
5		6	—	7	—	6	—			1	—	6	—
4	—	7	—	6	—	1	—	K		6	—	1	—
5	—	7	—	6	—	A	—	5		7	—	7	—
4	—	1	—	V	—	6		4	—	1	—	1	—
2	—		—	1		7	—	4	—	7	—	6	—
5	—	Q		7	—	6	—	2	—	1	—	N	
Q		5		6	—	7	—	5	—			7	
2		4	—	7	—	1	—	2	—	Q		6	—
4	—	2	—	1	—	1	—	Q	—	4		7	—
5	—	5	—	6	—	N	—	5		5	—	6	—
4	—	2	—		—	7		2	—	2	—	7	—
2	—	5	—	K		1	—	5	—	4	—	1	—
2	—	K		5		7	—	4	—	2	—		
P		2		4	—	6	—	5	—	4	—	K	
5	—	4	—	2	—	1	—	2	—	K		2	
4	—	2	—	4	—	7	—	P	—	5		5	—
2	—	4	—	2	—		—	4	—	5	—	4	—
4	—	5	—	4	—	V		2	—	4	—	2	—
5	—	5	—	P		7		4	—	2	—	4	—
2	—	P		2	—	1	—	2	—	4	—	5	—
	—	4	—	5	—	6	—	4	—	2	—	P	
V		2	—	4	—	7	—	5	—	P		2	—
1		4	—	5	—	1	—		—	5		2	—
7	—	2	—	2	—	7	—	N		2	—	4	—
6	—	5	—	5	—	N		6		5	—	5	—
7	—	4	—	Q	—	1	—	1	—	2	—	4	—
6	—		—	2		1	—	7	—	4	—	2	—
7	—	N		5	—	7	—	6	—	5	—	Q	
N		1		2	—	6	—	7	—			5	
6		7	—	4	—	7	—	1	—	V		2	—
1	—	1	—	4	—	6	—	A	—	1		4	—
7	—	7	—	5	—	A	—	6		7	—	5	—
1	—	6	—		—	1		6	—	7	—	4	—
6	—	1	—	V		6	—	7	—	6	—	5	—
1	—	A		6	—	1	—	1	—	1	—		
A		6	—	7	—	6	—	7	—	6	—		
6	—	7	—	6	—	7	—	6	—	A			

[a]S denotes stimulus.

[b]R denotes response.

[c]The letters appearing on this sheet designate which of the several boards containing the three experimental stimuli were shown full view to the subject.

ENHANCEMENT FEEDBACK FORM WITH VI
AS ENHANCEMENT PICTURE

Picture	Adjustment Score		Threshold		Conflict Ratio
A	27				
B	35				
C	—				
D	25				
E	37				
F	55				
G	30				
H	24				
I	—				
J	—				
K	—				

APPENDIX G

THE DATA

TABLE 45

TRIAD ASSIGNMENTS

Ss[a]	Picture Group		Ss	Picture Group		Ss	Picture Group	
	VII-VI-I	IV-V-II		VII-VI-I	IV-V-II		VII-VI-I	IV-V-II
7M	F	C	67M	E	E	44F	C	E
9M	C	B	70M	c	G	46F	A	E
11M	B	E	74M	A	F	47F	C	F
13M	D	C	75M	A	C	48F	F	E
20M	A	C	76M	C	E	49F	E	E
23M	E	E	77M	A	G	50F	G	E
26M	G	C	78M	E	C	51F	G	C
27M	E	B	80M	A	E	53F	A	E
28M	C	F	81M	C	G	54F	C	G
30M	B	C	83M	A	E	55F	A	G
31M	b	B	3F	A	E	56F	A	G
33M	b	F	4F	C	F	57F	A	C
34M	E	F	6F	E	B	58F	B	C
37M	D	E	22F	C	E	60F	G	C
41M	A	E	29F	E	E[d]	64F	C	F
42M	B	C	36F	B	C	65F	E	G
45M	B	C	38F	E	E	66F	A	E
52M	C	E	39F	A	F	68F	C	G
61M	A	F	40F	B	E	69F	F	E
62M	C	F	43F	C	F	71F	G	C
						72F	G	C

[a]M following subject number denotes male, F denotes female.

[b]These pictures were not assigned to a triad because there were three forgetting pictures in the group.

[c]These pictures were not assigned to a triad because there were two equally strong forgetting pictures in the group.

[d]Picture IV was accidentally made an enhancement picture.

TABLE 46

ACUITY DATA (in Percents)

Ss[a]	Picture Group						Ss	Picture Group					
	VII-VI-I			IV-V-II				VII-VI-I			IV-V-II		
	1st	2nd	Tot	1st	2nd	Tot		1st	2nd	Tot	1st	2nd	Tot
7M	46.3	62.4	54.3	48.2	70.4	59.3	3F	57.4	65.7	61.6	57.4	50.9	54.2
9M	50.0	49.4	49.7	61.7	57.4	59.5	4F	63.0	35.8	49.4	38.9	62.3	50.6
11M	55.6	55.6	55.6	53.7	44.4	49.0	6F	54.9	46.4	50.7	37.0	48.2	42.6
13M	59.2	52.0	55.6	52.3	68.5	60.4	22F	59.3	53.4	56.4	46.3	35.2	40.7
20M	49.0	60.6	54.8	36.9	47.2	42.0	29F	47.2	50.0	48.6	30.6	64.8	47.7
23M	57.4	49.6	55.4	38.0	59.3	48.6	36F	60.2	48.0	54.5	38.9	58.3	48.6
26M	75.9	42.6	59.3	60.2	62.3	61.2	38F	64.8	50.0	57.4	57.4	40.7	49.1
27M	53.7	59.3	56.5	68.5	54.6	61.6	39F	46.3	57.4	51.9	51.9	63.0	57.4
28M	37.0	46.3	41.7	61.1	58.3	59.7	40F	53.7	59.3	56.5	46.9	50.0	48.5
30M	55.6	54.9	55.2	51.9	50.0	50.9	43F	40.7	53.7	47.2	42.6	46.3	44.4
31M	60.2	44.1	52.2	32.6	65.3	48.9	44F	60.1	47.2	53.7	37.0	47.2	42.1
33M	44.4	61.1	52.8	52.8	50.0	51.4	46F	57.4	51.5	54.5	48.2	54.6	51.4
34M	79.6	57.5	68.6	37.0	52.3	44.7	47F	40.7	35.4	38.1	31.5	40.7	36.1
37M	42.6	53.7	48.2	52.2	35.8	44.0	48F	62.9	46.2	54.6	61.1	52.3	56.7
41M	39.8	43.0	41.4	46.3	47.2	46.8	49F	55.6	60.5	58.0	46.3	46.3	46.3

[a]M following subject number denotes male, F denotes female.

TABLE 46—Continued

Ss	Picture Group						Ss	Picture Group					
	VII-VI-I			IV-V-II				VII-VI-I			IV-V-II		
	1st	2nd	Tot	1st	2nd	Tot		1st	2nd	Tot	1st	2nd	Tot
42M	44.4	39.2	41.8	41.6	44.4	43.0	50F	53.7	34.7	44.2	25.9	48.1	37.0
45M	38.9	31.5	35.2	41.7	38.9	40.3	51F	51.9	63.0	57.4	42.6	35.7	39.2
52M	47.2	52.6	49.9	50.9	35.8	43.4	53F	53.3	42.6	47.9	42.6	49.2	45.9
61M	33.3	59.8	46.7	46.3	66.7	56.5	54F	37.0	47.9	42.5	50.9	37.0	44.0
62M	53.7	46.3	50.0	78.7	35.3	57.0	55F	50.0	35.7	42.9	41.8	40.7	41.3
67M	39.8	50.0	44.9	53.4	50.0	42.4	56F	46.3	55.6	50.9	63.0	57.4	57.4
70M	50.9	58.3	54.6	47.2	65.7	56.5	57F	68.5	49.0	58.8	62.0	31.5	46.8
74M	63.0	54.6	58.7	45.4	49.1	47.2	58F	42.6	48.5	45.5	38.9	60.4	49.6
75M	50.0	53.7	51.9	57.4	53.7	55.7	60F	50.0	43.5	46.8	53.7	40.7	47.2
76M	64.0	55.7	59.7	41.7	64.0	52.8	64F	52.9	64.0	58.4	40.7	59.3	50.0
77M	47.2	44.4	45.8	60.2	50.9	55.5	65F	57.4	50.0	53.7	27.8	51.9	39.8
78M	53.7	48.2	50.9	48.2	50.0	49.0	66F	50.0	64.8	57.4	46.3	48.2	47.2
80M	57.4	52.8	55.1	59.3	44.4	51.9	68F	43.5	55.6	49.5	45.4	53.7	49.5
81M	57.4	38.9	48.1	53.7	50.0	51.8	69F	39.8	48.8	44.3	33.3	46.3	39.8
83M	66.1	37.0	51.6	50.0	35.2	42.6	71F	57.4	39.7	48.5	53.7	54.6	54.2
							72F	37.0	41.7	39.3	60.2	53.7	56.9

TABLE 47

ANXIETY, ACCURACY, AND ERROR SCORES

Ss[b]	Picture VII							Picture VI						
	Type	Anx.	Acc. Scores[a]			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
3F	F	0	419	451	435	260	270	264	N	2	322	239	278	412	270	348
4F	N	1	265	310	281	150	146	147	N	3	382	362	375	500	508	505
6F	N	0	371	359	366	292	240	265	F	1	236	338	283	256	298	280
22F	N	0	344	380	361	182	198	190	N	2	312	293	303	364	386	376
29F	N	0	412	296	352	421	333	378	N	1	312	370	343	298	482	387
36F	E	0	338	323	332	279	439	369	N	4	231	281	253	186	211	200
38F	N	2	286	222	258	053	211	145	F	1	286	392	332	421	329	367
39F	F	0	440	452	446	448	348	404	N	1	280	258	268	310	304	308
40F	E	1	379	406	393	240	455	340	N	0	241	250	246	320	227	277
43F	N	0	227	207	216	250	160	210	N	1	318	379	353	469	520	491
44F	N	1	538	588	560	524	467	491	N	2	185	208	195	143	272	217
46F	F	3	387	359	374	457	355	403	N	2	290	266	279	283	447	370
47F	N	0	227	575	389	344	400	373	N	3	409	277	348	375	332	353
48F	N	0	412	320	373	350	345	347	F	2	176	200	186	200	310	265
49F	N	2	367	245	303	208	193	201	N	1	300	398	351	375	526	446

[a]All accuracy scores are given in thousandths.

[b]F following subject number denotes female, M denotes male.

TABLE 47--Continued

Ss	Picture VII							Picture VI						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
50F	N	0	379	267	335	400	386	392	E	3	241	227	236	260	293	279
51F	N	1	357	324	339	154	100	130	E	0	286	265	274	308	300	304
53F	F	2	479	565	517	238	258	249	N	6	174	087	135	245	258	252
54F	N	0	200	406	316	324	403	360	N	1	200	246	226	353	266	314
55F	F	0	407	311	367	407	300	347	N	2	259	275	266	222	375	308
56F	F	0	360	300	327	276	374	320	F[c]	2	240	353	302	345	243	299
57F	F	0	324	321	323	176	164	169	N	0	243	245	244	176	200	191
58F	E	0	304	306	305	323	323	323	N	1	304	405	358	258	276	267
60F	N	2	333	362	347	296	328	313	E	1	333	298	317	370	361	365
64F	N	0	370	290	326	354	231	300	N	0	350	276	309	162	231	192
65F	N	2	387	333	362	391	296	340	F	0	194	222	207	261	296	280
66F	F	1	259	371	323	444	368	413	N	0	333	286	306	333	158	261
68F	N	1	340	467	411	295	500	385	N	2	277	167	215	230	125	184
69F	N	0	372	455	418	354	411	380	F	1	349	241	289	338	253	299
71F	N	0	290	346	313	348	475	423	N	1	323	234	286	087	255	185
72F	N	0	250	311	282	265	317	290	N	0	275	289	282	382	349	366

[c]The data from this picture were not used because there was either another stronger, forgetting picture, another forgetting picture of equal strength, or two other forgetting pictures in the same group.

TABLE 47—Continued

Ss	Picture VII							Picture VI						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
7M	N	1	480	327	393	379	411	393	F	0	200	252	230	310	435	362
9M	N	1	259	225	242	222	190	206	N	1	222	278	250	407	395	401
11M	E	0	467	333	400	250	417	333	N	0	267	233	250	417	375	396
13M	F	0	250	302	274	228	278	254	E	1	312	226	272	318	355	339
20M	F	0	340	428	388	418	383	403	N	3	245	183	211	255	241	249
23M	N	1	452	448	450	478	364	416	N	0	226	217	222	261	331	298
26M	N	1	317	420	355	346	336	339	N	1	305	222	275	423	354	375
27M	N	1	448	406	426	220	273	245	F	2	241	219	229	340	227	287
28M	N	0	450	360	400	324	259	294	N	3	200	360	289	265	241	254
30M	E	1	300	371	335	292	339	315	N	1	233	214	224	292	361	327
31M	Fc	0	400	336	373	395	375	383	Fc	0	215	267	237	233	255	245
33M	Fc	0	375	273	316	400	238	333	Fc	2	208	303	263	300	429	353
34M	N	0	372	290	338	273	299	290	N	1	233	375	292	273	429	378
37M	F	0	435	379	403	300	280	291	E	1	261	241	250	283	160	228
41M	F	1	419	430	425	477	283	383	N	0	256	182	218	123	228	173

TABLE 47--Continued

Ss	Picture VII							Picture VI						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
42M	E	0	250	142	199	200	245	223	N	1	167	500	323	433	445	440
45M	E	1	381	353	368	364	460	414	N	0	333	235	290	394	351	372
52M	N	0	490	410	448	140	355	242	N	4	314	224	266	491	231	368
61M	F	1	278	356	328	278	234	261	N	2	222	262	248	417	313	378
62M	N	1	397	440	416	326	379	352	N	0	224	200	213	245	207	222
67M	F	1	326	222	268	262	407	328	N	0	302	407	361	431	370	403
70M	F^c	1	255	349	305	189	489	327	F^c	0	327	254	288	340	378	357
74M	F	1	397	508	449	425	469	449	N	1	176	153	165	150	041	090
75M	F	1	259	414	339	333	320	327	N	0	370	276	321	333	360	346
76M	N	1	406	300	356	231	167	195	N	0	203	333	264	154	375	276
77M	F	1	353	500	424	316	322	319	N	2	314	333	323	404	407	405
78M	N	0	414	462	436	400	571	491	F	1	276	192	236	440	286	359
80M	F	0	484	439	462	478	235	351	N	1	065	246	151	087	372	237
81M	N	0	387	524	442	130	273	214	N	1	290	143	231	348	379	366
83M	F	0	252	300	269	284	294	291	N	0	355	250	317	491	353	401

TABLE 47--Continued

Ss	Picture I							Picture IV						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
3F	N	0	258	310	285	326	459	384	N	0	515	399	459	130	320	232
4F	N	1	353	328	344	350	346	348	N	1	333	386	366	273	303	284
6F	N	3	393	302	352	451	461	458	E	2	250	231	239	382	250	323
22F	N	4	344	327	336	454	416	434	N	2	480	263	386	276	171	219
29F	F	1	275	333	305	246	185	216	E	0	394	343	359	267	158	230
36F	N	0	431	396	415	535	350	431	N	0	238	349	305	152	289	207
38F	N	3	429	386	410	526	460	487	N	3	323	409	359	304	375	345
39F	N	0	280	290	286	241	348	288	N	0	536	412	468	385	200	304
40F	N	1	379	344	361	440	318	383	N	3	197	185	191	472	333	405
43F	N	4	455	414	431	281	320	298	N	0	391	360	375	452	345	400
44F	N	0	277	204	245	333	261	292	N	0	250	412	341	206	386	288
46F	N	0	323	374	347	261	198	227	N	0	269	339	306	286	224	257
47F	N	5	364	148	264	281	268	275	N	0	353	318	333	324	375	348
48F	E	2	412	480	441	450	345	388	N	0	273	239	257	000	078	043
49F	F	3	333	357	346	417	281	353	N	0	360	520	440	345	241	293

TABLE 47--Continued

Ss	Picture I							Picture IV						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
50F	N	0	379	506	429	320	307	312	N	0	143	269	225	450	321	397
51F	N	2	357	412	387	538	600	565	N	1	261	311	284	323	239	279
53F	N	1	348	348	348	517	484	499	N	0	522	376	444	290	301	295
54F	N	3	600	348	458	324	330	327	N	1	164	200	179	151	176	165
55F	N	1	333	414	367	370	326	345	N	1	266	318	292	230	250	240
56F	N	1	400	347	371	379	383	381	N	2	412	419	415	450	435	442
57F	N	0	432	434	433	647	618	629	N	5	239	235	238	341	500	443
58F	N	0	391	290	337	419	402	411	N	0	476	307	373	303	338	317
60F	N	0	333	340	337	333	295	313	N	0	448	227	353	240	438	351
64F	N	3	280	435	365	483	538	507	N	1	136	219	185	219	364	278
65F	N	0	419	444	431	348	407	380	N	0	467	357	395	359	308	338
66F	N	1	407	343	371	222	421	304	N	0	200	346	275	414	250	333
68F	N	1	383	367	374	475	375	431	N	1	163	379	280	203	444	312
69F	E	3	279	304	293	308	336	321	N	1	167	240	209	250	241	246
71F	E	0	387	421	401	565	270	392	N	1	310	373	342	160	122	141
72F	E	2	475	400	435	353	333	344	N	0	338	448	390	326	320	322

TABLE 47--Continued

Ss	Picture I							Picture IV						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
7M	E	1	320	422	380	310	154	246	N	0	192	263	234	393	438	409
9M	N	0	519	497	508	370	415	393	E	1	429	258	347	000	261	137
11M	N	1	267	433	350	333	208	271	N	0	241	167	207	160	333	254
13M	N	3	438	472	454	455	369	408	N	1	398	460	433	350	294	328
20M	N	2	415	389	400	327	376	349	N	0	176	314	253	185	351	260
23M	F	8	322	336	329	261	305	285	N	1	195	250	229	209	273	234
26M	E	1	378	358	371	231	310	286	N	1	293	346	320	197	207	215
27M	N	0	310	375	344	440	500	468	E	0	324	441	376	059	250	171
28M	N	2	350	280	311	412	483	444	N	0	545	413	480	476	178	322
30M	N	2	467	415	441	417	300	358	N	2	393	185	291	154	296	226
31M	F^c	2	385	398	390	372	371	371	E	0	426	376	392	317	107	245
33M	F^c	0	417	424	421	300	333	314	N	0	351	482	414	451	333	391
34M	F	4	395	335	370	455	272	331	N	0	200	248	228	206	204	205
37M	N	4	304	379	346	400	560	473	N	0	432	413	425	232	205	217
41M	N	0	326	387	358	400	489	443	N	1	280	294	287	276	210	243

TABLE 47—Continued

Ss	Picture I							Picture IV						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
42M	N	4	583	358	478	367	310	337	N	1	312	250	280	292	233	263
45M	N	5	286	412	342	242	189	214	N	0	489	500	494	508	333	418
52M	N	2	196	367	286	369	414	390	N	3	236	362	288	340	238	282
61M	N	0	500	381	424	306	454	361	N	2	440	250	328	345	111	255
62M	N	6	380	360	370	428	414	416	N	2	318	472	365	261	387	356
67M	F	2	372	370	371	308	222	271	N	1	515	407	448	357	333	345
70M	N	1	418	397	407	472	133	316	N	0	431	465	451	228	432	309
74M	N	1	426	339	386	425	490	461	N	0	306	377	343	068	164	114
75M	N	4	370	310	339	333	320	327	N	3	323	379	350	130	120	125
76M	N	6	391	367	380	615	458	529	N	1	133	188	167	196	103	160
77M	N	2	333	167	252	281	271	276	N	0	431	327	383	442	189	302
78M	N	3	310	346	327	160	143	151	N	1	154	148	151	214	333	273
80M	N	3	452	316	387	435	392	412	N	1	406	250	339	273	167	196
81M	N	0	322	333	327	500	333	402	N	1	276	333	304	200	407	308
83M	F	3	392	450	413	225	353	308	N	0	519	526	522	630	471	532

TABLE 47--Continued

Ss	Picture V							Picture II						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
3F	N	0	192	272	230	347	226	283	F	0	290	327	306	521	452	485
4F	E	8	381	267	311	212	254	228	F	0	286	346	323	515	442	487
6F	N	6	450	346	391	235	250	242	N	0	300	423	370	382	500	436
22F	F	1	240	474	341	414	286	344	N	2	280	263	273	310	543	437
29F	F	2	364	286	311	293	368	319	N	0	242	371	330	427	474	442
36F	N	4	381	318	343	242	178	216	N	0	381	333	352	606	533	577
38F	F	4	355	318	340	217	188	200	F^c	1	323	273	301	478	438	455
39F	F	3	214	353	290	269	375	315	E	0	250	235	242	346	425	380
40F	F^c	2	552	519	535	074	148	110	F	4	251	296	274	454	519	485
43F	F	6	391	440	417	145	241	192	E	0	217	200	208	403	414	408
44F	N	1	400	157	264	265	211	240	F	6	350	431	396	529	386	464
46F	F	5	346	356	351	179	224	200	N	0	385	305	342	518	551	533
47F	E	0	294	364	333	324	406	362	F	1	353	318	333	351	219	290
48F	F	0	364	283	327	381	359	369	N	0	364	478	416	619	563	588
49F	N	4	280	280	280	172	345	259	F	1	360	200	280	483	414	448

TABLE 47--Continued

Ss	Picture V							Picture II					
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
50F	N	4	357	346	350	250	357	294	F	1	500	585	425	300	321	309
51F	N	2	478	414	449	226	213	219	N	2	261	275	267	436	547	495
53F	F	3	174	398	294	290	292	291	F[c]	0	304	226	262	419	408	414
54F	E	2	473	450	463	415	471	446	N	1	364	350	358	434	353	388
55F	E	1	469	454	462	286	375	331	N	5	266	227	247	483	375	429
56F	N	4	294	258	277	250	261	256	E	0	294	323	307	300	304	302
57F	N	1	373	353	366	244	135	174	N	0	388	412	396	415	351	374
58F	N	2	286	368	336	273	242	261	N	2	238	325	291	394	420	404
60F	N	4	310	409	353	360	281	316	N	1	241	364	294	400	281	333
64F	E	0	364	328	343	500	500	500	F	3	500	453	472	281	136	222
65F	N	5	267	393	350	205	231	215	E	0	267	250	256	436	462	446
66F	N	6	400	308	353	103	286	193	F	0	400	346	373	483	464	474
68F	N	2	429	207	308	576	200	404	E	0	408	414	411	220	360	284
69F	N	1	278	360	326	333	276	308	F	0	556	400	465	417	483	446
71F	N	1	414	339	376	560	429	495	N	0	276	288	282	280	449	364
72F	N	4	338	241	293	186	320	258	N	1	323	310	317	488	360	419

TABLE 47--Continued

Ss	Picture V							Picture II						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
7M	N	1	462	316	375	179	312	227	N	1	346	421	390	429	250	364
9M	N	9	360	355	358	531	217	366	N	0	210	387	295	469	523	497
11M	N	6	414	458	434	400	233	309	F	0	345	375	359	440	433	436
13M	N	2	319	297	306	277	294	284	N	0	283	243	260	374	412	389
20M	N	0	452	294	363	155	246	196	N	3	372	392	383	660	404	543
23M	Fc	0	561	500	524	388	318	360	F	0	244	250	248	403	409	405
26M	N	1	461	446	453	393	362	358	N	2	246	208	227	410	432	426
27M	N	5	324	287	308	294	245	265	N	0	351	271	316	647	506	564
28M	F	3	273	381	326	190	422	310	E	1	182	206	194	333	400	368
30M	N	6	429	556	491	462	370	415	N	4	179	259	218	385	333	359
31M	N	4	454	369	397	216	373	269	N	1	120	255	210	467	521	485
33M	F	2	281	259	270	078	222	152	E	0	368	259	315	471	444	457
34M	E	5	500	398	440	235	272	251	F	4	300	354	332	559	524	544
37M	Fc	5	213	328	260	237	346	300	F	4	355	258	316	531	433	479
41M	F	0	240	431	337	207	316	261	N	6	480	275	376	517	474	496

TABLE 47—Continued

Ss	Picture V							Picture II						
	Type	Anx.	Acc. Scores			Err. Scores			Type	Anx.	Acc. Scores			Err. Scores		
			1st	2nd	Tot	1st	2nd	Tot			1st	2nd	Tot	1st	2nd	Tot
42M	N	3	377	250	311	349	300	325	N	0	312	500	409	360	467	412
45M	N	2	289	310	299	254	364	310	N	0	222	190	207	238	273	256
52M	F	1	364	328	349	377	375	376	N	0	400	310	363	283	387	342
61M	E	4	360	444	410	276	333	298	F	0	200	306	262	362	556	436
62M	F	0	400	472	422	435	213	267	E	0	282	056	212	304	401	377
67M	F^c	3	243	259	251	280	330	308	F	0	243	333	287	362	333	347
70M	E	0	412	282	336	386	297	351	N	4	157	254	213	386	270	340
74M	E	0	531	359	441	576	291	438	F	3	163	264	216	356	545	447
75M	N	0	323	345	333	391	560	479	N	1	355	276	317	478	320	396
76M	N	2	444	435	438	200	154	182	F	0	423	377	395	604	744	657
77M	N	4	277	455	358	140	415	292	E	1	292	218	258	419	396	406
78M	N	3	346	333	340	071	222	145	N	0	500	519	509	714	444	582
80M	F	3	250	208	232	318	333	304	N	0	344	542	429	409	500	429
81M	N	1	241	148	196	280	296	288	E	2	483	519	500	520	296	404
83M	F^c	4	148	316	217	148	286	222	F	0	333	158	261	222	229	222

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