THE EFFECTS OF AROUSAL ON THE COGNITIVE PROCESSING OF INFORMATION IN AN EYEWITNESS SETTING

By

CRAIG L. JOHNSON

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Oklahoma State University

Stillwater, Oklahoma

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Thesis Approved:

William C. Scott
Thesis Adviser

Barbara J. Weiner

Donald K. Freeman

N. N. Durham
Dean of the Graduate College

923535

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CHAPTER I

INTRODUCTION

For 200 years eyewitness testimony has been the evidence of choice in the prosecution of criminal cases in the American court system. This state of affairs has persisted despite repeated incidents of misidentified suspects and false testimony that has resulted in the incarceration and even execution of many innocent persons. For example, Adolf Beck was found guilty in 1924 and incarcerated as a result of the eyewitness testimony of 22 witnesses (Wall, 1965.) Five witnesses, including two police officers, stated that Beck was positively the culprit. Seven years later Beck was acquitted in a retrial as the tragic error of misidentification by the witnesses emerged in the courtroom. Ironically, as the guilty individual was ushered into the courtroom, it was observed that he only remotely resembled Beck in appearance.

During the 1920's another defendant was identified as the guilty party by 30 witnesses. More fortunate than Beck, however, he gained acquittal by proving that he had been in jail at the time when part of the crime had been committed.

Countless other cases of unreliable testimony (Commonwealth vs. Sacco & Vanzetti, 1921, State vs. Purvis, 1894) (Wall, 1965) have led respected judges and investigators to comment on the use of eyewitness testimony. The late Judge Jerome Frank, in a book dealing with mis-

carriages of justice, stated, "Perhaps erroneous identification of the accused constitutes the major cause of the known wrongful convictions," (Frank & Frank, 1957.) Felix Frankfurter, noted jursit, commented before his death:

> What is the worth of identification testimony even when uncontradicted? The identification of strangers is proverbially untrustworthy. The hazards of such testimony are established by a formidable number of instances in the records of English and American trials. These instances are recent--not due to the brutalities of ancient criminal procedure (Frankfurter, 1957.)

In England, after Adolf Beck was found to be the victim of misidentification, a committee was formed to investigate the case. It concluded that "evidence as to identity based on personal impressions, however bona fide, is perhaps of all classes of evidence the least to be relied upon, and therefore, unless supported by other facts, an unsafe basis for the verdict of a jury" (Watson, 1924.)

Despite the numerous cases of erroneous testimony it is unlikely that the use of the eyewitness in our criminal justice system will abate. It is possible and desirable to investigate the dynamics of the eyewitness process, with special emphasis on variables that significantly affect such testimony. The discovery of the interrelationship of these variables, hopefully, will allow the court system to minimize future breaches of justice.

CHAPTER II

REVIEW OF THE LITERATURE

Eyewitness testimony as a perceptual process is subject to many confounding events. Rarely are circumstances optimal for the processing of information, especially in criminal situations. Reliability in processing information varies as a function of components such as stressfulness of the situation, perceived threat, attitudes, beliefs, length of exposure, and individual and sex differences.

Visits to local and state crime laboratories indicated that two of these variables are particularly interesting to criminal investigators. Of primary interest to many of these investigators is the effect of stress or high arousal on the processing and retention of information. More specifically, does a highly arousing or stressful situation facilitate or decrease a witness' reliability as a source of accurate information? Of secondary interest is whether males and females perform comparably when the level of stress is varied.

These two questions cover several diverse literatures in the field of psychology. The three areas of primary importance to be reviewed are as follows: (1) the effect of arousal on performance, (2) sex differences in performance and, (3) short term recall of visual information.

Arousal and Performance

Arousal, although not a unitary function, appears to be identified with various physiological changes. These changes seem to fluctuate with the degree of brain activity in the brain stem reticular formation. Changes also occur in electrocortical activity, circulatory activity, vasomotor responses, respiratory activity, pupillary diameter, electrical and thermal properties of the skin, and tension and activity of the skeletal musculature. All kinds of stimulus changes, except for those to which the subject has become habituated through frequent repetition, tend to evoke changes in all these variables. Increased arousal to the point of aversive stimulation has been theorized to elicit sympathetic activity of the autonomic nervous system and has been behaviorally described as the fight/flight syndrome (Hess, 1956). Relaxed states, on the other hand, have been associated with parasympathetic activity in the autonomic nervous system.

The popular conceptualization of the effects of arousal on performance tasks such as information processing is the inverted U curve presented in Figure 1 (Berlyne, 1967.) This theory states that an optimum level of arousal exists that facilitates maximum efficiency on performance tasks. There is a substantial body of research that supports the generalization that measures of response strength and efficiency reach a maximum at an intermediate arousal level (Malmo, 1958, Belanger & Tetreau, 1961, Duffy, 1962). Levels of arousal that are subnormal are ineffective in potentiating an activation level

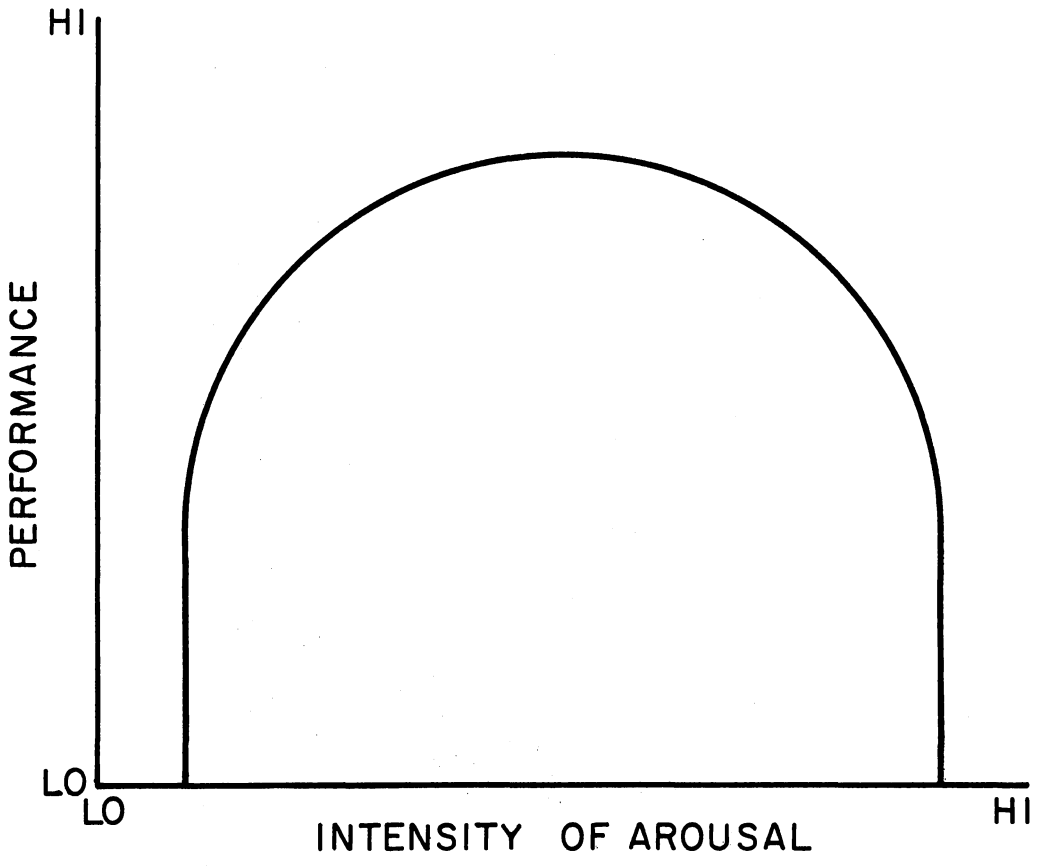

Figure 1. Inverted U Curve

sufficient to register much processing beyond an orienting response (Sokolov, 1958). Levels of arousal that are supernormal, however, produce interference effects that impairs efficient processing (Berlyne, 1967).

When a stimulus change exceeds a certain intensity the orientation reaction is replaced by a defensive reaction (Sokolov, 1958). This reaction, which often occurs in response to a strong or frightening stimulus, appears to constitute a protective device. Accompanying the defensive reaction is a temporary rise in the stimulus threshold which reduces the amount of information that reaches central mediating processes and consequently impairs recall of information.

Pavlov (1927) described a similar reaction, "supramaximal inhibition," in relation to conditioning responses. It takes the form of reduced activity, and in particular unusual resistance to the establishment of conditioned responses when a stimulus is exceptionally intense or has a strong impact on the nervous system.

Many experiments on exploratory behavior in lower animals have demonstrated that novel stimulation can induce either fear or exploration (Berlyne, 1960). Fear is more likely to occur when the novel stimulation is first encountered. The animal may retreat from novel features of the environment or, if it is unable to do so, remain crouched in a corner. Similar avoidance behavior has been observed with humans in relation to threatening stimuli. Luborski (1963) filmed eye movements while human adults were exposed to a series of pictures. More looking away from the main content, a shorter mean fixation time, and more forgetting occurred in connection with pictures producing the most intense Galvanic Skin Responses.

The conclusion emerging from these findings is that when stimulus intensity exceeds an intermediate range of arousal, a defensive reaction occurs. This defensive reaction replaces the orienting response, produces avoidance behavior, and raises the stimulus threshold which impairs information processing. This defensive reaction with its consequential behavioral effects is particularly relevant to the understanding of how eyewitnesses may react in highly arousing situations.

The demands placed upon an eyewitness during an interrogation involve primarily recalling details surrounding the event and attempting to recognize a suspect. Several studies in the literature of memory have investigated the effects of arousal on memory and recall.

Several experiments which are particularly relevant to the relationship between arousal and recall were conducted in the mid 1960's (Kleinsmith & Kaplan, 1963, 1964; Walker & Tarte, 1963). These experiments used paired associate learning with either words or nonsense syllables as stimulus terms and single digit numbers as response terms. The subjects were exposed to the material once and were not informed of the subsequent test for recall. When high arousal and low arousal stimulus terms were distinguished on the bases of GSR magnitude, responses associated with high arousal stimulus terms were recalled significantly less often when the test occurred within a few minutes of the training trial but significantly more often when intervals between training and testing ranged from 20 minutes to one week.

Levonian (1967) obtained comparable findings in an experiment with less artificial stimulus materials. Skin resistance was recorded while high school sktudents saw a film about traffic safety. They were tested both immediately after and one week later for the recall

of points made in the film. A large drop in skin resistance during exposure to a particular item tended to favor long term rather than short term recall. Short term recall was relatively better when the drop in resistance was low. Other studies have also supported the conclusion that the higher the level of arousal during learning, the greater the probability of long term recall and the smaller the probability of short term recall (Berlyne, 1966; Borsa, 1966; Hamacher & Koenig, 1966; Hamilton & Hockney, 1972; Zubryck & Borowoski, 1973).

Other experiments have been conducted in which treatments were introduced to raise the level of arousal during the acquisition phase of the task. Some of these manipulations include induced muscular tension (Stauffacher, 1937; Courts, 1939), white noise (Hormann & Todt, 1960; Berlyne, Craw, Salapatek & Lewis, 1965), tones (Schonpflug & Schafer, 1962), and physical exercise (Schonpflug, 1964). Each of these studies revealed that information processing and subsequent recall was most efficient at intermediate levels of intensity and that impairment, rather than facilitation, occurred when the intensity exceeded an intermediate level.

An assumption underlying the discussion up to this point is that arousal is a unitary dimension. Although it is generally accepted that arousal is multidimensional, only one bipolar dimension --pleasant/unpleasantness-- has been explored in depth. Generalizing from everyday experience, Wundt in 1874, advanced the general law that hedonic tone is related to stimulus intensity in accordance with the following curve (See Figure 2). As intensity rises from the absolute threshold there is a region of increasing pleasantness which reaches a peak and then declines to indifference, followed by increasing unpleasantness.

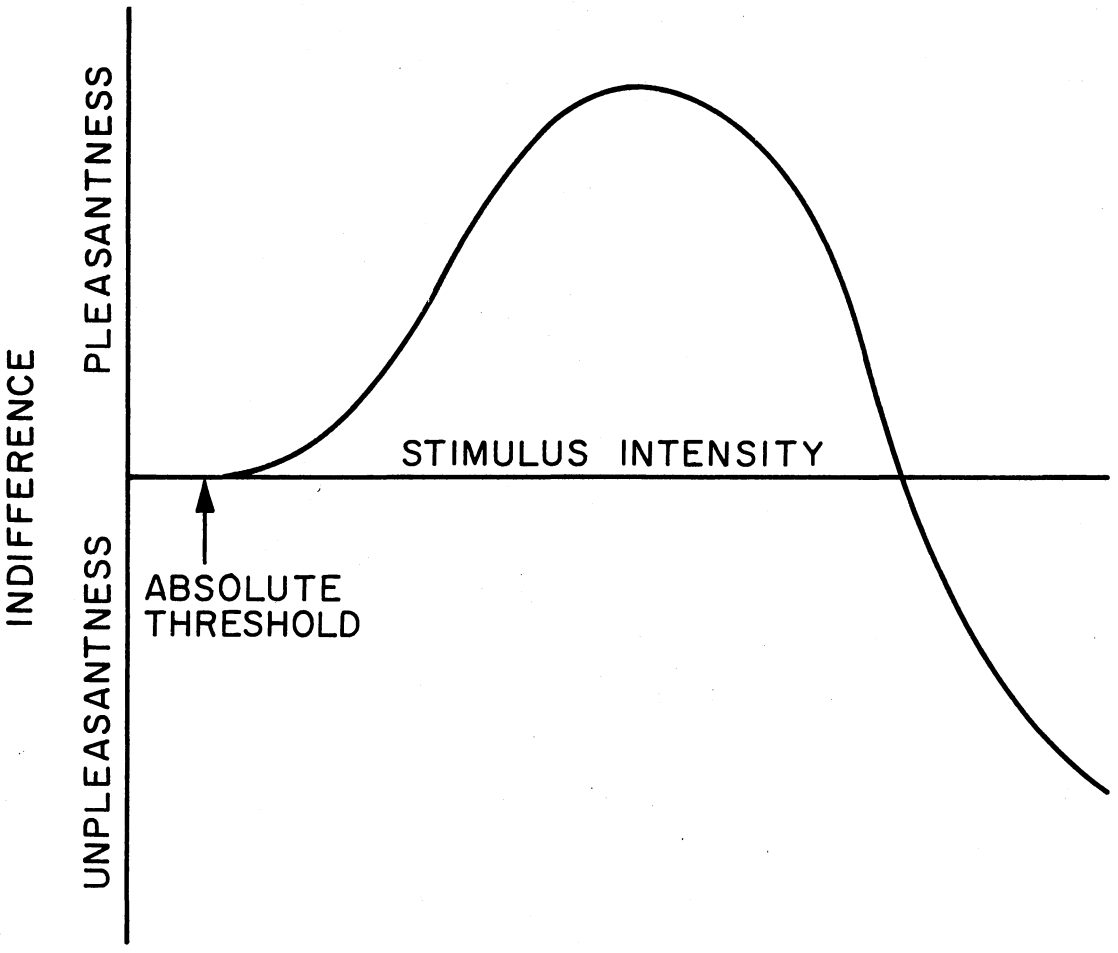

Figure 2. Stimulus Intensity and Hedonic Tone

Geilhorn (1961) identified reflexes which result in a movement toward the stimulating object that are elicited by "contact with broad smooth surfaces," and accompanied by feelings of well being. Withdrawal reflexes occur in response to stimuli which are "sharp, rough and irregular" and are associated with "unpleasant feelings."

The effects of visual contrast on human affective reactions were investigated by Alpert (1953). Subjects were first explosed to homogenous red visual fields and then a spot in the middle was made brighter or dimmer than its surroundings. Whether the background intensity was high or low, slightly brighter and slightly dimmer spots were judged pleasant. On the other hand, spots less dim than a high intensity background were judged unpleasant. This suggests that the highest intensities used exceeded an aversion threshold. What appears to be evident from these studies is that arousal of an intermediate intensity is judged as pleasant and elicits approach behavior. Arousal of high intensity is regarded as unpleasant and elicits avoidance behavior.

Other dimensions that appear to be included in arousal and contribute to the pleasant/unpleasant dimension are novelty, surprisingness, complexity, incongruity and uncertainty (Berlyne, 1967). Once again, intermediate levels of intensities of each of these variables enhance performance while high levels produce interference and decrease performance. From findings based on factor analysis, Bryne (1911), postulated two dimensions that are comparable to positive arousal (pleasant) and negative arousal (unpleasant). The dimension of positive arousal includes components such as alertness, curiosity, interest, and stimulation, whereas negative arousal includes components such as anxious, uneasy, feelings of unreality and confusion.

The issue of where positive arousal peaks and then turns to negative arousal appears to be dependent upon individual differences. Hebb (1949) and Meyer (1956), however, offer one generalization that seems pertinent. They suggest that a frightening or stressful situation will remain pleasant and even be sought out as long as the degree of the emotional situation remains under control and can be terminated at will. The essential point in this view is that the individual believes that he has control over the situation and posses the power of resolving the conflict. When the individual no longer feels he has control, negative arousal usurps positive arousal, avoidance behavior replaces approach behavior, and a defensive reaction supercedes the orienting reaction.

In summary, arousal appears as an intervening variable which can either facilitate or decrease performance depending upon the level of intensity. Intermediate levels are regarded as pleasant, produce approach behavior, and facilitate memory and recall. High levels of intensity are regarded as unpleasant or negative, produce avoidance behavior or a defensive reaction, and appear to interfere with recall and memory. The critical point at which positive arousal becomes negative arousal appears to vary with individual differences, but appears related to the degree of control the individual feels he has over the situation.

Sex Differences and Performance

To facilitate the literature review on sex differences, the area will be divided into two subcategories: (a) sex differences in arousal potential, and (b) sex differences in cognitive processing.

Sex Differences in Arousal Potential

Arousal potential is theorized as being the potential governing reactivity of the organism to stimuli. In the previous discussion on the effects of arousal on performance, high levels of intensity were found to produce a defensive reaction which interferes with effective processing. Also, tolerance for these levels of arousal appears to vary with individual differences. What is of interest at this point, in regards to eyewitness research, is whether the level of arousal potential or arousal tolerance varies not only individually, but as a function of sex.

Several physiological studies have shown that females appear to have higher baseline activation levels. Lundervold (1952) found greater muscle tension in the upper extremities, shoulders, back and thorax in 64 women than in 46 men. Shorter periods of relaxation also have been reported in electromyographs of women than of men (Reusch & Finesinger, 1943). Electroencephlograph studies have reported higher Alpha frequencies for females than for males (Henry, 1944; Kennard, Rabinovitch & Fister, 1955); a higher percentage of fast activity, including Beta rhythms, in females; and a higher percentage of Alpha rhythms in males (Kennard, Rabinovitch & Fister, 1955; Mundy, 1951).

The body temperature of women, taken at the time of a basal metabolism test, was found to be slightly higher than that of men (Jenkins, 1932). Also, heartrate variability is greater in women than in men (Malmo & Shagass, 1949). Females have also been found to be more sensitive to odors (le Magnen, 1952; Schneider & Wolf, 1955), high intensity auditory stimulation (Corah & Borfa, 1970) and pain (Woodrow,

Friedman, Siegelaab, & Collen, 1972). Males have not been found to be more responsive in any sensory mode.

In a study of autonomic and skeletal muscle responses to certain threatening pictures, David and Buchwald (1957) found that females produced a greater response than males for pulse cycle duration, and breathing time and amplitude.

Finally, experiments that have manipulated fear or high arousal as independent variables have found that females generally experience higher levels of anxiety as a result of the experimental manipulation (Benton, Gelber, Kelley, & Ciebling, 1969; MacDonald, 1970; Entwisle & Greenberger, 1972).

Explanations for differences such as these vary from cultural role expectations to genetic or biological differences. One interesting explanation for the higher arousal potential of females is that estrogen increases the basal threshold of many sensory perceptions (Broverman, 1968). This may account for the reviewed findings that females show more acute hearing, olfactory and tactile sense than males. By the same token, according to Broverman, this lower sensory threshold may also cause most women to hurt more under punishment and have greater need than most men to avoid stressful situations. This view may be particularly important for understanding females' performance as eyewitnesses under circumstances of high stress if, in fact, they are already predisposed to be more reactive to sensory stimulation.

Sex Differences in Cognitive Processing

The biggest sex differences in cognitive processing, relative to the eyewitness problem, is that females seem to process information

regarding human faces more efficiently than do males. One of the earliest studies dealing with sex differences in face recognition was conducted by Howell (1938). His study concluded that females had a significantly higher mean score recognition rate for facial photographs of both sexes than did males. Similarly, Witryol (1958) found females to be superior on social memory tasks that required the recognition of faces and the recall of names. He also reported that like-sex recall rates were significantly different. Males recognized male pictures better than female pictures, and females recognized female pictures better than male pictures. Finally, Cross, Cross, and Daly (1971), found that overall females were more efficient at recognizing faces. They also found a significant interaction which indicated that while males recognize male and female faces with equal facility, females recognized male faces less often and female faces more often than males. Another important result from their study was that males and females both misidentified males more often than females.

In conclusion, females apparently would be less efficient eyewitnesses than males in high arousal, stressful situations and more efficient than males in conditions of moderate arousal. The interaction between the level of arousal and the sex of the individual appears to be an important consideration in assessing the reliability of an eyewitness.

Short Term Recall of Visual Information

Since much of the information a witness is asked to recall is visual, especially the identification of a suspect, a review of the

literature involving cognitive processing of visual information seems relevant. It will cover both visual recall capacity of various objects and scenes and, more specifically, visual recall of the human face.

The literature of visual memory for complex stimuli indicates that the human capacity for recall of a broad spectrum of stimuli is quite exceptional. Haber (1970) demonstrates that after presenting 2,560 slides of various scenes and faces, the recognition rates of previously presented slides using a paired alternative forced choice task exceeded 90%. Shepherd (1967) and Nickerson (1965) in similar experiments presented subjects with 600 slides of various objects and scenes. A test series of 60 pairs of slides was then presented. Only one slide in each pair was a member of the original 600 slide stimulus set. The subjects' task was to indicate which slides was previously presented. Overall recognition rates in both experiments were 95% and 97% respectively.

Studies utilizing the human face exclusively as the stimulus, report comparable results. Hochberg and Galper (1967), using photographs of female faces, reported high recognition rates (about 90%). Yin (1969) using male faces as stimuli, found accuracy rates above 90%. In both of these experiments a forced choice test series was used after an initial presentation of the stimulus set.

From the results of these studies the reliability of a witness to accurately recognize a suspect appears quite good. Yet, in conversation with personnel in several law enforcement crime laboratories this is cearly not the case, at least not at the 90% and higher levels previously reported.

There are, of course, several reasons why the identification of criminals from law enforcement files could not be at this high level. These experiments were conducted under ideal laboratory conditions with instructional sets designed to specify the subject of interest. Also, the above experimental situations failed to capture the trauma of being present when a crime is committed. Unfortunately, there is no experimental evidence to indicate how reliable and accurate eye-witnesses are at recognizing individuals and recalling details in a live and stressful situation.

Summary

In summary, four conclusions can be drawn from the reviews of the literatures:

(1) High levels of arousal, which are experienced as unpleasant, will have a detrimental effect on cognitive processing, especially short term memory;

(2) Intermediate levels of arousal, which are experienced as pleasant, facilitate cognitive processing, especially short term recall;

(3) Some evidence exists that tolerance for high levels of arousal vary according to sex, with males having more tolerance for higher levels of arousal than females;

(4) Overall, both males and females are very efficient processors of visual information, with females being superior when the stimuli are human faces.

CHAPTER III

STATEMENT OF THE PROBLEM

The literatures reviewed have implications for understanding the role of arousal in affecting the performance of an eyewitness, the role of sex differences in performance as a function of the type and extent of the arousal, and the efficiency of a witness in the processing of visual information. Unfortunately, all of the experiments reviewed were conducted under rather artificial laboratory conditions.

The effects of the trauma that an eyewitness experiences in a criminal situation, and its subsequent effect on cognitive processing, is not present under these regular laboratory conditions. Further, no study to date has attempted to systematically create a situation that captures the trauma of being witness to a criminal act while simultaneously offering consistent and rigorous enough control to evaluate its relative effect. The following study was created to accomplish this purpose.

This study was designed to investigate three separate phenomena:

(1) The differential effects of high arousal and neutral or intermediate arousal on the processing of information in a live mundane setting.

(2) Potential sex differences in processing information as a function of the level of arousal in a live, mundane setting.

(3) The overall reliability of male and female eyewitnesses in recalling the events of a criminal act and subsequently identifying a suspect.

The following hupotheses were generated for the study:

(1) Overall performance will not be expected to vary as a function of the sex of the subject.

(2) Performance will, however, be expected to vary as a function of the interaction between the level of arousal and sex of subject.

a) Males will be expected to perform better in the arousal condition than females.

b) Females will be expected to perform better in the neutral condition than the arousal condition.

(3) Overall performance will be better in the neutral condition than the arousal condition.

(4) Subjects' ability to accurately identify a suspect's picture will be much poorer than the 90% accuracy rates reported in the visual processing literature.

(5) Female subjects will be expected to be better identifiers of targets than male subjects.

(6) The sex of the target will be expected to have an effect depending upon the level of arousal and sex of subject.

a) The male target will be expected to be more threatening for females in the arousal condition than for males. This will be expected to have a detrimental effect on information processing for females in the arousal condition.

b) Descriptions of the female target will be expected to be greater for female subjects than for male subjects in the neutral condition.

(7) More negative arousal will be expected in the arousal condition than the neutral condition.

a) Female subjects will be expected to experience more negative arousal in the arousal condition than male subjects.

To investigate these hypotheses, male and female subjects were exposed to live male and female targets in either a high arousal criminal situation or a neutral social situation. In the criminal situation, male and female subjects viewed either a male or female target leaving the scene of a crime in a vacant dormitory area. In the neutral situation male and female subjects viewed either a male or female target leaving the same area after the discontinuation of a psychological experiment. The dependent measures were the subjects' ability to accurately recall the details of the event and to identify the target.

CHAPTER IV

METHOD

Subjects. The subjects were 24 female and 24 male white undergraduate Psychology I students who received bonus points for participating.

Stimulus Materials. One male and one female upper classman served as targets throughout the duration of the experiment. The female target was 24 years old, 5 feet and 7 inches tall, 125 pounds and of medium build. She was fair complexioned with blonde hair that was parted in the middle and hung straight past her shoulders. The male target was also 24 years old, 6 feet tall, 200 pounds and of stocky build. He was also fair complexioned with black collar length hair that was parted in the middle. He also had a small moustache. Neither target had any characteristics that were obviously distinguishing. Both targets were dressed in jeans and flannel shirts that remained constant throughout the experiment.

Fifty male and fifty female 5 x 7 color photographs were bound into separate albums to resemble mug shot books. Five photographs appears on each page, and the target's picture was rotated to a new page every tenth subject.

The facial similarity of the targets to the other faces in their respective mug shot books was determined by having 50 independent observers rate them. Nontarget faces were presented one at a time next to the target's face and the observers were asked to rate the

similarity of the two faces. A four point scale with the verbal labels (1) "very dissimilar," (2) "dissimilar," (3) "similar," (4) "very similar" was used for the rating.

The mean similarity rating for the female nontargets to the female target was 1.95, indicating that the nontargets were generally regarded as dissimilar to the target. The mean similarity rating for the male nontargets compared to the male target was 1.99. This also indicated that the male nontargets overall were regarded as dissimilar to the male target.

All photographs were frontal facial views which includes the upper shoulders. A Konila 35 mm camers was uded with a lens of 135 mm effective focal length.

The blood used in the arousal condition was animal blood, and the grease used in the neutral condition was regular axle grease. The letter opener and pen used in the arousal and neutral conditions respectively, were both silver and 6" long. The wire attached to the confederate's arm in the arousal condition was regular electrical wire approximately 10" long and was attached by white adhesive tape.

The police uniform used in the experiment was borrowed from the local police department and was fully equipped according to regulation. Finally, the subjects reported to a vacant, unattended dormitory building on campus. The reception area and laboratory were adjoining suites on the ground level.

Procedure. Subjects were recruited for a learning experiment. Upon arriving in the reception area the subject was greeted by a receptionist and told that the researcher was with another person in an adjacent room, marked "laboratory." The laboratory was distin-

guished by a red light over the door. After seating the subject next to the exit of the laboratory the receptionist opened the door to the laboratory and checked on the progress of the experiment. After closing the door she commented to the subject that it would be just a few minutes, and then sat down behind a desk and began working on some papers. Within a minute she excused herself to run an errand and left the subject alone in the reception area.

The opening of the door to the laboratory by the receptionist was a cue for the experimenter and confederate to stop an ongoing word association task and to begin either a hostile or neutral interaction. During the hostile interaction (arousal condition), the subject overheard an argument about the continuation of an experiment involving shock. The exchange ended with bottles breaking, chairs crashing and the confederate (either male or female), bolting into the reception area with a bloodied letter opener and electrical wires attached to his/her forearms. The confederate remained in sight for four seconds, made one disclaiming comment ("He would not let me go"), and then existed.

During the neutral interaction (neutral condition), an equipment failure prevented the continuation of the experiment. After the equipment failed, the confederate, with grease on his hands and holding pen, entered the reception area, remained for four seconds, made one comment ("Too bad the machine broke"), and then left.

Both interactions lasted 3-4 minutes and were controlled for similarity of content. In the arousal condition the subject overheard the confederate being wired to receive shock for errors made in recalling word associations. In the neutral condition the subject

overheard the confederate being wired to monitor Galvanic Skin Responses as he/she participated in a game involving memorized word associations (see Appendices A and B for copies of the scripts).

Shortly after the confederate left the reception area, the experimenter entered it and asked the subject, "Are you - _____ _____? Please come with me." In the arousal condition the experimenter was dressed in a full police uniform, whereas in the neutral condition he appeared in a white lab coat. The subject was then led to an interrogation area where the investigation report was obtained.

At this point the subject was informed regarding the purpose of the experiment, and his help as solicited in the identification of the confederate and the recall of details relating to the situation. Before the actual interrogation began, the subject was asked to complete the Byrne Effectance Arousal Scale. This indicated, in part, the impact of the experimental manipulations.

The interrogation began by seating the subject at a bare table and asking him to relax for a minute and think about what had just occurred. After this brief interval, the experimenter asked the open-ended question, "Tell me in as much detail as you can what happened after you entered the reception area." Following the initial question concerning the total encounter, the interrogation was broken down into four specific topical areas: (1) the physical setting, (furnishings, lighting, etc.), (2) the conversation in the adjacent room, (3) the suspect's exit, and (4) the physical characteristics of the suspect. The initial question within each topical area was open-ended/free recall. Following the free recall a pre-determined set of probe questions were posed concerning relevant details that were not

mentioned in the free recall. All verbal reports by the subject were written by the experimenter during the investigation and tape recorded for subsequent verification.

At the conclusion of the interview the subject was seated in front of an album of mug shots containing either 50 male or 50 female 5 x 7 photographs. He was then given the following instructions: "The suspect in question may or may not be included in these photos. Please look through them and tell me if you see a picture of the person you just saw in the other room." At this point the experimenter left the room so as not to influence the subject's choice in any way. After the subject completed the identification task, he was asked to rate the confidence of his decision. If there were no further additions to the interview, the subject was given a short post-task inventory and further debriefed.

Throughout the experiment every attempt was made to simulate as closely as possible an actual police investigation. To facilitate this objective, tours were made of several crime labs and appropriate props were borrowed to lend realism.

Two weeks following the end of the experiment questionnaires were mailed to the subjects. They were asked to complete the questionnaire and return it.

Instruments. The Bryne Effectance Arousal Scale. This scale was used to measure the type and extent of the arousal created by the experimental manipulation (see Appendix C for a copy of scale). It consists of 16 questions that were identified through factor analysis to differentiate between a positive arousal (alert, stimulated, interest, etc.) and negative arousal (anxious, uneasy, disturbed).

Investigation Report.

The investigation report consisted of questions directed to the subject in an attempt to obtain information concerning the action that occurred and the circumstances surrounding that action. This report was separated into five units which corresponds in order to the flow of the experiment: (1) situation or setting, (2) conversation, (3) suspect exit, (4) suspect description, and (5) identification of suspect.

Following the experimental manipulation, each subject was initially asked to recall the entire flow of the experiment without intervention from the investigator. After the subject finished recounting as much about the complete flow of the experiment as possible, the investigation proceeded to a more structured interview revolving around the five units mentioned above (see Appendix D for a copy of the Investigation Report).

Within each of the first four units the subjects was first asked to recall as much about the specific unit as possible without intervention from the investigator. This type of reporting was termed Free Recall. After the subject had exhausted this free recall within the unit, the investigator would ask predetermined probe questions about any important details that the subject had failed to report during their free recall. The information received from the free recall was then summed with the probe information and termed Sum Recall.

The dependent variable for each of the first four units was obtained by assigning one point to each correct detail reported in the free recall or probe phase of the report. A general description of the units and the range of points possible follows.

Situation/Setting.

0-25 points possible for accurate description of the setting in the reception area. This included items such as the number of doors, door signs, number of windows, window covers, sources of light, floor coverings and pieces of furniture. The subject was also asked to sketch a floor plan of the room, to identify his position in respect to the suspect, and to diagram the flow of action.

Conversation.

0-20 points possible for accurate descriptions of what the subject overheard occurring in the laboratory. This included details such as number of people involved in the conversation, sex of the people, estimated age from their voice, nature of the experiment, arguments overheard, the beginnings and endings of arguments, length of the conversation, use of foul language, and the presence or absence of physical violence.

Suspect Exit.

0-8 points possible for accurate recall of what occurred when the suspect entered the reception area. This included details such as comments made by the suspect, length of exposure, presence of a letter opener (or pen), blood (or grease), and wires (or bandaid) attached to the forearm in the respective conditions.

Suspect Description.

0-13 points possible for accurate descriptions of the physical characteristics of the suspect. This included details such as sex, race, age, height, weight, hair style, color and length of hair, body build, attire and any other distinguishing characteristics.

The fifth unit was the identification of the suspect. This unit

did not involve any free recall or probe information. Instead, the subject was asked to attempt to identify the photograph of the suspect in the mug shot albums. The subject had two choices in this task. They either made an identification or decided that a picture of the suspect was not included in the mug shot book. Following this decision the number of the picture identified or the choice that it was not included was recorded in the report. The subject was then asked to rate how confident they were in their selection of a picture or decision that a picture of the suspect was not included in the mug shots. The scale used to assess the confidence ranged from 0 (no confidence) to 100 (absolute confidence).

Post Task Questionnaire.

The post task questionnaire was a series of nine questions concerning the subject's reaction to the experiment. All the questions were rated on a scale of 1-9. (A copy of the inventory and mean responses are presented in Appendix E.)

Follow-Up Questionnaire.

The follow-up questionnaire was mailed weeks after the experiment was completed. The questionnaire was designed to determine if the subject's participation in the experiment in any way influenced how they would regard eyewitness testimony if he were a juror in the future. It was also designed to find out in what way they had profited from the experiment. (A copy of the questionnaire and the mean responses are presented in Appendix F.)

CHAPTER V

RESULTS

The general design used for the analysis was a 2 x 2 x 2 analysis of variance. The three factors were motivation (arousal versus neutral), sex of subject (male versus female), and sex of target (male versus female).

The analysis was separated into six categories: (1) free recall--subjects free report without intervention from the investigator, (2) sum recall--sum of free recall and the information obtained from probe questions, (3) total analysis--total details recalled summing all the dependent variables in the sum recall category, (4) suspect identification--subjects identification of suspect's photograph and subsequent confidence rating, (5) error analysis--amount of overestimation or underestimation on key variables, and (6) arousal scale--measure of the type and extent of arousal created by the experimental manipulation.

A series of 2 x 2 x 2 analysis of variables were performed on dependent variables within each of these categories as listed below:

Free Recall
1) Complete Flow
2) Situation/Setting
3) Conversation
4) Suspect Exit
5) Suspect Description

Sum Recall
1) Situation/Setting
2) Conversation

3) Suspect Exit
4) Suspect Description

Suspect Information
1) Identification of Photograph
2) Confidence Ratings

Error Analysis
1) Length of Exposure
2) Distance from Suspect
3) Age of Suspect
4) Height of Suspect
5) Weight of Suspect

Arousal Scale
1) Positive Arousal
2) Negative Arousal

The results of the analysis performed on each category are summarized in Table I.

Overall, there were several consistent trends observed in the data. In the motivation condition the results indicated that more information was accurately recalled in the arousal condition than in the neutral condition. This trend was consistent across subcategories except for the category suspect description, where more information was accurately recalled in the neutral condition than in the arousal condition. No consistent trends were found for the sex of subject or sex of target conditions. A highly consistent trend was, however, indicated across all subcategories for the motivation by sex of subject interaction. Male subjects performed significantly better than female subjects in the arousal condition. While female subjects performed significantly better than male subjects in the neutral condition. Also, male subjects' performance was significantly better in the arousal condition than in the neutral condition and female subjects' performance was significantly better in the neutral condition than in the arousal condition. No other consistent trends were

TABLE I

SUMMARY TABLE FOR ANALYSIS OF VARIANCE

	A Motivation Neutral vs Arousal	B Sex of Subject Male vs Female	C Sex of Target Male vs Female	AB	AC	BC	ABC
FREE RECALL							
Entire Flow	***17.47 A7N	NS	NS	a3.77	NS	NS	NS
Situation	NS	NS	NS	NS	NS	NS	NS
Conversation	a3.74 A7N	NS	NS	*6.44	NS	NS	NS
Suspect Exit	NS	NS	NS	NS	NS	NS	NS
Suspect Description	***8.77 N7A	NS	NS	***8.77	NS	NS	NS
SUM RECALL							
Situation	NS	NS	NS	NS	NS	NS	NS
Conversation	NS	NS	NS	NS	NS	NS	NS
Suspect Exit	***34.13 A7N	NS	NS	NS	*6.53	NS	NS
Suspect Description	3.93 N7A	NS	***16.68 F7M	***50.69	***8.51	***9.93	*4.91
TOTAL DETAILS	**6.40 A7N	NS	NS	***16.03	NS	NS	NS
SUSPECT IDENTIFICATION							
Correct Identifications	NS	NS	NS	a3.53	NS	NS	NS
Confidence Ratings	NS	NS	NS	NS	NS	NS	NS
ERROR ANALYSIS							
Length of Exposure	NS	*4.16	NS	a3.73	NS	NS	NS
Distance from Suspect	NS	NS	NS	NS	NS	NS	NS
Age of Suspect	NS	NS	***9.66	*5.32	NS	NS	NS
Height of Suspect	*4.53	***7.34	*4.53	NS	NS	NS	NS
Weight of Suspect	NS	NS	***14.22	NS	NS	NS	NS
AROUSAL SCALE							
Positive	***35.72 A7N	NS	NS	NS	NS	NS	NS
Negative	***75.88 A7N	NS	***7.55 M7F	**4.02	*4.02	NS	NS

a .10 * .05 *** .001

indicated for the remaining interactions. A complete description of the results obtained follows.

Free Recall.

Main effects were found in the motivation condition for free recall of the complete flow, F (1, 40) = 17.47, the conversation, F (1, 40) = 3.79, and description of the suspect, F (1, 40) - 8.77. Free recall for the complete flow and conversation were greater under the arousal condition than the neutral condition. This was reversed for the free recall of the physical characteristics of the suspect, with recall being greater under the neutral condition than the arousal condition.

Significant interactions were found between the motivation condition and sex of subject. The dependent variables that were significan paralleled those for the main effects (complete flow, conversation, and description of the suspect). Simple effects tests revealed that male free recall more about the complete flow and the conversation in the arousal condition than do females, t (40) = 1.69, $p < .05$ (complete flow), t (40) = 2.06, $p < .05$ (conversation). These tests also indicated that females free recall more about the complete flow, conversation, and suspect description in the neutral condition than do males, t (40) = 1.68, p .05 (complete flow), t (40) = 1.77, $p < .05$ (conversation, t (40) = 2.43, $p < .05$ (suspect description). This would tenatively indicate that males free recall better under conditions of high arousal and females free recall better at intermediate or neutral levels of arousal.

Sum Recall.

Three main effects were found within the sum recall category. Two of the main effects occurred in the motivation condition, the third

in the sex of target condition. The variables that were significant under the motivation condition were suspect exit, F (1, 40) = 34.13, and suspect description, F (1, 40) = 3.93. For the variable suspect exit, more information was reported under the arousal condition than the neutral condition. This was reversed for the suspect description variable. More accurate descriptions of the suspect were provided under the neutral condition than the arousal condition.

The third main effect occurred under the sex of target condition. The dependent variable found to be significant was suspect description, F (1, 40) = 16.68. Overall, descriptions of the female target were more accurate than descriptions of the male target.

The interaction between the motivation condition and the sex of subject condition was found to be significant for the dependent variables conversation, F (1, 40) = 9.60, and suspect description, F (1, 40) = 50.69. Simple effects tests showed that for both dependent variables, males recalled more than females under the arousal condition, t (40) = 3.08, $p < .05$ (conversation, t (40) = 3.05, $p < .05$, (suspect description), and that females recalled more than males under the neutral condition, t (40) = 1.75, $p < .05$ (conversation), t (40) = 4.41, $p < .05$ (suspect description).

Other significant interactions were found between the motivation condition and sex of target condition for the dependent variables suspect exit and suspect description. Simple effects tests for the suspect exit variable showed that more details were recalled about the male target's exit than the female target's exit in the neutral condition, t (40) = 3.16, $p < .05$. There was no difference found in the arousal condition. For the dependent variable suspect des-

cription, descriptions of the female target were more accurate than descriptions of the male target in the neutral condition, t (40 = 5.00, $p < .05$. No significant differences in descriptions of the targets were found in the arousal condition.

A significant interaction was also found between the sex of subject condition and sex of target condition (male versus female) for the dependent variable, suspect description, F (1, 40) = 9.93. Simple effects tests revealed that female subjects' descriptions of the female target were more accurate than descriptions of the male target in the neutral condition, t (40) = 5.18, $p < .05$. No significant differences were found for male subjects' descriptions of either the male or female target.

A triple interaction was also found to be significant for the dependent variable suspect description, F (1, 40) = 4.91. Simple effects tests showed that male subjects gave significantly poorer descriptions of the suspect when it was a male target in the neutral condition, than in any of the other conditions. The t value for the nearest mean was t (40) = 3.66, $p < .05$. Conversely the most accurate description was of the female targets in the arousal condition for male subjects. Female subjects gave significantly poorer descriptions of the suspect when it was a male target in the arousal condition. The t value for the nearest mean was t (40) = 3.14, $p < .05$. They were most accurate in their descriptions when it was a female target in the neutral condition with the t value for the nearest mean being t (40) = 5.66, $p < .05$. Also, female subjects' descriptions of the male target, regardless of the motivation factor, t (40) = 5.66, p .05 (neutral), t (40) = 5.18, $p < .05$ (arousal).

Total Analysis.

The total analysis, which was the total details recalled collapsed across all the dependent variables in the sum recall category revealed a significant main effect, F (1, 40) = 6.40. More details were recalled in the arousal condition than in the neutral condition.

A significant interaction was also found between the motivation condition and sex of subject condition. Simple effects tests showed that males recalled significantly more details in the arousal condition than did females, t (40) = 4.56, $p < .05$, and that females recalled significantly more details in the neutral condition than did males, t (40) = 3.85, $p < .05$.

Suspect Identification.

Analysis of the subjects' ability to accurately identify the suspect's photo revealed no signficant main effects. There was, however, a significant interaction, F (1, 40) = 3.53, between the motivation condition and sex of subject. Simple effects tests showed that females were better at identifying the suspect's photo in the neutral condition than were males. No significant differences were found, however, between males and females in the arousal condition. The mean number of correct identifications made in each condition are presented in Appendix G.

Analysis of the confidence ratings obtained after the subjects made their identifications failed to yield any significant results. Mean ratings found in each condition are presented in Appendix G.

Error Analysis.

The error analysis produced four significant main effects for the variables, length of exposure, age of suspect, height of suspect, and weight of suspect.

For the variable, length of exposure, a main effect was found for the sex of subject condition, $\underline{F}$ (1, 40) - 4.16. On the average females overestimated the length of time they saw the suspect by 12 seconds, whereas males only overestimated by an average of 5 seconds. Since the exposure time was actually four seconds, this means that the average estimates for the females was 16 seconds and only 9 seconds for the males.

A main effect for age of suspect was found for the sex of target factor, $\underline{F}$ (1, 40) = 9.66. The age of the female target was underestimated by an average of four years, whereas the age of the male target was 24 years.

Three main effects were found for the height of suspect. In the motivation condition the height of both suspects was underestimated by .04 inches in the arousal condition and overestimated by .87 inches in the neutral condition, $\underline{F}$ (1, 40) = 4.53. In the sex of subject condition male subjects tended to overestimate the height of the suspect by 1.00 inch and females tended to underestimate on the average by .16 inches, $\underline{F}$ (1, 40) = 7.34. In the sex of target condition the male target's height was underestimated by .04 inches, the female target's height was overestimated by .88 inches on the average, $\underline{F}$ (1, 40) = 4.53.

One main effect was also found for the weight of suspect variable. The male's weight was underestimated by an average of 13 pounds while the average error in the estimate of the female's weight was, $\underline{F}$ (1, 40) = 14.22.

Two significant interactions were found between the motivation condition and the sex of subject for the length of exposure, $\underline{F}$ (1, 40) = 3.73, and age of suspect, $\underline{F}$ (1, 40) = 5.32, variables. For the length of

exposure variable, simple effects tests revealed that females overestimated the exposure time by an average of 15 seconds in the arousal condition, while the males overestimated by only an average of 2 seconds. This means that the females in the arousal condition were reporting on the average that they saw the suspect for 19 seconds, while the males were reporting an average exposure time of only six seconds, t (40) = 9.08. No significant differences were found between males and females in the neutral condition.

Simple effects tests performed on the age of suspect variable showed that females in the arousal condition underestimated the suspect by an average of 3.83 years, while the males underestimated by only an average of 2.5 years, t (40) = 3.07, $p < .05$. In the neutral condition the estimates of males and females were not found to be significantly different.

Arousal Scale.

The final analysis performed was on the positive and negative components of the Byrne Effectance Arousal Scale.

Analysis on the positive component revealed a main effect for the motivation factor, F (1, 40) = 35.72. More positive arousal was elicited in the arousal condition than in the nautral condition.

A greater difference occurred in the analysis of the negative arousal component where main effects were found for the motivation condition, F (1, 40) = 75.88 and sex of target condition, F (1, 40) = 7.55. More negative arousal was elicited in the arousal condition than in the neutral condition, and more negative arousal was reported when a male target was used than when a female target was used.

Two interactions were also found to be significant. These were

the motivation condition by sex of subject, $\underline{F}$ (1, 40) - 4.02, and motivation condition by sex of target, $\underline{F}$ (1, 40) = 4.02.

Simple effects tests performed on the motivation by sex of subject interaction indicated that females reported experiencing much more negative affect in the arousal condition than did males, $\underline{t}$ (40) = 7.32, $\underline{p} < .05$. No significant differences between males and females were reported in the neutral condition.

Simple effects tests performed on the motivation by sex of target interaction revealed that much more negative affect was reported in the arousal condition when the male target was present than when the female target was present, $\underline{t}$ (40) = 8.81, $\underline{p} < .05$. No significant differences were found between the targets in the neutral condition.

CHAPTER VI

DISCUSSION

The hypothesis that more negative arousal would be experienced in the arousal than in the neutral condition was supported. The experimental manipulation was effective in creating an arousal level of sufficient intensity to be regarded as aversive. The hypothesis that females would experience significantly more negative arousal in the arousal condition than male subjects was similarly supported. No difference, however, existed between the sexes in the neutral condtition. Overall, these results can be integrated on the basis of the generalizations advanced by Hebb (1955) and Meyer (1972). They contended that arousal would become aversive or unpleasant at the point at which the individual perceived he no longer controlled a situation. Since the target in the arousal condition was standing within six feet of the subject holding a bloodied weapon, perceived control was apparently threatened. It is probable that both males and females, but especially females, did experience the strong negative arousal as a result of a perceived loss of control.

The notion that arousal becomes aversive as a function of the perceived loss of control is further supported by the finding that significantly more negative arousal was created when the male rather than the female target was present in the arousal condition. A 6 foot, 200 pound male target with a bloodied knife poses considerably more

threat to both sexes' perceived control of the situation than does a female target. It is also interesting to note that the sex of the target influenced the attribution of criminality. When the male target was present, 96% of the subjects labeled him as the aggressor in the incident. When the female target was present, however, only 8% of the subjects labeled her as the aggressor. The overwhelming majority, 92%, perceived her the victim of the incident. Evidently, females were viewed as victims rather than aggressors. This attribution process would help minimize the perceived threat of the situation.

The hypothesis that female subjects in the arousal condition would experience more negative arousal than male subjects when a male target was present was not supported. Although the predicted interaction for the ratings was not significant, several findings indicate that the female subjects performance was more adversely affected by the presence of the male target in the arousal condition, than in any other condition. In the significant three way interaction for the suspect description, the poorest description for a target occurred when a female subject described a male target in the arousal condition. Also, female subjects were unable to make a correct identification of the male target in the arousal condition. This was the only cell without a correct identification. It was also the cell that had the highest rate of misidentification (100%).

Although the arousal ratings did not indicate it directly, female subjects did apparently experience more negative arousal, with its subsequent impairment than did male subjects when the target was male in the arousal condition. This poor performance by the female subjects appears congruent with the loss of control hypothesis. Evidently

female subjects perceived less control of the situation with a male target in the arousal condition.

The hypothesis that performance in recalling information would be better in the neutral than in the arousal condition was not completely supported. Results from the total analysis, conversation and suspect exit categories indicated that more details were recalled in the arousal condition than in the neutral condition. This trend, however, was reversed for the category suspect description. Although these results appear initially contradictory they are not since the level of arousal varied with specific phases in the flow of the experimental procedure. Initially, when the subject entered the reception area, the arousal was at an intermediate level which produced visual scanning and information processing of the room. This assumption is supported by the lack of a difference found in the recall of details about the physical setting from subjects in the neutral and arousal conditions. Also, the fairly good recall of the physical setting indicated that the intermediate level of arousal was facilitating information processing with little interference experienced at this point in the sequence. When a discussion of shock occurred in the laboratory followed by an argument in the arousal condition, attention was deployed toward the novel stimuli. The argument over the use of shock apparently heightened the level of arousal. This heightened arousal could have differentially influenced subjects depending on the subject's sex. For the males, perceptual processes appeared to be sharpened which enhanced processing, whereas interference seemed to be experience by females. The conversation, in the neutral condition, because of its uneventful content, did not elicit the same heightened arousal and consequently,

perceptual sharpening did not occur for subjects of either sex. Instead, upon processing the information in the reception area, the subjects returned to a rather low level of arousal that did not enhance the processing of the laboratory conversation. Poor performance as a result of low arousal in the neutral condition was especially true for male subjects. In the arousal condition, however, when the target broke into the reception area, bloodied weapon in hand, the arousal level exceeded an aversive threshold. The targets closely observed the reactions of the subjects to their entry. The targets' descriptions of the subjects reactions to the intrusion closely paralleled descriptions of freeze and avoidance behavior observed in laboratory animals under threat. Moreoever, very little eye contact was reported between the subject and target in the arousal condition and only three of 24 subjects (two female and one male) made any attempt to intervene or move from their chair, either while the target was present or following his exit. In most cases a full minute lapsed before the investigator entered the room. These general avoidance responses were not observed in response to the targets' entry in the neutral condition. The intense arousal and avoidance behavior resulted in attention being deployed or fixated on the peripheral stimulus (blood, knife, wires) rather than the face or physical characteristics of the target during their exit.

This notion of attention deployment during the suspect's exit in the arousal condition is supported by the recall data. Twenty-two of 24 subjects accurately described and recalled the peripheral stimuli, (blood, knife, wires) whereas only 3 of 24 subjects recalled the comparable items in the neutral condition. Since little time was spent

looking at the peripheral stimuli in the neutral condition, more time was available for scanning and processing the physical appearance of the target. Attention was simply deployed too long at peripheral items for effective processing of the target's appearance in the arousal condition.

In summary, the level of arousal began to vary with the introduction of the conversation in the laboratory. In the arousal condition an intermediate level of arousal was created that facilitated information processing; in the neutral condition a lower level of arousal did not facilitate information processing. The suspect's exit in the arousal condition created an aversive level of arousal which facilitated the recall of peripheral stimuli, but interfered with effective processing of the physical characteristics of the target. In the neutral condition, however, attention was ineffectively deployed and the intermediate level of arousal enhanced the processing of the physical characteristics of the target. When the effects of arousal on performance are evaluated in this perspective, they are in agreement with Berlyne's theory of arousal (1967). Intermediate levels of arousal do enhance performance, whereas high levels of arousal interfere with performance.

The hypothesis that performance would not vary as a function of the sex of the subject was supported except for the error analysis. As hypothesized, however, sex differences did occur as a function of the level of arousal. The significant motivation level by sex of subject interactions for the variables, conversation, suspect exit, suspect description, and total analysis, were all comparable in form. (See Figure 3.) Male subjects consistently performed better than

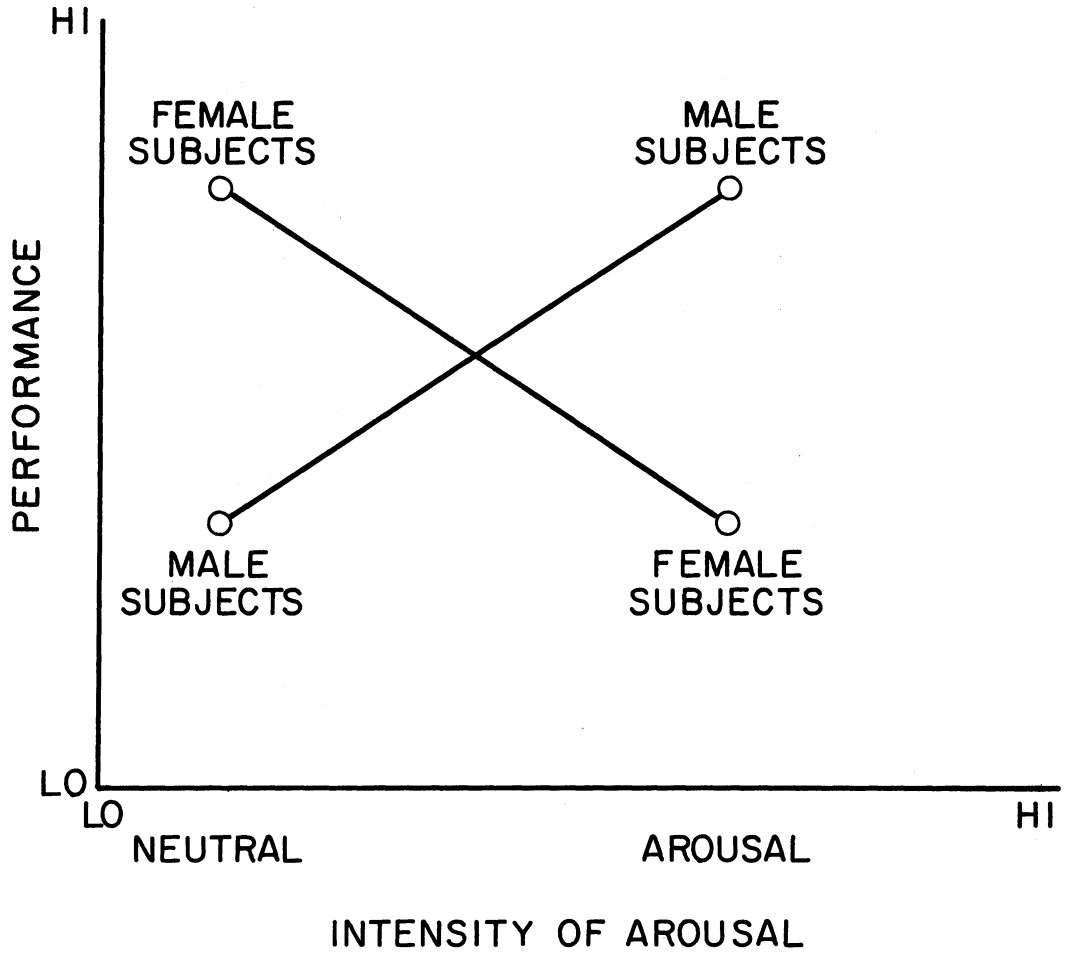

Figure 3. Motivation X Sex of Subject Interaction

female subjects in the arousal condition, and female subjects consistently performed better than male subjects in the neutral condition. Males' overall performance was better in the arousal than the neutral condition. This relationship was reversed for females. Their performance was superior in the neutral condition. These trends also appeared in variables that failed to reach statistical significance. Both the statistically significant and nonsignificant results indicate that performance efficiency varies as a function of the sex of the subject and the intensity of the arousal.

These results support findings presented earlier that female subjects have a lower threshold or tolerance for stimuli. Consequently, females may require a less intense stimulus to achieve maximum performance with increasing arousal than do males. Males, on the other hand, may be able to tolerate more intense stimuli whtout experiencing as much interference, but are less efficient at lower levels of arousal. This hypothesized relationship among sex, arousal, and performance can best be conceptualized by proposing different arousal/performance curves for the sexes. (See Figure 4.)

The negative skewed leptokurtic curve for the females would indicate an arousal potential that is generally more reactive. Efficient processing and peak performance would occur at lower levels of arousal than for males. The curve for the males appears more mesokurtic, indicating that males' arousal potential would be less reactive. Their performance would be less efficient at lower levels of arousal, and peak performance would occur at higher levels of arousal than for females. The relationship reflected in curves of this nature would explain why sex differences affected performance differentially in the same experimental manipulation.

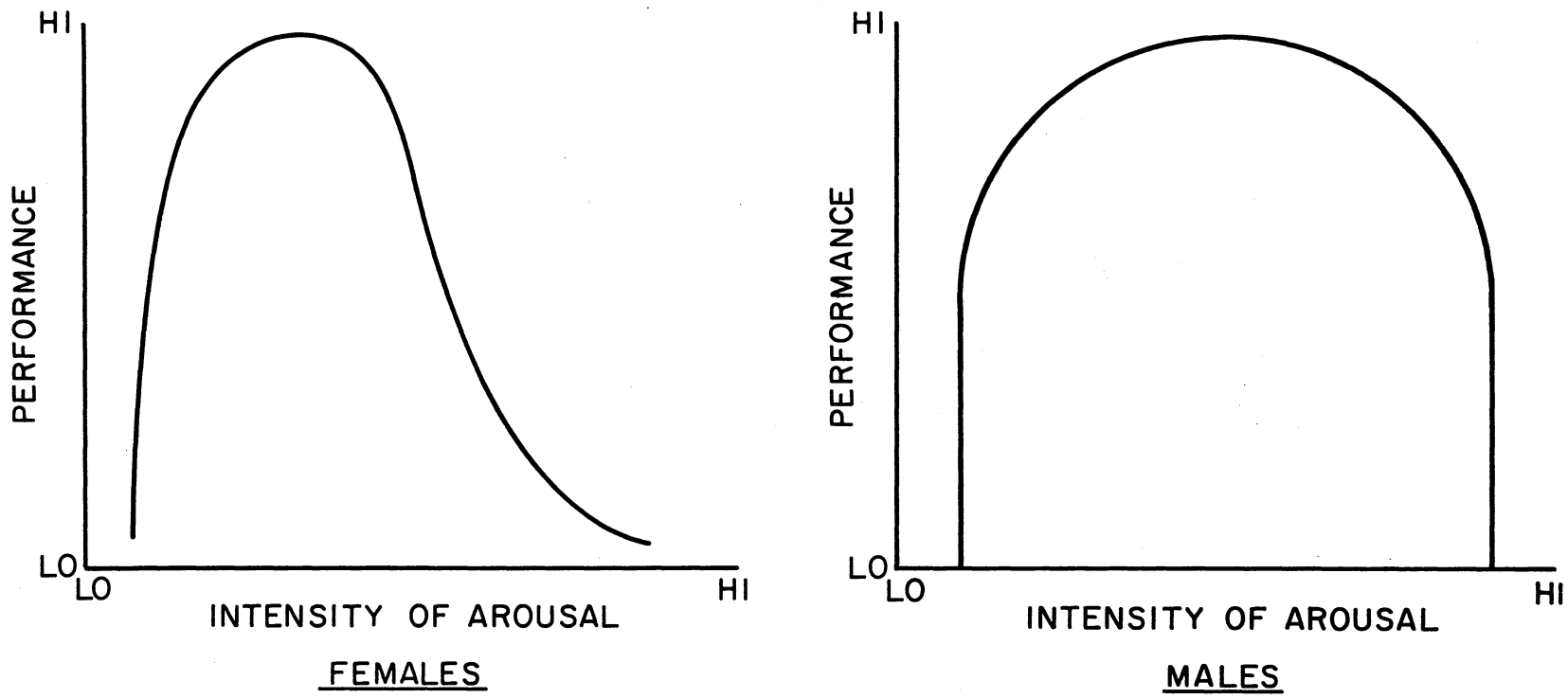

Figure 4. Arousal/Performance Curves for Females and Males

Overall, the target's sex influenced the subjects' ability to give accurate descriptions of their physical characteristics. Descriptions of female targets by both male and female subjects were more accurate than ones of male targets. This was especially true in the neutral condition. Also, as was predicted, the most accurate descriptions across all conditions occurred when female subjects were describing female targets in the neutral condition. These descriptions were extremely accurate and were far superior to male subjects' descriptions of either female or male targets.

Two explanations for these results can be proposed. Since only one male and one female target were used, the first explanation would be that the female target was simply the easier of the two to describe. If true, then the results of this study would be regarded as peculiar to the realtionship between the two targets used. Thus, their scientific significance is limited. If the results are not restricted to the targets used, however, then a second explanation emphasizing cultural and sex role biases in person percpetion may be considered. This explanation contends that while males, in our culture are not encouraged to scrutinize other males, they are encouraged to "girl watch." This custom would create a practice effect for males viewing females that could function as a basis for sex differences in person perception. A culture based explanation appears to be applicable for female observers also. The glorification of the female form in the mass media such as television and magazine advertisements could serve to enhance the discerning capacity of both male and female observers for female forms. Since little evidence is available to support this cultural interpretation further investigation is warranted.

The hypothesis that the subject's identification rates of the targets picture would be much poorer than the 90% accuracy rates reported in earlier studies was supported. Regardless of the arousal level, accuracy rates never exceeded 67%. The best recognition rates were produced by female subjects in the neutral condition. The female subjects' 67% average in the neutral condition was significantly better than male subjects' average of 25%. Both male and female subjects' performances in the arousal condition, however, were poor. The males' average recognition rate was 33%, whereas the females' average was only 25%. The finding that female subjects were better recognizers than male subjects in the neutral condition supports similar findings reportedby Witryol (1958) and Cross, Cross, and Daly (1972).

The reason for these overall poorer recognition rates compared to earlier findings probably involves the nature of the experimental setting. Previous experiments have specifically identified the task required of the subject and have used photographs rather than live targets as stimuli. Instructional sets that cue the subject to the task before the stimuli are presented allow the subject to selectively focus his attention. This selective attention, prompted by the instructional set, artificially inflates recognition rates. Also, a photograph used as stimulus is neither as rich nor as complex as a live target. A less complex stimulus requires less processing which results in fewer errors being committed. Both of these criticisms of previous studies could account for the decreased recognition rates observed in this study.

An analysis of the overall reliability of the subjects indicated

that on the average they were able to recall 57.5% of the information from the different phases of the experiment. Sixty percent of the informaton was accurately recalled in the arousal condition and 55% was recalled in the neutral condition. The recall rates for males and females were comparable. Males were able to recall 59% of the information, and females, 58%. Percentages for the amount of information recalled as a function of the motivation level by sex of subject interaction are presented in Figure 5. As this figure indicates, the overall recall rates paralleled the relationships found in several other dependent measures.

The free recall phase of the interrogation accounted for 49% of the accurate information that was reported by the subjects. Since no criteria is currently available in the literature it is difficult to evaluate the quality of this performance. Further research is needed in this area to establish these norms.

In conclusion, the overall reliability of eyewitness reporting and identification is suspect and requires additional investigation. The present study was successful in demonstrating that different levels of arousal do affect the performance of eyewitnesses. Intermediate levels of arousal were found to facilitate performance; high levels interfered. Although no main effects were found between males and females, the subjects' sex interacted with the level of arousal to produce differential effects on performance. Males perfromed better at higher levels of arousal; females, at lower levels of arousal. This finding generated a new conceptualization of the relative shapes of arousal/performance curves for males and females. The sex of the target affected the intensity of arousal the subjects

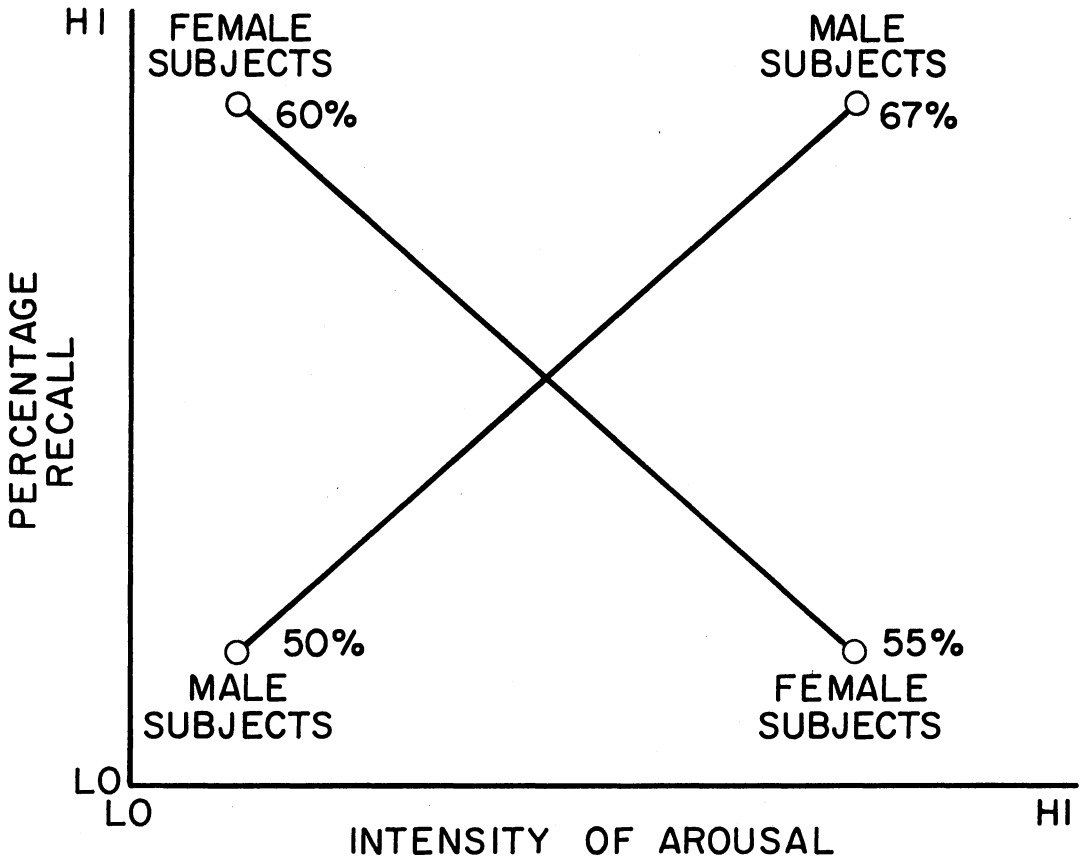

Figure 5. Motivation X Sex of Subject Recall Rates

experienced and the accuracy of their descriptions of the targets. The male target was viewed as more threatening than the female target in the arousal condition. This adversely affected recognition and recall for the male target in the arousal condition, especially for female subjects. Descriptions of the female target were found to be more accurate than descriptions of the male target. This was especially true for female subjects in the neutral condition. Finally, females in the neutral condition were the most efficient recognizers of the targets' photographs. Recognition rates overall, however, were far below rates obtained under different laboratory conditions.

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APPENDIX A

NEUTRAL CONVERSATION SCRIPT

Experimenter: Ok, that takes care of the first part of the experiment. By the way, you really did well.

Confederate: Thanks, it wasn't too bad.

Experimenter: Now for the second part of the experiment I am going to ask that you learn another set of associations similar to the first set. This time, however, you will be punished each time that you miss an item.

Confederate: Punishment...what kind of punishment?

Experimenter: That is what this machine is for over here. Would you mind coming over and having a seat?

Confederate: Hey this looks pretty complicated. What are all the dials for?

Experimenter: It's not as complicated as it looks. During this phase of the experiment I will once again give you a list of associations to learn. After you have had time to look them over I will begin giving you the cues as before. However, on these trials each time that I give you a cue, two numbers will flash on the screen. The number on the right will indicate how many points you will receive if you answer correctly. The number on the left indicates how many points you will lose if your reply is wrong.

Confederate: And this panel is where the points are tallied?

Experimenter: That's right, and the object is to amass as many points as possible.

Confederate: Hey this looks like it will be a little more interesting.

Experimenter: Another thing that I would like to do, if you don't have any objections, is to attach these wires to your forearms. These are hooked to this machine and give us some indication of what is occurring physiologically when you make a response.

Confederate: Sure, that's ok.

Experimenter: Ok, let me turn this on and see it if is working. There seems to be some problem...hold on, I think it will only take a minute to repair.

Confederate: Do you have a lot of trouble with this eqipment?

Experimenter: We have been lately. This plug is usually the problem. Yes, it's alright now. Well, now that that is fixed let's get started with the task. Remember, you have only 30 seconds to learn it. Do you have any questions before we start? Good...ready, go.

Experimenter: Ok, times up. Are you ready for the first item?

(Several word associations ensue.)

Confederate: Hey, I think something is wrong with the machine again, the lights are not working.

Experimenter: Let me take a look. I'm sorry but we are not going to be able to continue because of the machine. I really appreciate your participating and I will be sure that you get your credit.

Confederate: Thanks alot. I'm sorry the machine broke; it was becoming fun. Perhaps we can complete the experiment later.

Experimenter: That would be nice. I will call you if it is possible.

APPENDIX B

AROUSAL CONVERSATION SCRIPT

Experimenter: Ok, that takes care of the first part of the experiment. By the way you did well.

Confederate: Thanks, it wasn't too bad.

Experimenter: Now for the second part of the experiment I am going to ask you to learn another set of associations. This time, however, you will be punished each time you miss an item.

Confederate: Punishment...what kind of punishment?

Experimenter: That is what this chair is for; would you mind coming over here and having a seat.

Confederate: That doesn't look very comfortable, what are the wires for?

Experimenter: The wires are hooked to a generator here. During this phase of the experiment each time that you miss an item you will be shocked as a form of punishment.

Confederate: How much shock?

Experimenter: It is not enough to cause you any harm, but it is enough to be uncomfortable.

Confederate: Hey, I'm not sure I want to be a part of this. I'm not too crazy about being shocked, besides, they didn't say anything about being shocked when I signed up for this experiment.

Experimenter: I'm sorry, something should have been mentioned, but how about letting me finish attaching the wires and then see what you thing?

Confederate: Ok, but I'm not too excited about this.

Experimenter: Yes, I can see that. Ok, be real still for a second... there that should do it. Let me turn this on and see...oh no! Don't tell me it's not working again.

Confederate: Oh great! That's just what I need, an equipment failure while I'm wired up like this!

Experimenter: Relax, I'll have it fixed in a minute.

Confederate: Do you have a lot of equipment problems?

Experimenter: We have been lately. There that seems to be the problem. Yes, it seems to be alright now. Ok, here is the list. Remember, you have 30 seconds to learn it. Do you have any questions before we get started? Ready...go.

(30 second pause)

Experimenter: Your time is up. Here is the first item.

(Several word associations ensue. Finally the confederate misses an item and is shocked.)

Confederate: Hey, that really hurt! How about turning it down a little?

Experimenter: Can't it has to stay the same. Here is the next item.

(wrong response)

Confederate: Sorry, but I have had enough of this. I want to stop.

Experimenter: Hey, look you have already committed yourself, besides the wires are attached and everything is working alright. Just sit still.

Confederate: Committment, the hell with committment! This isn't worth any two points. I'm getting out of here.

Experimenter: Hey, sit still, you're tearing the wires out!

Confederate: The hell with the wires, I said let me up!

Experimenter: Come on, you're tearing the place up!

(chair falls and bottle breaks)

Confederate: Get out of my way!

Experimenter: Look out...where did you get that?

APPENDIX C

EFFECTANCE AROUSAL SCALE

IMPORTANT: Complete this 16 item inventory on the basis of how you <u>think</u> the student felt after reading the stranger's questionnaire. Complete this inventory as you THINK HE filled it in.

---

1. Entertained (check one)

__1__ Not at all entertained
_____ Slightly entertained
_____ Moderately entertained
_____ Entertained
__5__ Quite entertained

2. Disgusted (check one)

__1__ Not at all disgusted
_____ Slightly disgusted
_____ Moderately disgusted
_____ Disgusted
__5__ Extremely disgusted

3. Unreality (check one)

__5__ Strong feelings of unreality
_____ Feelings of unreality
_____ Moderate feelings of unreality
_____ Slight feelings of unreality
__1__ No feelings of unreality at all

4. Anxious (check one)

__1__ Not at all anxious
_____ Slightly anxious
_____ Moderately anxious
_____ Anxious
__5__ Extremely anxious

IMPORTANT: Complete this 16 item inventory on the basis of how you think the student felt after reading the stranger's questionnaire. Complete this inventory as you think he filled it in.

---

5. Bored (check one)

__1__ Extremely bored
_____ Bored
_____ Moderately bored
_____ Slightly bored
__5__ Not at all bored

6. Uneasy (check one)

__1__ Not at all uneasy
_____ Slightly uneasy
_____ Moderately uneasy
_____ Uneasy
__5__ Quite uneasy

7. Confused (check one)

__1__ Not at all confused
_____ Slightly confused
_____ Moderately confused
_____ Confused
__5__ Quite confused

8. Curiosity (check one)

__5__ Strong curiosity
_____ Curiosity
_____ Moderate curiosity
_____ Slight curiosity
__1__ No curiosity

9. Confident (check one)

__5__ Not at all confident
_____ Slightly confident
_____ Moderately confident
_____ Confident
__1__ Extremely confident

IMPORTANT: Complete this 16 item inventory on the basis of how you think the student felt after reading the stranger's questionnaire. Complete this inventory as you think he filled it in.

---

10. Intellectually challenges (check one)

__5__ Strongly challenges intellectually
_____ Intellectually challenged
_____ Moderately challenges intellectually
_____ Slightly challenges intellectually
__1__ Not at all challenges intellectually

11. Stimulated (check one)

__1__ Not at all stimulated
_____ Slightly stimulated
_____ Moderately stimulated
_____ Stimulated
__5__ Extrememly stimulated

12. Interested (check one)

__5__ Extremely interested
_____ Interested
_____ Moderately interested
_____ Slightly interested
__1__ Not at all interested

13. Alert and eager (check one)

__5__ Not at all alert and eager
_____ Slightly alert and eager
_____ Moderately alert and eager
_____ Alert and eager
__1__ Extrememly alert and eager

14. Depressed (check one)

__1__ Not at all depressed
_____ Slightly depressed
_____ Moderately depressed
_____ Depressed
__5__ Extremely depressed

IMPORTANT: Complete this 16 item inventory on the basis of how you think the student felt after reading the stranger's questionnaire. Complete this inventory as you think he filled it in.

---

15. Aroused (check one)

__1__ Not at all aroused
_____ Slightly aroused
_____ Moderately aroused
_____ Aroused
__5__ Extremely aroused

16. Disturbed (check one)

__1__ Not at all disturbed
_____ Slightly disturbed
_____ Moderately disturbed
_____ Disturbed
__5__ Extremely disturbed

APPENDIX D

INVESTIGATION REPORT

Date _____ Name _____ Subject # _____

Condition: Sex of S
male female
Sex of C
male femlae
Motivation
neutral arousal

Comments:

Subject # _____

Please describe in as much detail as possible what happened to you after you entered the reception area.

Subject # _____

(Situation)--Please describe in as much detail as possible the room and furnishing that you were in.

Probe:

furniture

# of door

signs

color of walls

sources of light

# of windows

window covers

arrangement: draw room and identify flow of action

Subject # _____

(Conversation)--Please describe in as much detail as possible what happened in the other room.

Probe:

How many people were in the other room?
age sex

What were they talking about (what was the experiment about)?

What was the tone of their exchange (did it change throughout the experiment)?

Did there seem to be an argument-was there any use of foul language?

What did the argument seem to be about?

How did it start?

How did it end?

How long did it last?

Did there seem to be any physical violence?

Subject # _____

(Suspect exit)--Please describe in as much detail as possible what happened when the suspect came out of the room.

Probe:

Was anything said?

What was said?

Were they carrying anything?

Did they make any movement toward you such as an attack?

How long did you get to see them?

Who was responsible for the violence (arousal condition)?

What were you thinking?

Subject # _____

(Suspect description)--Please describe in as much detail as possible the physical characteristics of the person.

Probe:

Sex

Age

Race

Height

Weight

Body build

Color of hair

Style of hair facial hair

Length of hair

Clothes (mode of dress)

Distinguishing characteristics

Please rank in order the features of the face that you used to identify the person.

hair __
eyes __
noes __
ears __
mouth __

teeth __
complexion __
shape of face __
chin __
lips __
other __ (describe)

APPENDIX E

POST TASK QUESTIONNAIRE

Were you comfortable working with the experimenter? Yes ___ No ___

Were you serious in your answers? Yes ___ No ___

Describe the experiment in which you just participated by circling the number which corresponds to your feeling or impression about it.

Mean Response										
	interesting									dull
1.58		1	2	3	4	5	6	7	8	9
	worthwhile								not	worthwhile
1.54		1	2	3	4	5	6	7	8	9
	not pleasant									pleasant
7.33		1	2	3	4	5	6	7	8	9
	not valuable to science							valuable to science		
7.81		1	2	3	4	5	6	7	8	9
	soothing									threatening
4.10		1	2	3	4	5	6	7	8	9
	arousing								not	arousing
2.85		1	2	3	4	5	6	7	8	9

APPENDIX F

FOLLOW-UP QUESTIONNAIRE

If you were serving as a member of a jury in the future, how would you regard eyewitness testimony?

__1__ Extrememly reliable

_____ Reliable

_____ Slightly reliable

MEAN = 3.33

_____ Slightly unreliable

_____ Unreliable

__6__ Extremely unreliable

Do you feel you would be better prepared to be an eyewitness, if the occasion arose, as a result of participating in the experiment?

__1__ Definitely yes

_____ Yes

_____ Uncertain

MEAN = 2.07

_____ No

__5__ Definitely no

Please explain.

Did you learn anything about yourself as a result of participating in the experiment? Please explain.

Again, thank you for your cooperation and assistance!

APPENDIX C

MEAN TABLE FOR ANALYSIS OF VARIANCE

	A		B		C	
	A	N	M	F	M	F
FREE RECALL						
Entire Flow	5.46	2.67	4.17	3.96	4.17	3.96
Situation	9.46	9.42	8.92	9.96	8.79	10.08
Conversation	4.58	3.21	4.00	3.97	3.50	4.29
Suspect Exit	2.50	1.04	2.33	1.21	2.33	1.21
Suspect Description	2.00	2.92	2.33	2.58	2.25	2.67
SUM RECALL						
Situation	14.50	14.50	14.38	14.63	13.63	15.38
Conversation	10.33	9.58	10.33	9.58	9.66	10.25
Suspect Exit	4.08	2.75	3.54	3.29	3.63	3.21
Suspect Description	5.88	6.58	6.00	6.45	5.50	6.95
TOTAL ANALYSIS	40.38	36.08	38.54	37.92	36.71	39.75
SUSPECT IDENTIFICATION						
Correct Identificaton	0.29	0.45	0.29	0.45	0.33	0.41
Confidence Ratings	49.88	50.00	47.08	52.79	49.58	50.29
ERROR ANALYSIS						
Length of Exposure	8.08	9.16	5.50	11.75	10.37	6.87
Distance from Suspect	0.04	-0.08	0.45	-0.50	-0.25	0.20
Age of Suspect	-3.16	-3.54	-3.17	-3.54	-2.71	-4.00
Height of Suspect	-0.04	0.87	1.00	-0.16	-0.04	0.87
Weight of Suspect	-9.17	-3.33	-4.16	-8.33	-12.50	0.0
AROUSAL SCALE						
Positive	4.01	3.21	3.72	3.51	3.69	3.53
Negative	3.14	1.92	2.39	2.65	2.72	2.33

	A X B				A X C				B X C			
	MOTIVATION		SEX OF SUBJECT		MOTIVATION		SEX OF TARGET		SEX OF SUBJECT		SEX OF TARGET	
	MA	MN	FA	FN	M_TA	M_TN	F_TA	F_TN	MM_T	MF_T	FM_T	FF_T
FREE RECALL												
Entire Flow	6.17	2.17	4.75	3.17	5.67	2.67	5.25	2.67	4.25	4.08	4.08	3.83
Situation	8.92	8.92	10.00	9.91	9.42	8.17	9.50	10.67	8.92	8.92	8.67	11.25
Conversation	5.58	2.42	3.58	4.00	3.92	3.08	5.25	3.33	3.58	4.42	3.42	4.17
Suspect Exit	3.58	1.08	1.42	1.00	3.58	1.08	1.41	1.00	3.67	1.00	1.00	1.42
Suspect Description	2.33	2.33	1.66	3.50	1.92	2.58	2.08	3.25	2.42	2.25	2.08	3.08
SUM RECALL												
Situation	14.25	14.50	14.75	14.50	14.50	12.75	14.50	16.25	14.17	14.58	13.08	16.17
Conversation	12.17	8.50	8.50	10.67	10.25	9.08	10.41	10.08	9.92	10.75	9.42	9.75
Suspect Exit	4.33	2.75	3.83	2.75	4.00	3.25	4.17	2.25	3.83	3.25	3.41	3.17
Suspect Description	6.91	5.08	4.83	8.08	5.66	5.33	6.08	7.83	5.83	6.16	5.16	7.75
TOTAL DETAILS	44.08	33.00	36.17	39.17	40.33	33.08	40.42	39.08	38.25	38.83	35.17	40.67
SUSPECT IDENTIFICATION												
Correct Identification	0.33	0.25	0.25	0.66	0.16	0.50	0.41	0.41	0.33	0.25	0.33	0.58
Confidence Ratings	47.50	46.67	52.25	53.33	51.25	47.92	48.50	52.08	52.92	41.25	46.25	59.33
ERROR ANALYSIS												
Length of Exposure	2.00	9.00	14.17	9.33	11.50	9.25	4.66	9.08	6.41	4.58	14.33	9.17
Distance from Suspect	1.00	-0.08	-0.91	-0.08	-0.50	0.0	0.58	-0.16	-0.25	1.16	-0.25	-0.75
Age of Suspect	-2.50	-3.83	3.83	3.25	-2.58	-2.83	-3.75	-4.25	-2.50	-3.83	-2.92	-4.16
Height of Suspect	0.41	1.58	-0.50	0.16	-0.67	0.58	0.58	1.16	0.25	1.75	-0.33	0.0
Weight of Suspect	-5.83	-2.50	-12.50	-4.16	-18.33	-6.67	0.0	0.0	-8.75	0.41	-16.25	-0.42
AROUSAL SCALE												
Positive	4.17	3.25	3.85	3.18	4.05	3.34	3.97	3.09	3.85	3.57	3.53	3.49
Negative	2.86	1.92	3.40	1.90	3.47	1.97	2.80	1.86	2.60	2.19	2.83	2.48

	A X B X C							
	MOTIVATION				SEX OF SUBJECT		SEX OF TARGET	
	AMM_T	AMF_T	AFM_T	AFF_T	NMM_T	NMF_T	NFM_T	NFF_T
FREE RECALL								
Entire Flow	6.33	6.00	5.00	4.50	2.17	2.17	3.17	3.17
Situation	9.17	8.67	9.67	10.33	8.67	9.17	7.67	12.17
Conversation	5.00	6.17	2.83	4.33	2.17	2.67	4.00	4.00
Suspect Exit	2.17	1.00	1.00	1.83	1.00	1.00	1.00	1.00
Suspect Description	3.00	1.66	0.83	2.50	1.83	2.83	3.33	3.66
SUM RECALL								
Situation	14.67	13.83	14.33	15.17	13.67	15.33	11.83	17.17
Conversation	12.00	12.33	8.50	8.50	7.83	9.16	10.33	11.00
Suspect Exit	4.50	4.16	3.50	4.16	3.16	2.33	3.33	2.16
Suspect Description	7.66	6.16	3.66	6.00	4.00	6.16	6.66	9.50
TOTAL DETAILS	45.66	42.50	35.00	38.33	30.83	35.16	35.33	43.00
SUSPECT IDENTIFICATION								
Correct Identifications	0.33	0.33	0.0	0.50	0.33	0.16	0.66	0.66
Confidence Ratings	55.00	40.00	47.50	57.00	50.83	42.50	45.00	61.66
ERROR ANALYSIS								
Length of Exposure	2.66	1.33	20.33	8.00	10.16	7.83	8.33	10.33
Distance from Suspect	0.33	1.66	-1.33	-0.50	-0.83	0.66	0.83	-1.00
Age of Suspect	-1.50	-3.50	-3.66	-4.00	-3.50	-4.16	-2.16	-4.33
Height of Suspect	-0.50	1.33	-0.83	-0.16	1.00	2.16	0.16	0.16
Weight of Suspect	-11.66	0.0	125.00	0.0	-5.83	0.83	-7.50	-0.83
AROUSAL SCALE								
Positive	4.21	4.14	3.98	3.79	3.50	3.00	3.17	3.18
Negative	3.24	2.48	3.69	3.12	1.96	1.89	1.98	1.83

VITA

Craig L. Johnson

Candidate for the Degree of

Master of Science

Thesis: THE EFFECT OF AROUSAL ON THE COGNITIVE PROCESSING OF INFORMATION IN AN EYEWITNESS SETTING

Major Field: Psychology

Biographical:

Personal Data: Born in Denver City, Texas, February 25, 1950, the son of Richard and Geraldine Johnson.

Education: Graduate from Memorial High School, Tulsa, Oklahoma, May, 1968; received the Bachelor of Science degree in Business from Oklahoma State University, Stillwater, Oklahoma in 1972; enrolled in Master's program at Oklahoma State University, 1972-1975; completed requirements for the Master of Science degree in July, 1975.

Professional Experience: Child therapist, Summer of 1973, at Riverside Hospital, Tampa, Florida; graduate teaching assistant, Department of Psychology, Oklahoma State University, 1972-1975; therapist, Payne County Public Inebriate Program; Stillwater, Oklahoma, 1975, Psychiatric Aide, Summer of 1975, Minnesota Medical School, Minneapolis, Minnesota.