DOCTORAL DISSERTATION SERIES
Publication No.: 11,341

AUTHOR: Thomas Edward Pustell, Ph. D., 1955
University of Michigan

TITLE: CUE AND DRIVE ASPECTS OF ANXIETY IN RELATION TO PERCEPTUAL VIGILANCE AND DEFENSE

University Microfilms, Ann Arbor, Michigan

CUE AND DRIVE ASPECTS OF ANXIETY IN RELATION TO PERCEPTUAL VIGILANCE AND DEFENSE

by
Thomas EDWARD Pustell

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in the
University of Michigan
1954

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Abstract of Dissertation
University of Michigan

Department of Psychology
1954

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The present study was primarily an exploration of a new technique for the study of discrimination without clear conscious awareness (subception). Predictions derived from several theoretical interpretations of the work of Blum, and Lazarus and McCleary were tested.

The procedure attempted to study some perceptual consequences of affect which was experimentally associated with a previously neutral stimulus. Subjects were given either negative or positive reinforcements (electric shock or money) paired with one of four geometrical figures. There were 12 men and 12 women in the negative reinforcement, and there were 12 men and eight women in the positive reinforcement group. This procedure was similar to classical rather than instrumental conditioning, since the subject's responses had no effect upon the administration of reinforcements. In addition, the inadvertant reinforcement of his responses was not possible, because the subject could not give a response before the reinforcement was delivered.

Under conditions of low illumination and short stimulus exposures, the subject made the same series of perceptual judgments both before and after these experimental treatments. The four stimuli, which were presented simultaneously by tachistoscope, were equidistant from the center of the presenting field. Each one appeared an equal number of times in all positions used. The subject was instructed to designate the position (top, bottom, left or right) of whichever of the four stimuli "stands out the most" because "one design is darker than the other three." Unknown to the subject all four of the stimuli were actually equally dark and approximately equal in attention getting value. If the operation produced an increase in the frequency of choice of the critical stimulus, this was considered perceptual vigilance. A comparable decrease was considered perceptual defense. Also obtained were scores

on the Pd scale from the MMPI, the Taylor Manifest Anxiety Scale and a post-experimental objective measure of each subject's level of awareness.

Practically all statistically significant findings occurred in the shock group. All 12 males showed perceptual vigilance. This is interpreted as confirmation of the hypothesis that moderately strong anxiety can function as a cue or signal which heightens perception. All of the low awareness females (six out of 12) showed perceptual defense. It is suggested that this can be attributed to a stronger anxiety reaction to electric shock on the part of the females. This interpretation leads to the proposal that anxiety of intense drive proportions is reduced by perceptual defense whenever (1) escape or other constructive means of drive reduction are impossible, and (2) perceptual conditions are vague or ambiguous. Thus, under certain conditions the drive function of anxiety is considered to promote perceptual defense, and under other conditions the cue function is considered to promote perceptual vigilance. This "cue-drive hypothesis" is applied not only to the highly significant sex difference in reaction to the shock signal, but also to previous experimental findings.

Random results among women in the shock group at close-to-conscious awareness are among the findings which are interpreted as evidence that semi-conscious sets and ideas of the subject may either inhibit or reinforce more automatic perceptual changes, except at levels of awareness which are far below usual statistical thresholds.

No significant perceptual changes were found as a function of the monetary reinforcements. The failure of such "reward" to influence perceptual judgments is attributed to the inability of occasional, very small reinforcements (fifteen cents in nickels) to induce strong positive feelings in the face of a fatiguing and monotonous three-hour procedure.

No significant trends were found in relation to the Pd and Taylor scales.

ACKNOWLEDGEMENT

I am indebted to all the members of my committee, and especially to the chairman, Dr. Edward L. Walker, for much unselfishly given intellectual stimulation and helpful guidance. I owe a similar debt to Dr. John W. Atkinson, who served on the committee for a time, and was most helpful in sharpening the theorizing which was the background for this study. Dr. Carl R. Brown and Mr. George R. Fisher were indispensable in the design and construction of much of the apparatus, and Mr. Keith Smith and Dr. David Birch provided sound advice regarding statistical matters. To Dr. Wesley Allinsmith, who made his class available for subject recruitment, and to the subjects themselves, I am also indebted. Finally, I am most greatful to the person who played the most important part in making this work possible, my wife, Margery.

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CHAPTER I

THE PROBLEM

Background of the Problem

Although many recent psychological experiments deal with the notions of "perceptual vigilance" and "perceptual defense," very few of them utilize discriminations which are made without conscious awareness. Instead, studies in this area have for the most part dealt with variations in conscious recognition thresholds (2, 9, 16). Such studies have met with considerable criticism, particularly on the grounds that results may in part be a function of the unknown extent to which subjects may more or less consciously alter their recognition reports (13, 15, 23, 24). The present study seeks to avoid this difficulty by employing responses which do not require that the subject consciously recognize anything.

The process by which a discrimination response is made without conscious awareness on the part of the subject has been called "subception" by Lazarus and McCleary (15). Although they employed the term in reference to autonomic discrimination without awareness, "subception" is equally appropriate as a description of the process by which any discrimination response is made without conscious awareness. Consequently we will employ the concept in this more inclusive sense.

An excellent summary of the few studies which have concerned themselves with subception is provided by Helson (11). One of the earliest of these studies was done by J. G. Miller (18), who asked the subject to guess which of five stimulus figures the experimenter was exposing in another room. Unknown to the subject, the actual figures were dimly illuminated from behind a one-way mirror, into which he had been asked to look. Accuracy of report was better than chance even when the subject was not aware that he was seeing anything. Furthermore it increased as illumination level was raised. Interestingly there was a marked drop in the threshold of conscious awareness after the subjects had been informed that they were actually seeing something.

Other studies of subception have used bodily responses as indicators of discrimination without awareness. Davis (6) found that electrically recorded muscular tension responses occurred to auditory stimuli which the subject was unable to hear. McGinnies (16) found stronger galvanic skin responses to socially taboo words than to neutral words which were presented tachistoscopically below recognition threshold. His experiment was criticized particularly on the grounds that reluctance to report taboo words may have made the conscious thresholds inaccurate (13, 17); however, a subsequent experiment by Lazarus and McCleary (15) confirms the plausibility of such results. They used nonsense syllables as stimuli. During training half of the syllables were associated with electric shock and half were neutral. After this training the stimuli were presented at several tachistoscopic speeds. No shock was used in this part of the experiment but the subject's expectancy of shock in

connection with half of the syllables was maintained. It was found that even when the subjects were unable to identify the syllables correctly, they nevertheless gave a stronger galvanic skin response to the shock syllables than to the neutral syllables. Thus the results of these three studies all indicate that the organism may give bodily responses to stimuli of which it is not consciously aware.[1]

A more recent study by Blum (3) employs a perceptual judgment response but seeks to avoid the pitfall of conscious suppression by not requiring the subject to make a recognition response. He found evidence for "perceptual vigilance and defense" in response to conflict stimuli presented tachistoscopically at two levels of awareness. The stimuli employed were four of the Blacky Pictures.[2] In the vigilance series patterns of four stimuli were presented at a fast speed (.03 seconds) and the subject merely indicated the location of the one which "stands out the most" by saying left, right, top or bottom. At this speed none of the subjects correctly guessed that he was looking at pictures of dogs. Next came a "sensitization" procedure during which two of the stimuli were shown to the subject and one of them was structured traumatically (Oral Sadism for women and Masturbation

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[1] In a recent analysis of the Lazarus and McCleary data, Howes (12), has suggested that the postulation of subception as a mechanism of "unconscious perception" is not necessary when the statistical nature of discrimination is taken into account. However, he agrees that the experimental results establish the existence of the subception effect, and he proposes an alternative, more general interpretation of this effect without denying its existence.

[2] This is a projective test made up of cartoon-like pictures of incidents in the life of a dog named Blacky. Each picture is designed to elicit material relevant to one of the psychosexual stages in psychoanalytic theory.

Guilt for men). This was done by means of the experimenter's comments about the depicted incident. Then the original task was repeated at the same fast speed. Most subjects tended to shift relatively more often to the traumatic picture than to the neutrally structured control, indicating perceptual vigilance for the traumatic stimulus at a low level of awareness. Next came the defense series, in which a longer exposure of .20 seconds was used--a speed at which the subjects could very frequently recognize one or more of the pictures. In this series the subject was given a different task, that of alternately trying to locate the positions of the conflict and neutral pictures. At this close-to-conscious level there was generally less success in locating the conflict picture than in locating the neutral one, indicating an avoidance of the conflict stimulus at this higher level of awareness. Because the subjects could at least partially recognize what they were seeing during this defense series, the extent of more or less conscious determinants of their responses is unknown. However, the perceptual vigilance found at the lower level of awareness is less open to question, because of the likelihood that they were recognizing little or nothing during the repeat run at the fast speed.[1] Thus this study adds to the evidence that "discrimination without awareness" is a demonstrable phenomenon.[2]

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[1] Greater confidence in the perceptual vigilance finding is also indicated by the work of Cutler (5). Using a procedure similar to Blum's, he obtained vigilance for conflict words at a low level of awareness but failed to obtain significant defense at higher awareness.

[2] A second tachistoscopic experiment was completed by Blum (4) too recently to be considered as a part of the background of the present study. Therefore it will be considered in the discussion chapter rather than at this point.

Theory of the Problem

The problem investigated in the present study was derived principally from a consideration of the studies of Lazarus and McCleary, and Blum. The present writer felt that it would be possible to combine aspects of both approaches in order to explore further the nature of subception phenomena. Thus a procedure was sought which would combine the perceptual judgment responses used by Blum with the artificially induced motivation and originally neutral stimuli employed by Lazarus and McCleary. It was hoped that such an exploratory experiment would provide evidence relevant to some theoretical formulations suggested by the phenomena which were produced in Blum's experiment.

The Approach-Avoidance Orientation

Let us first consider Blum's own psychoanalytic theorizing. The preference for the conflict stimulus at the low level of awareness is said to reflect the striving of repressed psychosexual impulses for conscious behavioral expression. This seems similar to saying that at a low level of awareness, the approach component of an approach-avoidance conflict predominates. However, at the higher level of awareness, and with a task requiring active searching for the conflict stimulus, Blum proposes that the associated threatening impulses are so close to consciousness that the ego avoids recognizing them by means of perceptual defense. And so at this point it is as if the avoidance component of an approach avoidance conflict predominates. Blum's theorizing and an application of Neal Miller's formulation of an approach-avoidance conflict (19) are thus analogous in this context.

This parallel was pointed out by J. W. Atkinson in a personal communication. The assumption is required that an increase in tachistoscopic speed of presentation is equivalent to going farther from an object which has both approach and avoidance valences. With this assumption granted, Miller's conception would predict the predominance of approach responses at fast speeds and the predominance of avoidance responses at slow speeds. Because these two dualistic theories make parallel predictions, we will refer to them together as the approach-avoidance orientation, despite their very different theoretical origins.

Affect as a Cue

A second orientation would attempt to explain the occurrence of perceptual vigilance as a function of the cue or signal aspects of anxiety. Vigilance would then be looked upon as a manifestation of the organism's hypersensitivity to a danger signal, rather than being seen as a reflection of an approach toward attractive but taboo impulses. It is possible then that the traumatic stimulus in the Blum experiment served to elicit an anxiety reaction in the same way that shock syllables did in the Lazarus and McCleary experiment. The use of such a flash of anxiety as a cue or danger signal is compatible with much psychological theorizing.[1] Thus Dollard and Miller (7) have spoken of the use of any mild stimulation as a cue which guides behavior. Also Freud refers specifically to this function of anxiety:

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[1] The absence of lowered recognition thresholds for shock syllables in the Lazarus and McCleary experiment does not contradict this point of view because many other factors, such as the subject's definition of the situation, also influence his recognition threshold. Such factors were minimized in the Blum experiment because recognition was not required.

> One is tempted therefore to assert that the development of anxiety is never expedient; perhaps a closer dissection of the situation in dread will give us a better insight into it. The first thing about it is the 'readiness' for danger, which expresses itself in heightened sensorial perception and in motor tension. This expectant readiness is obviously advantageous . . . . The more the development of dread is limited to a flash, to a mere signal, the less does it hinder the transition from the state of anxious readiness to that of action, and the more expediently does the whole course of events proceed (10, p. 343).

The Cue-Drive Orientation

If we adopt the cue function of anxiety as the explanation for the perceptual vigilance, then we must also adopt one of a number of alternative explanations of the perceptual defense. One such explanation of defense at high awareness relies upon the distinction between stimulation as a cue and as a drive, which is made by Dollard and Miller. They say that all stimulation has both cue and drive properties. At relatively low intensities of stimulation, the cue properties predominate, and at high intensities of stimulation, the drive properties predominate. In order to apply this distinction to Blum's experiment we must make the assumption that higher awareness of the traumatic picture would tend to elicit stronger anxiety. The notion is that the clearer the stimulus becomes, the more definitely is it perceived as belonging in the general class of "anxiety provoking situations." Thus the higher the awareness, the greater would be the generalization of anxiety from the past to the present. This would mean then that at low awareness the traumatic stimulus would elicit mild anxiety, which would act as a cue and produce vigilance, whereas at high awareness the increased strength of the anxiety would involve drive as well as cue value. The drive function of anxiety would then motivate defensiveness as one possible

way of reducing this unpleasant stimulation. At this stronger intensity of anxiety its cue properties would be working toward vigilance, whereas its drive properties would be working toward defense. This orientation, which assumes the operation of these two functions of stimulation, will be referred to as the "cue-drive" point of view.

Conscious Threshold Interference (CTI)

Another explanation of Blum's findings at the higher level of awareness is different from the previous ones in that it does not assume the involvement of a defensive process. We will refer to this notion as "conscious threshold interference" (CTI). As in the cue-drive interpretation the vigilance effect at low awareness would be attributed to the cue aspect of anxiety. However at the higher level of awareness, where the conscious threshold is approached, the CTI theory hypothesizes that a whole host of semi-conscious associations, expectations, hypotheses, hopes, fears and other thoughts come into play. Such covert responses would compete with the response of locating the affective stimulus, thus interfering with the subject's efficiency at the assigned task. If we grant that there are more and/or stronger associations to the traumatic stimulus, then any vigilance resulting from the cue functions of anxiety would be reduced or reversed by CTI whenever the conscious threshold was approached. It is important to note that this decrease in perceptual acuity near the conscious threshold is considered to be a function of strong associations, competing hypotheses and the like. Therefore, in contrast to the previous orientations considered, CTI is hypothesized to be <u>disruptive</u> rather than <u>defensive</u> in nature.

The problem for the present study was that of finding situations in which these different theoretical speculations would lead to different predictions. It was hoped that this could be achieved with a procedure involving the experimental induction of positive or negative affect toward one of four originally neutral stimuli. If negative affect was induced, there would be no approach tendency present to explain any perceptual vigilance that might occur. Hence the approach-avoidance formulation would be less tenable. In the case of the induction of positive affect, all the formulations would predict vigilance (either on the basis of approach to a desirable object or on the basis of positive affect functioning as a cue or signal). However, if in the case of positive affect, defensive-like reactions occurred near conscious threshold, this would support the notion of CTI. This is because avoidance of a positive object cannot very well be looked upon as defensive in nature.

CHAPTER II

THE EXPERIMENTAL DESIGN

Subjects

All subjects were students at the University of Michigan who were naive regarding experimental psychology. The bulk of them were recruited from an undergraduate course in the psychology of adjustment, a few from the student employment service, a few from "friends of friends," and a few from telephoning at random undergraduate listings in the student directory. Group N consisted of 12 males and 12 females who agreed to take part in a paid "experiment on the psychology of vision." Group P consisted of 12 males and eight females who agreed to take part in an "experiment on the psychology of vision, during which you will be paid sums of money from time to time as part of the procedure."

Apparatus

The tachistoscope used in this experiment was designed for use by one subject at a time, and was manufactured by R. Gerbrands of Arlington, Massachusetts.

The stimuli included four "test cards." These were made by cutting triangles, circles, squares and diamonds out of black paper, and mounting one of each of these stimuli on each of four pieces of white cardboard. On every card there was a stimulus at the top,

and different ones at the bottom, the left and the right. In order to counterbalance the effects of any position tendencies, each stimulus appeared once in each of the four positions.

The stimulus figures were about one square inch in area, and were roughly equated for attention-getting value with pilot subjects. At various fast speeds they were given the task of picking the one that "stands out the most." The sizes of the stimuli were altered minutely until stimulus preferences were approximately equal. There was no need for a perfect match, because of the nature of the control which each subject provided for himself. This will be described in the next section.

Sixteen "training cards" were also used. They consisted of four sets of four cards each. Any given set was identical with the four test cards, except that on each card only one of the stimulus figures was in black and the other three were in light grey. Thus there was one set with a black circle and the three other stimuli in grey on each card. A second set had a black triangle, a third a black square, and a fourth a black diamond on each card, with the remaining stimuli in grey.

The illumination of the adaptation field was 6.29 foot lamberts, and that of the presentation field only .0425 foot lamberts. The presentation field was dimly illuminated in this fashion because it had been found that at bright illuminations the solid, black stimulus figures could be seen clearly even at very fast speeds.

Procedure

Group N, Negative Affect

All subjects were run individually, the entire procedure usually taking a little less than three hours. As a first step the subject was asked to fill out a questionnaire consisting of 182 true-false items from the Minnesota Multiphasic Personality Inventory (MMPI). Included were all the items in the L, K, F and Pd scales of the MMPI, in addition to the 50 items from that test which make up the Taylor Manifest Anxiety Scale (26). The four MMPI scales were used mostly as "padding" for the anxiety scale; however, the Pd scale was also included because Bitterman and Kniffin (2) find a positive correlation between Pd score and reluctance to report the recognition of socially taboo material.

Next the subject was familiarized with the tachistoscope and asked to try to recognize "something written there that will be flashed very rapidly." Then the hand printed letters "QZY" were flashed in the center of the presentation field for .10 seconds. This procedure was repeated, with the duration of exposure increased by .05 seconds each time, until the subject had correctly identified the letters twice in succession. This procedure served to give the experimenter a rough preliminary estimate of differences in the awareness thresholds of the various subjects.

Baseline Procedure

Next the following instructions were read to the subject in an informal way:

Now I'm going to present some patterns or designs very quickly at a fraction of a second. There will be four designs shown simultaneously each time--one at the left, one at the right, one at the top and one at the bottom. (Here a rough sketch of the presentation field was drawn on which the four locations were indicated with X's.) Many different combinations of four designs will be used. At such a fast speed you'll have the feeling that you can see only some blurs or else nothing at all.

These are dark designs on a white background. And each time one design is darker than the other three, so that it stands out more than they do. Each time, I'd like you to tell me which one of the four stands out the most. Just say left, right, top or bottom. And each time force yourself to choose the one that stands out the most even though you feel there is absolutely no basis for your choice. This can be quite frustrating because you may feel like you're not seeing much of anything, but we know that people do much better than chance even when they have no confidence in their judgments.

Keep your eyes in the eyepiece throughout each series to maintain your adaptation level. Each time I say ready, look at the fixation point so that you will have a chance to see each of the four designs equally well.

Try to keep an open mind each time, until the designs are presented. And then quickly force yourself to choose left, right, top or bottom.

Then 12 trials were run at .10 seconds with the four test cards. Note that contrary to the expectancy given the subject, all four of the stimuli were dark each time. Hence there was no correct response, even though the subject believed that there was.

Next the subject was questioned about what he had been able to make out during the 12 trials. On the basis of his report, and his threshold in the recognition of QZY, the experimenter estimated the particular speed which the baseline should employ in order to keep below the subject's conscious threshold.

After the speed was set at .08, .09, or .10 seconds, a baseline of 64 trials was run in which the four test cards were still being used. There was a short rest pause after each block of 16 trials. In order to counterbalance sequence effects, each card appeared once in every four presentations, the order within each group of four being

random. At the end of this procedure the subject was questioned about what he had been able to see during the baseline run.

The purpose of the baseline was to obtain an indication of the subject's perceptual preferences prior to the introduction of the experimental training. A repetition of this baseline following training would then reflect any alterations in these preferences.

Training and Test Procedures

Next the shock electrodes were attached to the subject's right forearm, and several test shocks were given in order to determine the strongest intensity of shock which the subject could be talked into tolerating. Usually it was possible to get him to allow the level to be increased beyond the point where he had first decided he would not allow a higher intensity. He was cajoled into allowing increases in intensity until a firm and final refusal was met. This was the intensity level used during the training procedure.

The subject was then told that (1) the experimenter would continue to present four designs each time, and that the subject was to continue to pick out the one that stood out the most; (2) it would be easier to see the one that stood out the most because we would start out with some much slower speeds, and then later get back to some fast ones; (3) it would be necessary to shock him, but only in connection with a certain "danger signal"--something that he would see in the tachistoscope; (4) the danger signal was something simple--there was no "catch" to it--so that after a few shocks he would probably have a pretty good idea of what it was; (5) it would not be necessary to shock him every time that the danger signal appeared;

(6) he would never be shocked without the danger signal, which would appear a fraction of a second before the shock; and (7) what he picked or said in connection with which one stood out the most would have no effect on whether or not he got a shock--that would be determined by something else.

The training procedure, as described below, was then begun. It had as its purpose the induction or "conditioning" of fear or anxiety in connection with one of the four stimulus figures. After this a repetition of the baseline procedure would reveal any perceptual shifts occurring as a result of such "conditioned" affect. For example, if shock was associated with the circle, the subject might later either avoid circles or perhaps choose them very frequently. In case the relative ease of producing shifts might not be equivalent for each of the four stimuli, an equal number of subjects (three men and three women) were trained on each of them. The stimulus to be associated with shock for a given subject was randomly chosen ahead of time and is referred to as the "critical stimulus."

The training procedure consisted of nine 16-trial blocks which were begun at an exposure speed which was definitely above conscious threshold (one second). In subsequent blocks, speeds were increased from time to time up to .15 seconds, which was subjectively nearly as fast as the baseline. The training cards (each having one black and three grey stimuli) were used in this part of the experiment. The subject's first clear perceptions, therefore, revealed to him exactly what he had been told he had been seeing during the fast speed employed during the baseline procedure, when all the stimuli had actually been black.

A training block consisted of the presentation in random order of each of the 16 training cards. Like all of the three neutral stimuli, the critical stimulus appeared (in black) four times in each training block, once in each of the four positions. After the first training block the subject was told what the critical stimulus was, provided he had not already guessed it. This was done in order to induce selective anxiety rather than generalized apprehension.

A partial reinforcement schedule was used, shock being delivered by an automatic timer approximately .3 seconds after the onset of the critical stimulus and lasting for one second. This timing of the shock prevented all of the subjects from giving any responses prior to the onset of shock. This precluded the possibility of reinforcing or inhibiting any of the subject's verbal responses. Also note that this training was similar to classical rather than instrumental conditioning, with the subject's responses being irrelevant to the reinforcements.

The training and test schedule are shown in Table 1. The partial reinforcement and the gradually increasing speeds used in the training and test procedures were designed to provide a gradual transition from the shock training to the "shockless" test repeat of the baseline, which would go undetected by the subject. This was done in order to keep the subject's expectancy of shock as high as possible during the test procedure.[1] For the same reason it was also necessary

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[1] Work with pilot subjects had indicated that there was no change in perceptual preferences from the baseline to the test procedure if the shock electrodes were removed for the latter procedure. This was apparently because any "conditioned" anxiety disappeared as soon as the subjects could see that they were no longer in danger of being shocked.

to insert two additional blocks of training between the first and last halves of the test procedure. During Training Blocks I-VII the subject received a total of four shocks with each position in which

TABLE 1

TABLE SHOWING THE EXPOSURE SPEED, NUMBER OF REINFORCEMENTS AND KIND OF STIMULI EMPLOYED IN EACH 16-TRIAL BLOCK OF THE TRAINING AND TEST PROCEDURES

	Training Blocks I - VII							Test Blocks I & II		Training Blocks VIII & IX		Test Blocks III & IV	
Speed	1.00	1.00	.70	.70	.35	.35	.15	B	B	.15	.15	B	B
Number Shocks	4	3	0	3	1	3	2	0	0	2	2	0	0
Stimuli	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Te	Te	Tr	Tr	Te	Te

B: Baseline speed (.08, .09 or .10 seconds)
Tr: Training Cards - 1 black and 3 grey stimuli per card.
Te: Test Cards - 4 black stimuli per card.

he had seen the critical stimulus, a grand total of 16 shocks out of 28 presentations of the critical stimulus. Then unknown to the subject, the test cards were substituted for the training cards and the first half of the baseline was repeated without shock (Test Blocks I and II). Next, switching back to the training cards, two more training blocks (VIII and IX) were run. In these two blocks one more shock was delivered in each position, making a total of five for each position, or a final total of 20 shocks out of 36 presentations of the critical stimulus. Finally, in Test Blocks III and IV the test cards were again used to repeat the last half of the baseline without further shock. It should be noted then that in this procedure shock was never delivered in connection with the test cards, which were used for both the baseline

and the test procedures.

Level of Awareness Procedure

After the electrodes had been removed and the experimenter had announced that no more electric shock was to be used, the subject was given a short rest pause. Then the experimenter gave approximately the following instructions.

Now the next part of the experiment is a very important part, because I need a good, reliable indicator of your ability to see in this kind of situation.

So what I am going to do is to continue presenting four designs at a time--but this time I'll ask you to look for a certain design each time. I'll ask you to look for the square, or the circle, or the diamond or the triangle. And after I do that, I'll say ready. You look at the fixation point same as before. There'll be a flash, and then you try to locate the particular thing that I've asked for. Just say top, bottom, left or right. And force yourself to pick something even though you're not at all sure.

Sixty-four trials were run in this fashion, with a rest pause after every 16 trials. Since the purpose of this level of awareness procedure was the obtaining of an indication of how much the subject had been able to see during the baseline and test procedures, the same stimulus cards and the same speed were employed here as in those procedures.

It seemed best to obtain this measure of awareness after the experiment proper rather than before, because preliminary subjects had invariably shown a considerable lowering of recognition threshold after becoming a little experienced with the situation. Therefore any measure taken at the start would probably have underestimated the level of awareness attained by the subject after the long experience of the training period. Presumably after 64 baseline trials, 144 training trials and 64 test trials, the rate of improvement would have leveled

off enough so that the level of awareness procedure would give a good approximation of what the subject had been able to perceive in the immediately preceding test procedure. However, since fatigue factors might raise the threshold again, our instructions were designed to keep the subject motivated. Although the final result is bound to be somewhat in error, it probably provides enough information to order the subjects' awareness levels without gross distortion.

The experiment was followed by an unstructured question period during which the subject was encouraged to tell about what he had noticed or suspected and how he thought he had reacted during the various phases of the experiment.

Group P, Positive Affect

The entire procedure for Group P was identical with that for Group N except for some modifications in the training procedure, which will be described next.

Training Procedure

The directions and procedure during training were the same as those used in the shock training except that the reinforcements were meant to be rewarding instead of punishing. Thus instead of being told about a "danger signal," the subject was told that he would get deliveries of money, consisting of "fifteen cents in nickels" in connection with a "money signal." He was also told, "The money will be yours to keep at the close of the experiment." The reinforcement schedule, the speeds employed, and the stimulus card manipulation were just as described in the Group N procedure and as summarized in Table 1. Since the subject received 20 reinforcements he finished up with 60

nickels, or $3.00 at the end of the training.

A word about the method of delivering the nickels is in order at this point. The supply of nickels was contained in a vertical brass tube about four and three quarters inches high. It was mounted directly behind the presenting field of the tachistoscope. The experimenter manually released three nickels at a time, simply by pushing a metal slide. Thereupon the money clattered noisily down a metal chute into a receptacle located directly in front of the subject and about a foot below the tachistoscope eyepiece. Since the receptacle was part of an old bell, the coins landed with considerable clanging. During rest pauses the subject could see the accumulated pile of coins, but he was told to leave the money in the receptacle until the end of the experiment. Since the money was released manually, the timing was not as precise in this case as with the automatically delivered shock. However in the vast majority of reinforcements, the experimenter succeeded in starting the money on its way a fraction of a second after the onset of the critical stimulus, and a little before the subject gave his response.

CHAPTER III

RESULTS

Group N

Results for the 24 subjects in Group N are presented in Table 2. The dependent variable with which we are concerned is the ratio of the number of times that the critical stimulus was chosen during the test procedure to the number of times it was chosen during the baseline procedure. For convenience we will refer to this variable as the "test-base ratio." A test-base ratio greater than one, reflecting an <u>increase</u> in choices of the critical stimulus from baseline to test runs, will be said to indicate perceptual vigilance. Similarly a test-base ratio of less than one, reflecting a <u>decrease</u> in choices of the critical stimulus from base to test runs, will be said to indicate perceptual defense. A ratio of this nature makes an allowance for each subject's predisposition to pick his critical stimulus prior to the introduction of the training procedure. In addition a ratio avoids the problem of having to make intersubject comparisons of perceptual shifts in different units, avoiding the question for example as to whether an increase of five triangles is exactly equivalent to an increase of five squares.

One of the major problems in the analysis of the data was that of finding a meaningful way to classify each subject's performance as belonging to either a high or a low level of awareness

TABLE 2

EXPERIMENTAL DATA, GROUP N

Subject	Sex	High or Low Awareness	Level of Awareness (%) S	T	D	C	General	Critical Stimulus Choices Base	Test	Test-Base Ratio	Chi Square	2-Tail p Level
1	M	L	25	25	38	44*	33	13	30	2.31	10.12	.01
2	M	L	19	19*	19	25	20	12	18	1.50	1.56	.30
3	F	L	44	56	50*	56	52	16	8	.50	3.28	.10
4	M	H	62*	44	44	62	53	14	23	1.64	3.07	.10
5	M	H	75	88	81	81*	81	15	21	1.40	1.39	.30
6	F	H	56	69*	12	62	50	14	33	2.36	12.13	.001
7	M	H	62*	62	62	62	62	12	14	1.17	.19	.70
8	F	L	38	25	38	25*	31	18	10	.56	2.92	.10
9	M	H	25	25	19*	75	36	15	19	1.27	.64	.50
10	M	L	44	38*	38	31	38	17	23	1.35	1.30	.30
11	F	H	83*	67	58	83	73	18	12	.67	1.56	.30
12	M	L	25	25	38*	38	31	14	16	1.14	.17	.70
13	F	L	6*	38	12	19	19	21	9	.43	6.26	.02
14	F	L	12	31	38*	44	31	17	16	.94	.04	.90
15	F	H	94	94	81	100*	92	16	23	1.44	1.80	.20
16	F	H	75	75*	25	62	59	21	32	1.52	3.89	.05
17	M	L	25	38*	25	25	28	15	21	1.40	1.39	.30
18	M	L	25	25	31*	31	28	17	20	1.18	.34	.70
19	M	L	25*	31	6	31	23	11	13	1.18	.20	.70
20	M	L	25	25	44	25*	30	16	25	1.56	2.90	.10
21	F	L	38	31*	12	38	30	24	16	.67	2.32	.20
22	F	H	50	75	75	44*	61	16	14	.88	.17	.70
23	F	H	75	81	62*	44	66	19	11	.58	2.78	.10
24	F	L	19*	25	38	19	25	17	15	.88	.16	.70

*Critical stimulus, S = Square T = Triangle D = Diamond C = Circle

category. Questioning of the subjects revealed that none of them became aware of the deceptive use of the test stimulus cards during the fast speed of the baseline and test presentations. Therefore, we can say that to this extent at least, all of the subjects were operating below complete conscious awareness. Nevertheless, it would be difficult to believe that conscious determination of responses was not an important element in the case of any subject who attained, say eighty or ninety percent accuracy in the level of awareness procedure. This state of affairs requires that some cutting point, however arbitrary, be chosen. In an attempt to find as meaningful a cutting point as possible we can reason that the greatest interest is in those subjects who are least suspected of having brought about a shift in choices of the critical stimulus by means of conscious volition. Therefore, the split was designed to include as many subjects as possible in a relatively "pure" low awareness group, without including any who might have been able to see very much consciously. A given subject was excluded from the low awareness group, and put in the high awareness group, if during the level of awareness procedure he had been able to locate even one of the four stimuli to the extent of attaining an accuracy level half way between chance and complete discrimination. The use of a point half way between chance and complete accuracy as an arbitrary discrimination threshold has some precedent in the determination of difference thresholds in psychophysics (27, p. 135). Chance accuracy in the four-choice situation of the level of awareness procedure is 25 percent. Half way between 25 percent and 100 percent accuracy is 62.5 percent or, if rounded off to an even number, 62 percent.

Therefore, if a subject was able to locate one or more of the four stimuli on at least 62 percent of his attempts, he was excluded from the low awareness group and put in the high awareness group. This cutting point gave us eight males and six females in the low awareness group and four males and six females in the high awareness group. The mean level of awareness was 29.9 percent for the 14 low awareness subjects, and 63.3 percent for the ten high awareness subjects. Having described our cutting point for low and high awareness we can now look at the findings for both categories and for the total group as well.

Table 3 shows the total group of shock subjects categorized as to whether they show perceptual vigilance or defense. Fifteen of the 24 subjects became vigilant toward the critical stimulus, and nine showed defense. Thus there is some suggestion of a tendency for vigilance to predominate over defense but a one-tail sign test is not significant.[1]

When we look at the breakdown by sexes in Table 3, we find an unpredicted, but highly significant difference. All 12 males fall in the vigilance category, whereas of the 12 females, only three show vigilance and nine show defense. Two-tail sign tests indicate an insignificant tendency toward defense in the females ($p < .20$), and a highly significant vigilance trend in the males ($p < .002$).[2] An exact test of the difference between

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[1] In all cases where any of the theoretical orientations previously described have led to a prediction, a one-tail test of significance is used.

[2] The reader may wonder whether these trends are statistically significant when some account is taken of the significance or rela-

TABLE 3

NUMBER OF SUBJECTS IN GROUP M SHOWING VIGILANCE AND DEFENSE

	Male	Female	Total
Vigilance	12	3	15
Defense	0	9	9
Total	12	12	24

these male and female trends gives a two-tail p value of less than .001, indicating the high statistical significance of the sex difference finding.

We turn next to the low and high awareness subgroups. Table 4 indicates the number of low and high awareness subjects in the vigilance and defense categories. Frequencies are shown for males and females separately, and for the two combined. Whether the total group or either of the sex groups is considered, Fisher's exact test does not yield a significant value. Therefore, evidence is lacking for the decrease in vigilance at high awareness which was predicted by both the cue-drive and CTI orientations. In fact the only shift in frequencies from low to high awareness is found in the females, and is slightly in the direction opposite to this

tive magnitude of the shift in each of the individual subjects. To answer this question a four-fold contingency table of each subject's choices of the critical and neutral stimuli during the baseline and test procedures was set up. After a chi square had been calculated for each individual, it was added with the others in its subgroup to give a total chi square for that category, provided a test for heterogeneity (25, p. 191) was not significant. In the case of the 12 females, the shifts are too heterogeneous to be meaningfully combined. However, the homogeneous shifts in the 12 males provide a total chi square of 37.31, with a two-tail p value of less than .001.

prediction.

TABLE 4

NUMBER OF LOW AND HIGH AWARENESS SUBJECTS IN THE VIGILANCE AND DEFENSE CATEGORIES, GROUP N

	Awareness		
	Low	High	Total
Males			
Vigilance	8	4	12
Defense	0	0	0
Total	8	4	12
Females			
Vigilance	0	3	3
Defense	6	3	9
Total	6	6	12
Total Group			
Vigilance	8	7	15
Defense	6	3	9
Total	14	10	24

Directing our attention to the trends in the low awareness group only, we find that the unpredicted sex difference which appeared in the total group remains despite the decrease in the size of the sample. All eight of the males show vigilance, and all six of the females show defense. Two-tail sign tests gives a p of less than .02 for vigilance in the males, and a p of less than .05 for defense in the females.[1] An exact test of the difference between these

[1] Because the shifts are homogeneous for each sex, total chi squares can also be calculated. The total chi square for the

male and female frequencies again provides a two-tail p value of less than .001. Thus there is little question that at low awareness the male vigilance trend and the female defense trend are significant and different from one another.

Having evaluated statistical significance we may also wish to have some idea of the magnitudes of these perceptual shifts in the low awareness subjects. Among the eight low awareness males there was a mean increase of 45 percent from baseline to test choices of the critical stimulus. The comparable figure is a mean decrease of 34 percent for the six low awareness females.[1]

These findings in the low awareness group are not completely adequate however, because as it happened there were not equal numbers

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eight low awareness males is 17.98, giving a two-tail p of less than .05. For the six low awareness females the total chi square is 14.98, and a two-tail p is again less than .05. Therefore, when account is taken of the relative magnitude of the shift in each subject, the vigilance trend in the males and the defense trend in the females remain statistically significant.

[1] After this sex difference had first become obvious, it was thought desirable to see whether it might be due to a difference in the attitude toward or the meaning of the electric shock to the two sexes. Consequently a rating booklet along the lines of Osgood's "semantic differential" (21, 22) was made up. The last few subjects filled it out at the close of the experiment, and all but one of the earlier subjects were successfully induced to do this through the mail. Looking at the low awareness subjects only, no significant sex differences were found in the ratings of the individual's critical stimulus, or in the ratings of the concepts "electric shock" and "shock signal." The three concepts were rated by both sexes as "bad," "potent" and "active," indicating similar rating behavior for the men and women regarding the concepts most closely related in meaning to the shock itself or to its warning signal. In their ratings of the concept "experiment," the women assigned it less potency (p of the difference less than .01), and perhaps slightly less activity (p of the difference less than .10), than did the men. In their ratings from concept to concept, the men gave a more consistent picture than did the women. For more details on the construction and findings of the questionnaire see the Appendix.

of males and females trained with each of the four stimuli as the critical one. Nevertheless, since there were at least one male and one female in the low awareness group who were trained on each of the four stimuli, it was possible to check further on these findings. Numbers of male and female subjects trained on each of the four stimuli were equated by excluding all subjects except the first male and the first female to be trained on each of the four stimuli at low awareness. This reduced low awareness group thus consisted of four males and four females. All of the males show vigilance and all of the females show defense. The numbers are too small for a sign test to be significant for either sex[1] but an exact test of the difference between the sexes is again significant (two-tail p less than .05). Thus when the stimulus control is restored, the findings at low awareness remain stable even with this very small group.

At high awareness we find that the four males again are vigilant; however, the six females show no trend whatever, being split evenly between the vigilance and defense categories. There are no statistically significant findings in the high awareness group.

Scatter plots were inspected to determine whether there was any relationship between perceptual shift (test-base ratio) and each

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[1] However, when account is taken of the size of each individual's shift by combining chi squares, the total chi squares are again significant for both sexes. Vigilance in the four males is indicated by a total chi square of 12.22 and a two-tail p of less than .02. Defense in the four females results in a total chi square of 14.78 and a two-tail p of less than .01.

of the following variables: (1) level of awareness, expressed as the percentage of correct choices in the level of awareness procedure; (2) score on the Taylor Manifest Anxiety Scale; and (3) score on the Pd scale. There was no indication of a significant correlation in any of these cases, whether for males, females, high or low awareness subjects, or the entire group.

The question as to a relationship between the direction of the perceptual shift and the relative ease with which the subject could later locate the critical stimulus during the level of awareness procedure was also investigated. Expressed in another way we wondered whether vigilance would be associated with a higher level of awareness for the critical stimulus than for the average of the three neutral stimuli, and whether defense would be associated with a level of awareness for the critical stimulus which was below this neutral average. Sign tests were run in which it was determined how many subjects' perceptual shifts agree in this fashion with their level of awareness results. Of the 14 low awareness subjects, nine agree and five disagree. The high awareness subjects show a similar trend, with six out of the ten subjects agreeing and four disagreeing. This means that out of the total group of 24 subjects, 15 agree and nine disagree. However this slight relationship between perceptual vigilance or defense on the one hand, and the relative ability to see the critical stimulus on the other hand, does not yield any significant sign tests.

Group P

The data for the 20 subjects in Group P are shown in Table 5. The treatment of the data employed for these subjects was the same as that for the subjects in Group N. This included the use of the test-base ratio of critical stimulus choices, as well as the use of the same criteria for the low and high awareness classifications.

In general the experimental variable seems to have had little effect, if any, in this group. Considering the total group first, we see in Table 6 that there is no tendency for either vigilance or defense to predominate among the 20 subjects. That this is true is shown by sign tests for males and females separately and for the total group. All sign tests were made by combining the "no change" and "defense" categories into a single "no vigilance" category, which was then compared with the "vigilance" category. When the same combination of categories is used for an exact test of a difference between the males and the females, it too, is not significant. Therefore, our results for the positively reinforced group show neither an unpredicted sex difference, nor the perceptual vigilance which was predicted by all our theoretical orientations.

Turning next to a consideration of the effects of low and high awareness as shown by the subject distributions in Table 7, we again find an absence of any marked trends. The low awareness group consists of nine males and two females whose mean level of awareness is 30.5 percent, and the high awareness group consists of three males and six females with a mean awareness of 61.4 percent. These means are very similar to those already reported for Group N.

TABLE 5

EXPERIMENTAL DATA, GROUP P

Subject	Sex	High or Low Awareness	Level of Awareness (%) S	T	D	C	General	Critical Stimulus Choices Base	Test	Test-Base Ratio	Chi Square	2-Tail p Level
1	M	H	69	81	62	69*	70	19	19	1.00	--	1.00
2	F	H	25	44*	31	69	42	14	22	1.57	2.47	.20
3	F	H	62	62	38*	56	55	15	18	1.20	.36	.70
4	F	H	75*	88	75	100	84	16	7	.44	4.29	.05
5	M	L	31*	38	31	25	31	18	14	.78	.66	.50
6	M	L	31	31	25*	31	30	11	22	2.00	4.93	.05
7	M	H	38	56*	31	62	47	18	12	.67	1.56	.30
8	F	L	38	25	56	19*	34	21	17	.81	.59	.50
9	M	L	25	31	25*	25	27	11	15	1.36	.77	.50
10	M	L	25	19	12	25*	20	12	20	1.67	2.66	.20
11	F	L	50*	12	25	25	28	18	13	.72	1.06	.50
12	M	L	31	31*	19	31	28	16	22	1.38	1.34	.30
13	F	H	81	69	75	81*	77	13	13	1.00	--	1.00
14	M	L	50*	56	44	50	50	17	20	1.18	.34	.70
15	F	H	75	94	62*	62	73	17	13	.76	.69	.50
16	F	H	25	44*	44	62	44	22	18	.82	.58	.50
17	M	L	38	50*	25	38	38	28	18	.64	3.39	.10
18	M	L	0	31	12	38*	20	15	15	1.00	--	1.00
19	M	L	19*	25	31	44	30	18	17	.94	.03	.90
20	M	H	56	56	44*	88	61	18	14	.78	.66	.50

*Critical stimulus, S = Square T = Triangle D = Diamond C = Circle

TABLE 6

NUMBER OF SUBJECTS IN GROUP P SHOWING VIGILANCE AND DEFENSE

	Male	Female	Total
Vigilance	5	2	7
No Change	2	1	3
Defense	5	5	10
Total	12	8	20

TABLE 7

NUMBER OF LOW AND HIGH AWARENESS SUBJECTS IN THE VIGILANCE AND DEFENSE CATEGORIES, GROUP P

	Awareness		
	Low	High	Total
Males			
Vigilance	5	0	5
No Change	1	1	2
Defense	3	2	5
Total	9	3	12
Females			
Vigilance	0	2	2
No Change	0	1	1
Defense	2	3	5
Total	2	6	8
Total Group			
Vigilance	5	2	7
No Change	1	2	3
Defense	5	5	10
Total	11	9	20

Sign tests and exact tests were employed in the same way as with Group N, but none is significant. One slight tendency is found in the high awareness group. Of the nine subjects in this category, only two show vigilance, whereas seven do not. A one-tail sign test gives a p of less than .10, providing very tenuous confirmation of the CTI prediction of decreased vigilance at high awareness. However, further information about this relationship is found when a rank order correlation between the test-base ratio and the general level of awareness is calculated for the entire positive group of 20 subjects. A rank order statistic is necessary because the use of ratios means that the distribution cannot be assumed to be a normal one. Tau, which was calculated and evaluated for statistical significance according to methods given by Kendall (14), is a negative .29 with a one-tail p of less than .05. This correlation further confirms the CTI prediction of a decrease in vigilance as the level of awareness approaches the conscious threshold. The significance of the absence of a similar finding in Group N will be considered in the discussion chapter.

As in the case of Group N, inspection of scatter plots for Group P did not suggest the existence of any correlation between the test-base ratio and either the Taylor Manifest Anxiety Scale or the Pd scale.

CHAPTER IV

DISCUSSION

Primarily, this experiment was an exploratory one which was designed to gather information about what effects, if any, could be induced by combining the perceptual technique used by Blum, and the "conditioning" of originally neutral material as done by Lazarus and McCleary; on the other hand, it was also felt that deductions from explicitly formulated theoretical positions would lead to contradictory predictions, which of course would lend the undertaking something a little more like the air of a "crucial experiment." Now that the outcome is known, what is the standing of this investigation with regard to these two major purposes? It appears that the successful induction of statistically significant experimental effects in the subjects of the shock group suggests that the first purpose has been achieved, even if imperfectly. Stated in another way the present author feels that the results of this experiment justify the use of this kind of laboratory technique for the exploration of the relationships between affect and subception. Looking at the study in the light of its second purpose, namely its function as a crucial experiment, we are forced by the outcome to proceed more cautiously. The results, even in the more successful shock procedure, do not clearly favor one theoretical orientation over the others. Instead our data suggest that none of

these orientations is sufficiently complete to deal adequately with all of the findings. However, rather than being irrelevant to these theories, our data can be shown to reflect back upon them in a way which leads to a revised theoretical position. Consequently we will first proceed to evaluate each of the original positions in the light of the evidence, and then to propose some modifications. The modifications will not be offered as a polished theory. Instead it is the author's intent that they be regarded as a set of tentative hypotheses which derive from exploratory work, and which may serve as an impetus to further necessary and pertinent research.

The Approach-Avoidance Orientation

The prediction of avoidance of the negative, shock stimulus which was made by the approach-avoidance position is in accordance with the findings for the low awareness females; however, we are hard put to interpret even this result as a genuine confirmation of the original position, in view of its inability to account for the more significant vigilance reaction among the males in the shock group. It is difficult to imagine that the men were manifesting the influence of some positive, rewarding influence which was totally absent in the case of the females. It is true that many of the shock subjects, mostly males, indicated by their comments that they were attempting always to seek out the critical stimulus in order to be able to brace themselves, tense up, etc., and not be taken by surprise when shocks were delivered. If this is interpreted as a positive reward which explains the "approach" tendency of the males, we still are unable to find any way in which this orientation could

account for the failure of the low awareness females to be influenced by the same potentially rewarding state of affairs. To decide arbitrarily that the same goal is rewarding to one sex and punishing to another is most unsatisfactory in the absence of any reasonable rationale for such a position.

Other findings bearing upon the approach-avoidance orientation are less clear-cut but they also fail to offer substantial confirmation of this hypothesis. In the first place we find that with the women in the shock group, there is a slight increase in the relative frequency of vigilance as the level of awareness goes up. This trend is not significant but it is relevant here because it is opposite to the increasing avoidance of the shock stimulus which we would expect with greater awareness on the basis of the approach-avoidance hypothesis. Finally in Group P we find a similar reversal of an approach-avoidance prediction in the significant correlation between level of awareness and a decreasing preference for the money signal. Here we find subjects defending more and more as they get psychologically closer to what was supposed to be a rewarding goal. In this case, however, the comments of the subjects suggest that the "reward" of fifteen cents every now and then for a very tedious, three-hour procedure was simply not enough to cancel out the effects of boredom and disappointment over the failure of the procedure to be as interesting as most subjects had expected. We might assume then that there actually was an automatic, increased tendency to avoid what had become a symbol of disappointment, as it could be seen more clearly. Here again the interpretation is unsatisfactory, for it appears that this increasing defense could

just as well have been due to a conscious set on the part of the subjects. The likelihood of this alternative is increased by frequent subject comments to the effect that they suspected our purpose was to make them pick the money signal too frequently, and accordingly they had scrupulously attempted to avoid doing this in an effort to be very "objective" about the money signal. It appears then that the extent to which they were carried away by this "objectivity" was in part a function of the visibility of the stimuli. This leads us to a reconsideration of the notion of CTI.

Conscious Threshold Interference (CTI)

Our original formulation of the CTI notion involves only the influence of automatic inhibitory effects, such as strong emotional associations, a number of competing hypotheses and the like. At first glance it may seem that the Group P finding we have just discussed, i.e., a negative correlation between vigilance and level of awareness, is a confirmation of this hypothesis. However, as we have already indicated, the comments of the subjects indicate that at high awareness at least, the effect was due to some more-or-less conscious sets rather than to the automatic inhibition factor which we supposed CTI to be. If this is the case then it is also reasonable to assume that at high awareness a more-or-less conscious set of the subject could have a facilitation effect rather than an inhibitory one.[1] This could have been the case with one female shock subject. She showed vigilance for the critical stimulus

[1] A study by Postman, Bronson and Gropper (24) confirms this point of view.

(test-base ratio of 1.44) at the high level of awareness of 92 percent. In the post-experimental interview she said, "I felt like I was supposed to react some way to the circle--maybe I would say a circle, or maybe never say a circle." One interpretation of her comment is that she suspected that the purpose of the experiment was the induction of perceptual defense, and that the vigilance was a result of her nearly conscious set to keep this from happening. This interpretation would explain her mistaken certainty that the shock training had not affected her choices in any way. Further confirmation of the possibility of such a facilitation effect comes from the only trend in the shock group relevant to CTI. This is the slight reversal among the females, of the CTI prediction of a decrease in vigilance at high awareness. The interpretation here too, is that some of these high awareness subjects may have had a vague set to avoid becoming defensive about the critical stimulus, causing them to over-correct any such tendency.

Admittedly this formulation is speculative; however, the notion that interference factors which are close to consciousness can work either to enhance or to inhibit the more automatic tendencies seems to be a reasonable way of summing up the relevant information. The acceptance of this point of view means that perceptual judgments which are out of the conscious control of the subject are best studied at levels of awareness well below the usual statistical thresholds of consciousness.

The Cue-Drive Orientation

The prediction of the cue-drive orientation that increasing awareness would raise anxiety to drive proportions, and bring about perceptual defense toward the shock signal is not confirmed by our results. All of the males in Group N show vigilance over their entire range of awareness (20-81 percent awareness), with no indication of any decrease at the higher extreme. Furthermore what little trend there is among the females in Group N is, as already mentioned, in the opposite direction to this prediction. The drive aspect of the cue-drive notion, as applied in this prediction, appears to be in error. More will be said later about a different application of this principle.

Affect as a Cue

The hypothesis that affect, particularly anxiety or fear, can function as a signal or cue which heightens perception is apparently confirmed by the results of this study; however, the confirmation is a qualified one, since we have demonstrated this trend under select conditions with only part of our sample. Looking first at the results in Group P, there is no confirmation of the hypothesis. The low awareness subjects showed no trend whatever, and there is a significant correlation, showing decreasing vigilance at higher awareness. We have already suggested that this correlation be interpreted as resulting from the interference of a semi-conscious set of the subjects to avoid showing undue attention to the money signal. The failure to induce any other perceptual trends regarding the money signal is interpreted as a fault of the experimental

procedure. By this we again are referring to the apparent failure of the procedure to induce positive feelings of reward. Indeed one subject went so far as to say that he resented being paid in a fashion so similar to animal experiments he had heard about. Feelings of boredom and impatience were almost unanimously expressed in this group. Our conclusion is that the procedure was not a fair test of the hypothesis that positive affect heightens perception, because there is no reason to believe that positive affect was induced to any significant extent. An experiment similar to the present one but involving a shorter procedure and/or much larger monetary reinforcements would be a better test of the influence of positive affect upon subception.

Looking next at the results for all of Group N, we again fail to find a significant trend; however, this time the direction at least is favorable to the vigilance hypothesis, with 15 of our 24 subjects shifting as predicted. Nevertheless, without further analysis these data would supply no basis for rejecting the null hypothesis.

The finding that the males and females reacted very differently to the shock signal allows us to consider each sex separately. The unanimous vigilance preference in the males allows us in their case to reject the null hypothesis with a high degree of confidence. Therefore, the hypothesis that, under certain conditions, anxiety acts as a cue has been confirmed by this result. The finding seems all the more stable in view of its holding up significantly when only low awareness males are considered.

If anxiety or fear as a cue is a valid formulation of the reactions of the males to the shock signal, then we are confronted with the vexing problem of explaining the reason that the low awareness females showed nearly as significant a tendency to behave in an exactly opposite fashion. Our attempts to find an explanation for this difference led us to believe that the cue function of anxiety is a valid but incomplete formulation. Therefore we can now consider a proposed modification of the hypothesis.

The Problem of the Sex Difference: A Reformulation of the Cue-Drive Hypothesis

The hypothesis which the writer feels explains the unexpected sex difference most adequately is a simple one. It makes the assumption that the women were much more frightened by going through the shock procedure than were the men. This would mean that the men were in a state of moderately severe anxiety which acted primarily as a cue. On the other hand the women probably were in a state of extremely severe anxiety which acted primarily as an unpleasant drive. Since the men were primarily given a cue, they became vigilant. Because the women were faced with an unpleasant drive, and could not escape readily, one way to reduce the drive was to avoid seeing its stimulus whenever possible. Such perceptual defense would be particularly facilitated by the low awareness condition. Thus the net result of this theorizing is that we have returned to the cue-drive hypothesis but in a new context.

The plausibility of the cue-drive hypothesis rests primarily on the case that can be made for the assumption that the female subjects actually were made more anxious by the shock procedure.

Unfortunately the evidence is not decisive; nevertheless, we can consider relevant speculations. If we look first at the behavior of the subjects during the shock procedure, the most striking impression is that the women appeared much more quiet, placid and resigned as compared to the typical vocal complaints, nervous chatter and more visibly agitated reactions of most of the males. Comments of the females during the post-experimental interview reinforced this subjective impression of passive resignation. They expressed ideas similar to those of one subject who said that,

> . . . when it came, it came (the shock) so the signal after a while didn't mean too much . . . and there wasn't anything I could do about it, and the tensing didn't help any.

Another female subject said that at the fast (test speed) she had thought to herself,

> When it comes, it comes, and I can't do anything about it anyway. I couldn't see the pattern, I couldn't tell when it was going to come, I couldn't expect it.

But this same subject indicated that she was clearly anxious, for she said that at slow (training) speeds the critical stimulus made her very tense.

> But at slow speeds I could see these designs and therefore every time I thought I saw the square as the darker I felt tense--and even the other shapes, because I could see them and each one I interpreted to be the square until I actually realized it wasn't.

These comments suggest that the females felt unable to do anything other than to resign themselves to an unavoidable but disturbing procedure. The comments of the males suggested that they too were very disturbed by the shock, but that they never became resigned to their fates.

After I knew it was coming I would sort of tense myself--try to build up a defense . . . . Toward the end I tried to do it about every time you flashed a card . . . got sort of nervous, sort of builds up inside you, toward the end of shocking I got quite uneasy.

As the speeds got faster, according to the same subject,

It seemed that the circle (critical stimulus) was always the brightest--I found myself following the circle around and naming it whether it was or not.

Another male subject expressed with considerable emphasis,

"I didn't like it (shock),"

and then indicated another way in which he had actively attempted to <u>do something</u> about it.

When it started getting real fast (test speed), I began to doubt that there was going to be any shock, since there would be no signal for me to know that it was going to come . . . I tried not to show any signs of relaxing because I knew as soon as I did, you'd give me a shock.

Though these impressions of an activivy trend in the males and a resignation trend in the females are very subjective and therefore unreliable, they are supported to some extent by the fact that none of the men verbalized the idea of resignation which we got from some of the women. This difference in post-experimental comments, plus the noisy, complaining behavior of most males during shock, as opposed to the almost ominous silence of most women, suggest the hypothesis that on the whole the women felt much less able than the men to do anything at all about the threat of shock. If this was the case, the hypothesis proposes further that this feeling of helplessness to deal with the situation must have tended to make the women more anxious than the men. This proposal is in accord with the findings of an experiment by Mowrer (20) in which hungry

rats refused food more often in a shock situation which they could not control than in one which they could control.

Another consideration also supports this line of reasoning. This is the notion that among young college people in this culture, women would be far more likely to be frightened and upset by the experience and threat of electric shock than would men. On the whole it seems that men are far more likely to have had more acquaintance with electricity and electrical gadgets, as well as with potentially risky or frightening endeavors. These considerations, even though very speculative, favor the interpretation that the women were generally more upset than the men.

One possible refutation of our argument is that we were less apt to get easily frightened women because they were volunteers. This does not seem to have been the case. In the first place the fact that the subjects were paid for their participation may have helped counteract some reluctance due to timidity. More importantly, the subjects did not know that shock would be employed until after they had come to the experiment and become involved to the extent of having filled out the anxiety questionnaire and having been familiarized with the use of the tachistoscope. Some of the subjects seemed a little apprehensive upon hearing that shock would be used, but no one refused to continue. Thus the situation was such that the individual was in a sense almost a "captive subject," for leaving probably would have meant an embarrassing loss of face as well as the loss of the monetary reward. It is of course conceivable that the outwardly quiet behavior of the female subjects really indicated that they were <u>less</u> disturbed by the shock than were the

males; however, if this was actually the case, it is difficult to understand why the females would defend against choosing a relatively innocuous critical stimulus. It seems far more likely that they felt quite frightened and helpless.[1]

Further relevant information regarding the sex difference comes from other experimental work. In a personal communication Professor D. D. Wickens of Ohio State University reports finding that when a galvanic skin response is conditioned by employing the same intensity of electric shock for all subjects, females tend to give larger responses than do males. Furthermore he finds that women more frequently object to this intensity of shock and hence are more frequently eliminated as experimental subjects than are men. In the light of this information, our assumption that the women in the present experiment were more frightened by shock than were the men is considerably strengthened.

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[1] Another possible basis for refuting the interpretation that the women were more frightened by the shock experiment is the failure of the post-experimental rating scales to show a significant sex difference in ratings about the shock and the shock signal. We feel that the absence of a difference merely indicates that both sexes were giving extreme ratings pertaining to an unpleasant experience. Getting a device which measured beyond these extremes and this rather stereotyped characterization of the experience would have been difficult. In addition the passage of a considerable amount of time, in most cases, between the experiment and the ratings may have blunted some of their sensitivity. Finally we do not feel that the significantly greater tendency for the women to rate the concept "experiment" as less potent than do the men is crucial, because we have no way of knowing whether this difference is an indication of actual feelings or of some kind of defensive or critical behavior on the part of the women. Indeed the greater inconsistency in the female ratings from concept to concept could support the interpretation that the women were more disturbed by the shock experience than were the men. See the Appendix for further details.

Additional relevant evidence about the sex differences comes from a similar finding in the Blum experiment (3). In his experiment proper, males and females were given different traumatic stimuli.

> The male and the female Ss were given different sets to control the influence of any physical factors operating in the picture choice and also to demonstrate that any positive results obtained would apply to more than one psychosexual dimension. All the males were given the Masturbation set for two reasons. In the original Blacky monograph . . . females were suggested to be more oral sadistic than males, and in the pre-testing it was found to be more difficult to disguise Oral Sadism for the women and Masturbation Guilt for the men (3, p. 95-96).

Under these conditions both sexes showed vigilance at low awareness. However, a supplementary study was also done which reversed these sets.

> . . . the entire experiment was repeated on another group of Ss with the traumatic and neutral sets reversed, i.e., Oral Sadism structured as the traumatic picture for the men and Masturbation Guilt for the women (3, p. 97).

At the low awareness level the supplementary study produced vigilance toward the oral sadism card in five out of seven males; however, vigilance toward the masturbation card occurred in only one out of seven females. It appears then that the sex difference in reaction to the masturbation card was similar to the one found in reaction to the signal for electric shock, i.e., vigilance in the males, and defense in the females.

The first step in applying the cue-drive hypothesis to the masturbation card trends is to compare the way in which the two traumatic stimuli were structured. On the one hand ". . . the Masturbation picture (V) was structured as the traumatic one by stating, 'Over here, Blacky can't keep from licking his sexual parts even though he's been scolded for it,'" and on the other hand, "Oral Sadism (II) was maximized by the comment, 'Over here, Blacky

is bitterly angry at her mother and feels like chewing Mama instead of her collar' (3, p. 95)." After either one of these traumatic structurings and one of the neutral structurings, the subject was asked to think for 30 seconds about similar experiences of his own. He was also reassured that he would not be asked about his thoughts.

Next we can consider the effects of the two traumatic structurings upon a typical young woman in the presence of a male psychologist. The masturbation set involves not only the taboo sexual topic of masturbation, but it also contains the implication of an oral sexual perversion. The oral sadism set involves a topic much more acceptable in mixed company, the matter of angry feelings between mother and daughter. It seems that in all likelihood most young women in our culture would be extremely threatened by the former, and much less threatened by the latter.

The implications of this reasoning for our hypothesis are clear. We suggest that the women reacted to the oral sadism set with mild emotion. Mild emotion could have provided sufficient cue value to bring about the vigilance trend. On the other hand we suggest that they reacted to the masturbation set with extremely intense anxiety. The drive of severe anxiety could have produced the perceptual defense trend, which was the most readily available way for the subject to reduce her anxiety, outside of actually leaving the situation. We feel that there is good reason to expect that the males reacted much less intensely to the masturbation set than did the females. In the first place there was no violation of the common taboo against the discussion of sexual topics is mixed company. Furthermore, the typical young male has had far more

"desensitization" to sexual talk, including talk about masturbation, by reason of the greater frequency and frankness with which many males discuss and joke about such matters. In short we feel that a reasonable hypothesis for explaining the sex difference in reaction to the masturbation card is the same as the one already proposed to explain the reactions to the shock stimulus, namely that the men were only mildly or moderately anxious, whereas the women were extremely anxious. The cue value of low anxiety could have produced the vigilance among the men, whereas the defense among the women could have resulted from their efforts to reduce the drive aspect of intense anxiety.

Another hypothesis, which very closely parallels the cue-drive formulation, can also explain the sex difference in the two experiments. It simply proposes that perceptual defense occurs when the subject has a predisposition to use repression as a means of handling a particular problem area. Application of this idea to the data under consideration requires the assumption that the women were predisposed to employ repression in connection with the shock situation and certain sexual problems, but not in connection with oral sadism. It is possible that this might have been the case; however, we suggest that if a repressive tendency in connection with sexual problems and the problem of handling the shock threat was considered plausible it would be largely because we sense that such problems might tend to elicit very strong anxiety. In short the suggestion is that whenever we postulate a repressive tendency for a certain area, we are faced with the problem of explaining why repression is used for that particular difficulty. More often than

not, and perhaps always, it is an area in which considerable anxiety is involved. If any operations which are used to identify a repression area can also be looked upon as operations which reflect an area of high anxiety, then the two theories become operationally identical in that context. Further research may indicate whether both variables play a part in producing perceptual defense, whether one does and the other does not, or whether the two are operationally identical.[1]

The results obtained in the Blum studies and the present one encourage the formulation of hypotheses which apply to all of them. For the moment the present writer prefers the cue-drive hypothesis to the repression hypothesis on the grounds of greater generality. By this we are referring to the proposal that, given (1) intense enough anxiety, (2) no easy way to escape from the

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[1] In a second, ingeniously controlled tachistoscopic experiment (4), Blum has recently proposed and put the repression predisposition theory to a test. Using advanced clinical psychology graduate students as subjects, he obtained an independent indication of each individual's repression tendencies regarding areas in which the subject had also shown manifestations of conflict. Using a low-awareness, tachistoscopic procedure, defensive behavior regarding the Blacky pictures which represented these areas was found. This relationship was interpreted as confirmation of the notion that people will show perceptual defense in conflict areas where they have a predisposition to employ repression as a defense. However, the measure of a repression tendency in a particular area which was used--remembering a particular Blacky card on one occasion and forgetting it on another--can also be reasonably considered to be an indicator of marked anxiety or disturbance regarding the particular card. In other words, once an area is independently determined to be a conflict area, then remembering it on one occasion and forgetting it on another occasion may easily mean that the material disturbs or flusters the person considerably. Therefore, the finding of defense against this especially threatening stimulus material can also be interpreted as a confirmation of the cue-drive hypothesis. The parallelism of the two explanations reinforces the notion that they may be found to be operationally identical.

situation, and (3) a sufficiently ambiguous or unclear reality, everyone will defend perceptually against the stimuli which elicit the anxiety. Under these limiting conditions this prediction would be expected to hold true regardless of whatever defense mechanisms were characteristic of the individual in other situations. Operational definitions of such defenses are hypothesized by the cue-drive point of view to be relevant to perceptual vigilance and defense as found in these studies, only to the extent that such operations also reflect the anxiety level which is characteristic of the area in question. When there are indications of moderate anxiety, perceptual vigilance would be predicted regarding the area in question, and when there are indications of severe anxiety, perceptual defense would be predicted. Only further experimentation can indicate whether a determination of the defense mechanism preferences of each person is necessary for the accurate prediction of perceptual behavior under the limited conditions listed above. Such operations may prove to be necessary either as a supplement to the cue-drive hypothesis, or as a replacement for it.

As part of a final summing up of the cue-drive hypothesis of perceptual vigilance and defense, it is relevant to point out the survival value of such a mechanism. At the first flash of anxiety the organism is provided with a danger signal which makes it more alert and ready to respond to the danger in some way. This is the cue function of a low intensity or short duration of anxiety. Perceptual vigilance is hypothesized to be one manifestation of this phenomenon. If the organism has not immediately responded to the danger signal with flight or some other effective way of eliminating the danger, the drive function of anxiety comes into play. The

danger signal now elicits strong negative motivation which forces the organism to try all possible means at its disposal to eliminate the threat of danger and the unpleasant sensation of anxiety. Ordinarily the organism finds some way to escape or otherwise dispose of the danger, and hence survive; however, if flight or other constructive ways of eliminating danger are impossible or difficult, and the situation is unclear or ambiguous, then, as a last resort, the organism will seek relief from a severe anxiety drive by doing the only thing possible under the circumstances, i.e., by defending perceptually against the danger signal which elicits the drive. It is well that such perceptual defense is a last resort which occurs under restricted conditions, and only after all other modes of adaptation have been ruled out, for no organism could survive long or effectively if it preferred to handle warning signals by ignoring them.

Situations in which we humans frequently find ourselves are--like the tachistoscopic situation--ambiguous and lacking in definite structure. What is figure and what is ground often depends largely upon the structure which we impose upon our raw sense impressions. The theorizing presented here suggests that tolerable emotions and tensions may serve to heighten relevant perceptions, whereas severe, intolerable tensions may under certain conditions make us blind to them.

CHAPTER V

SUMMARY

The present study was primarily an exploration of a new technique for the study of discrimination without clear conscious awareness (subception). Predictions derived from several theoretical interpretations of the work of Blum (3), and Lazarus and McCleary (15) were tested.

Subjects were given either negative (electric shock) or positive (monetary) reinforcements in connection with one of four geometrical figures. This training was similar to classical rather than instrumental conditioning, since the subject's responses had no effect upon the reinforcement schedule. In addition the inadvertant reinforcement of his responses was not possible, because the subject could not give a response before the reinforcement was delivered.

Under conditions of low illumination and short stimulus exposures, the subject made the same series of perceptual judgments both before and after training. His task was to designate the position (top, bottom, left or right) of whichever of four stimuli stood out the most due to its darkness. Unknown to the subject all four of the stimuli were actually equally dark and approximately equal in attention-getting value. An increase in choices of the reinforced stimulus from pre- to post-training judgments was considered perceptual

vigilance, and a comparable decrease, perceptual defense. Also obtained were a post-experimental objective measure of each subject's level of awareness, and scores on the Pd scale from the MMPI and the Taylor Manifest Anxiety Scale (26).

No significant trends are found in relation to the Pd and Taylor scales, and no significant perceptual changes are found as a function of the monetary reinforcements. The failure of such "reward" to influence perceptual judgments is attributed to the inability of occasional, very small rewards (fifteen cents in nickels) to induce strong positive feelings in the face of a fatiguing and monotonous three-hour procedure.

The major findings occur in the shock group. The finding of perceptual vigilance in all 12 males is interpreted as confirmation of the hypothesis that moderately strong anxiety can function as a cue or signal which heightens perception. The finding that all of the lowest awareness females (six out of the total of 12 females) show perceptual defense is tentatively hypothesized to be due to a stronger anxiety reaction to electric shock on the part of the females similar to that found by Wickens (personal communication). It is proposed that anxiety of <u>intense</u> drive proportions is reduced by perceptual defense whenever (1) escape or other constructive means of drive reduction are impossible, and (2) perceptual conditions are vague or ambiguous. Thus, under certain conditions the cue function of anxiety is considered to promote perceptual vigilance, and under other conditions the drive function is considered to motivate perceptual defense. This "cue-drive hypothesis" is applied not only to the highly significant sex difference in reaction to the shock

signal, but also to previous experimental findings.

The random results among women in the shock group at close-to-conscious awareness, and other findings are interpreted as evidence that semi-conscious sets and ideas of the subject may either inhibit or reinforce more automatic perceptual changes, except at levels of awareness which are far below usual statistical thresholds.

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APPENDIX

As soon as the sex difference among low awareness shock subjects began to emerge, it was decided to attempt to determine whether the difference was attributable to the meaning of the shock experience to the two sexes. Accordingly a 90-item rating booklet, modeled after Osgood's semantic differential (21, 22), was made up. The following ten concepts were rated on each of nine scales: triangle, circle, square, diamond, electric shock, fifteen cents, experiment, psychology, shock signal, and money signal. The nine scales can be divided into three groups of three scales each. Those in a given group had heavy factor analytic loadings on one of three orthogonal dimensions, as follows:

Dimension	Scale
Evaluative	good-bad
	nice-awful
	beautiful-ugly
Potency	strong-weak
	large-small
	heavy-light
Activity	fast-slow
	active-passive
	hot-cold

The ninety items appeared in a random sequence except that no two adjacent items contained either the same scale or the same concept. The form of the items is shown by the following sample from the rating booklet:

28. ELECTRIC SHOCK strong___:___:___:___:___:___:___weak

29. EXPERIMENT active___:___:___:___:___:___:___passive

Instructions for the use of these seven-point scales were printed on the cover of the booklet as follows:

> This booklet lists a number of items pertaining mostly to the experiment in which you recently took part. After each item there is a rating scale on which you are to indicate your opinion of the item by making a check mark in the appropriate position.
>
> If you have no opinion or the rating scale does not apply to the item listed, then check in the middle of the scale.
>
> Work rapidly, giving your immediate impressions. Do not struggle over particular items.

The booklet was filled out by the last few subjects in each group immediately after the experiment; nearly all of the previous subjects were induced to do this via the mail from a few days to a few months after they had been through the experiment.

The success of this application of the semantic differential was tested by an analysis of the ratings of those subjects in whom we were most interested, the low awareness males and females in the shock group. Booklets were obtained from all six females and seven of the eight males. Ratings for the subject's critical stimulus, and for the concepts "electric shock," "shock signal" and "experiment" were scored from one to seven and tabulated. In analyzing a given concept, the first step was to determine where an individual subject placed the concept on each of the three dimensions. The subject's median rating of the concept on each of the three scales making up a particular dimension was taken as his most representative rating on that dimension. Thus each subject was given three median rating scores--one each for the evaluative, potency and activity dimensions. Then on each dimension a separate median of medians was found for

all 13 subjects, as well as for the seven males and the six females separately. The results for the four analyzed concepts were as follows:

	Evaluative	Potency	Activity
"Electric Shock"			
Males	6	1	1
Females	7	1	1
Total Group	6	1	1
"Shock Signal"			
Males	6	1	2
Females	7	1.5	1.5
Total Group	7	1	2
Each Subject's Critical Stimulus			
Males	6	1	2
Females	5	3.5	3.5
Total Group	6	2	2
"Experiment"			
Males	4	2	2
Females	3	4	3.5
Total Group	3	2*	2**

*Median test of the difference between ratings by males and females yields a 2-tail p of less than .01.

**Median test of the difference between ratings by males and females yields a 2-tail p of less than .10.

Sex differences in ratings were evaluated for statistical significance by means of median tests. The first step in this process was the categorization of the males and females as being above or not above the total group median of the particular set of ratings. Then an exact test of this four-fold contingency table was used to indicate the significance level of the difference in ratings by the males and females.

The results show that there are no significant differences in the ratings given by males and females to the concepts "electric shock," "shock signal," and the individual's critical stimulus. Translating the ratings into words, both males and females rated the three concepts as "bad," "potent," and "active." Thus no sex difference is found for the ratings most relevant to the warning for and experience of electric shock.

The ratings of the concept "experiment" are not uniform for the two sexes. The difference for the evaluative dimension is not significant, but that for the potency dimension is significant at the .01 level, and that for the activivy dimension falls just short of significance, being at the .10 level. The findings indicate that the women rated "experiment" as very slightly on the "good" side of the evaluative dimension, and as neutral with regard to potency and activivy. On the other hand the males, while not differing significantly on the evaluative dimension, were more inclined to rate "experiment" as being very potent and perhaps more inclined to see it as very active. These differences suggest that the women tended to rate the concept "experiment" in a less formidable light than did the men; however, there is no way of knowing (1) whether the women actually experienced the procedure in this way, or (2) whether they were simply more reluctant to admit feeling that they had been subjected to a potent and active experience, or (3) whether deprecation of the potency and activity aspects of the experiment was a subtle way of criticizing the experiment.

It is also interesting to note that the ratings of the males present a more consistent picture of the experience as the various

concepts are compared. On the other hand the females tend to vary a little more from one concept to the next. Again we cannot be sure what this means, since it is equally possible that the women were either more confused or else more discriminating than the men.