THE EFFECT OF FALSE FEEDBACK ON COGNITIVE AND FANTASY MEASURES OF EMOTIONAL AROUSAL

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ABSTRACT

THE EFFECT OF FALSE FEEDBACK ON COGNITIVE
AND FANTASY MEASURES OF EMOTIONAL AROUSAL

By

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The relationship between false physiological feedback, cognitive evaluation of emotional stimuli, and fantasy behavior was investigated using a 2 x 2 x 2 design. One hundred and four undergraduates were given sexual or general instructions, sexual or neutral pictures, and high or low arousal feedback. Linear increases in ratings of attractiveness of the pictures corresponded to the four levels of increases in arousal feedback for aroused subjects. Significant differences were also found for sexual imagery, and sexual and aggressive defensiveness on a thematic apperception test. The cognitive ratings and fantasy results were co-supportive measures of emotional arousal, and did not support alternative explanations of the rating changes using adaptation level.

Approved Stuart W. Bandy
Chairman

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Joan Rae Nuttall

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And, finally, thanks to the subjects. Miraculously enough, they fulfilled my expectations, which I honestly did not expect.

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INTRODUCTION

A recent set of experiments has involved giving subjects false information concerning their state of physiological arousal by playing prepared tapes of heart beats or clicks while showing them emotional stimuli and telling them they were listening to their own heart beats. Those subjects who believed their own heart rates were changing in response to viewing slides of nude females subsequently rated those particular nudes as more attractive than other nudes to which their heart rates supposedly did not change, and maintained these preferences for up to five weeks (Valins, 1966, 1967; Barefoot and Straub, 1971). From these studies, Valins concluded that emotional arousal occurred through the utilization of cues about emotional arousal, and that these cues could be either physiological or cognitive. His important finding was that the occurrence of "emotional" behavior depended on the subject's thoughts, i.e., his cognitions.

Valins claimed that the rating results could not be explained as a secondary result of actual physiological changes incurred from listening to the tape. Both Goldstein, Fink and Mettee (1972) and Stern, Botto and Herrick (1972) replicated Valins' manipulation while recording heart rate. The data from the former study is not possible to interpret, since no control group existed who heard the clicks on

the tape and did not believe they were hearing their own hearts. Stern, et. al., however, instructed one group to pay attention to the clicks, and reported that these subjects exhibited the same rating changes to correspond with increases and decreases in the click rate as the group who was told the clicks were their own heart rates. The authors concluded that the rating changes and physiological behavior of the Valins group was due to attention factors, and not to any emotional arousal.

The fact that the same rating changes were found for subjects who did not believe they were "aroused" by the slides as for those who did believe they were "aroused" suggested that the mechanism mediating the changes might be an adaptation level (AL) phenomenon. According to AL, the neutral range where no responses are elicited would be determined by the initial period of steady clicks on the tape before any changes were introduced. Subsequent increases and decreases would lead to a positive affective response to the stimulus change per se, and not to any emotional appraisal of the pictures.

The purpose of the present experiment was to assess the presence of emotional arousal in some way which would be unaffected by changes in stimulus level. If subjects did actually become emotional by the cognition that, "I am physiologically aroused," and the ratings reflected this arousal as Valins suggested, then their emotional feelings should be detectable using other methods as well. However, if the rating changes were an AL phenomenon, no lasting emotional differences between subjects given arousal feedback and those given no arousal feedback should exist after the ratings and feedback have

concluded. The latter prediction follows from the assumption that an AL rating change is a momentary fluctuation in affect which is subject to minor environmental changes and fades when such changes no longer exist.

Studies can be cited as evidence that the Thematic Apperception Test (TAT) is a valid indicator of emotional arousal of various types. Experimental manipulations to produce certain emotions such as anger or fear have produced stories with more references to the appropriate feeling state than control procedures, which did not expose subjects to any emotion-arousing experiences (Atkinson, 1958; Feshback, 1955). Using the TAT and a scoring system developed by Rubenfeld (1964), Barclay and Haber (1965) and Barclay (1969, 1970) also found that making college-age subjects angry also aroused their sexual feelings. These aggressively aroused males expressed more sexual imagery than aggressive imagery in their protocols, supposedly because the directly manipulated emotion (anger) was perceived as inappropriate by the subject, who inhibited expressing it and exhibited the parallel emotion (sex) instead. Also, arousing a subject sexually has produced more aggressive than sexual imagery, and more sexual than aggressive defensiveness (Barclay, 1970b).

The important point is that different patterns of sexual and aggressive imagery and defensiveness have been found for aroused and unaroused subjects (Barclay, 1970). Aroused males became overtly aggressive when aggressively provoked, and especially in response to TAT pictures where both a male and female were present but the female was obviously in a dominant position (FD). Aroused males also

were less defensive about this aggression than control males. Aroused males responded to FD pictures with increased sexual imagery as well, but were very defensive about these feelings, while control males expressed more sexuality to male dominant (MD) pictures.

These studies have shown that the TAT can reflect differences in emotional arousal. The TAT also provides the subject with a less structured medium for responding than a rating scale, and thus could be expected to produce a more complete picture of the dynamics of false feedback manipulation. Since the TAT stories are written after the subject has finished viewing the pictures and receiving the feedback, they are not subject to fluctuations in stimulus input level, *per se*.

In order to control the nature of the emotional arousal on the TAT, subjects were given frames of reference within which to interpret the feedback they received. Two sets of instructions were prepared for this purpose. One set described the polygraph as a detector of "general arousal," and the other set was identical to the first except that the word "sexual" was substituted for "general."

These instructions, in conjunction with either sexual or neutral pictures, enabled the subject to identify the appropriate expectation about physiological arousal. The degree to which this expectancy was confirmed or disconfirmed by the feedback should be reflected in the TAT protocols in terms of imagery and defensiveness. For example, viewing neutral pictures with a general arousal expectancy set should

not elicit as much defensiveness about high arousal feedback as viewing neutral pictures with a sexual arousal expectancy. The neutral pictures were houses and rooms, which may properly elicit nostalgia or other emotions which can fit into a general arousal framework while pictures of houses and rooms are not sexual stimuli in our culture. If the subject views sexual stimuli with a sexual arousal framework, and receives no arousal feedback, he might be concerned about his seeming lack of responsiveness to appropriate sexual stimuli.

An Instruction x Picture x Feedback design produced eight experimental groups with the following labels:

GSA - general instructions, sexual stimuli, appropriate (arousal) feedback
SSA - sex instructions, sexual stimuli, appropriate (arousal) feedback
GCA - general instructions, control(neutral) stimuli, appropriate (no arousal) feedback
SCA - sexual instructions, control stimuli, appropriate (no arousal) feedback
GSIA - general instructions, sexual stimuli, inappropriate (no arousal) feedback
SSIA - sex instructions, sexual stimuli, inappropriate (no arousal) feedback
GCIA - general instructions, control stimuli, inappropriate (arousal) feedback
SCIA - sex instructions, control stimuli, inappropriate (arousal) feedback

Hypotheses

I. Subjects given high arousal feedback should rate those pictures on which they received high feedback as more attractive than the pictures receiving low arousal feedback. Similarly, subjects who received low arousal feedback on all pictures should show no consistent pattern in their ratings. These hypotheses follow from Valins' findings.

II. Subjects told they are aroused by the feedback should resemble aroused subjects in the former fantasy experiments. They should show a pattern of more manifest sex imagery in response to FD than MD pictures, and be defensive about this expression. They should also show more aggression to FD pictures, but not be particularly defensive about this aggression. Subjects told they are unaroused by the feedback should respond more to MD pictures and be defensive about aggression, just as the unaroused subjects in the earlier studies.

III. Subjects who received sexual arousal instructions should be defensive about sexual arousal, since the sexual instructions should serve to intensify the sexual nature of the experimental manipulation, and emphasize the inappropriateness of sexual expression. This increased defensiveness should be demonstrated either through high defensiveness scores or a loss of imagery.

Subjects given general instructions should feel less defensive about sexual arousal than subjects given general instructions. General instructions permit subjects to employ a variety of explanations for their arousal, thus diluting or even eliminating the sexual connotations.

METHOD

Overview of the Method

Feedback was delivered in the form of a needle driven across a scaled meter in a fashion designed to convince a subject that he was either very aroused or essentially unaroused by the stimuli he was viewing. Subjects believed they were connected to a real polygraph by three physiological indicators marked "GSR," "EKG," and "RESP," and that the meter was giving them information about what the polygraph was recording. Ratings of attractiveness were obtained during this period, after which subjects wrote stories to four TAT pictures and filled out a post-exposure questionnaire dealing with their emotional feelings during the study. Neutral as well as sexual pictures were used to control for the effect of sexual stimuli on TAT fantasy, and to test the strength of the needle feedback to induce emotion in absence of appropriately emotional stimuli.

Each subject rated each picture immediately following a thirty second viewing period for that picture. False feedback studies have been successfully completed using several different formats (Valins, 1966; Goldstein, et. al., 1972; Bramel, 1963), while all the fantasy experiments have found that one relatively long stimulus presentation was sufficient to arouse subjects emotionally (Barclay, 1970). The total amount of time available for "scanning" the picture was

controlled, however, and was equal to that in the Valins studies. Barefoot and Straub (1971) provided evidence that subjects used the time for each slide to peruse the details of the pictures to justify the feedback they were receiving.

Subjects

One hundred four male undergraduates at Michigan State University served as subjects for the experiment. All subjects received two experimental half-credits for participation.

Apparatus

Two long tables were positioned perpendicularly in a 9'x12' room. A table screen was placed on one table so that the polygraph operator (Female Experimenter) could not be seen behind it. Physiological feedback was presented to the subject via a feedback box with a glass enclosed meter on the front. A black needle could be driven across the meter front by a control lever on a box placed behind the partition, which was connected to the feedback box by several long cables.

Three physiological detectors were attached to the front of the feedback box and labelled at their connections. One was labelled "GSR," the second "EKG," and the third "RESP." Electrodes and a strain gauge were attached to the subjects from these indicator sockets.

Red and green lights were positioned immediately to the right of the meter and could be manipulated by control box switches. The red light went on when the feedback needle entered the top one-fourth of the meter area. Finally, a master switch labelled "ON-OFF" appeared on the meter front.

The control box contained switches for the lights, meter and hummer and a master "ON-OFF" switch, as well as a replica of the meter. When the hummer was on, the feedback box produced a low volume humming noise simultaneous with illumination of the red light.

Stimuli

The TAT pictures used in this study were $8\frac{1}{2}$"x11" black-and-white pictures, first used by Barclay and Haber (1965). A male dominant and female dominant pair exists for each of four poses: (a) boss and worker, (b) chess players, (c) teacher and student, and (d) the lovers. Before the Barclay and Haber study, independent judges rated the eight pictures for salient differences and found that dominance reversal was the only relevant cue in the pictures. Each TAT booklet contained two MD and two FD pictures, so that one of each pose was included. The order of the pictures was randomized.

The sexual stimuli were eight $8\frac{1}{2}$"x11" pictures of female nudes taken originally from nudist magazines. Five were black-and-white and three were color. The eight neutral pictures were all black-and-white pictures of houses and rooms. No people appeared in the neutral pictures. Both sexual and neutral pictures were mounted on white cardboard $14\frac{1}{2}$"x17" in size.

Procedure

The male experimenter (E) accompanied each subject (S) into the room and presented the first general instruction sheet. Then, S was given either the "general arousal" or the "sexual arousal" instructions and told these would explain more about the equipment surrounding him. S was assured that all responses would remain anonymous.

S was then given a copy of the Picture Evaluation Checklist (See Appendix B). After reading the brief instructions at the top, S was told that the male E would show him some pictures, each for thirty seconds. At the end of that time, S was to mark his checklist by rating the picture he had just seen on a scale of 1 to 7 on attractiveness. Then, the next picture would be shown.

After any questions were answered, the male E called the polygraph operator to connect S to the arousal indicators. The operator, who was wearing a white coat, appeared from behind the partition, told S to remove all articles from his breast pocket, his watch, and if S was wearing a heavy sweater with a shirt underneath, he was asked to remove the sweater also. The operator connected the GSR and EKG indicators the inside right and left wrists of S, respectively. After the former was connected, she flipped a switch on a small silver box connected to those wires saying, "This is merely an adaptor for our purposes. It is not important for you." She asked S to hold out his arms so she could attach the respirator indicator around his chest and said, "Now, this is supposed to be somewhat tight, but of course not so tight that you feel uncomfortable. How does it feel?" The operator then flipped the master switch on the feedback box and disappeared behind the partition, saying, "I'll turn on the polygraph and tell you when we're ready to begin."

The operator turned all switches on the control box, except the master switch, to "ON" position as loudly as possible. Simultaneous with activation of the master switch, the female E began to manipulate the needle to waver in the low end of the meter. She asked if the

green light was on, to which the male E answered "Yes," unless S answered first. The operator replied with, "Fine. One moment please." Five seconds later she said, "You may begin."

S viewed each picture for thirty seconds. To insure that S would see the needle at all times, the pictures were placed on top of the feedback box for the entire viewing period. At the end of the viewing time, the male E said "Check," at which time each S marked his preference for that picture. The average intertrial interval was four seconds. Occasionally, when a given S was receiving high arousal feedback, the needle was not returned to the low area of the meter at the end of four seconds. Since the red light did not extinguish until the meter had returned to the low area, the male E had to wait an additional few seconds.

After all pictures had been rated, the male E took the Checklist and told the operator they had finished. She turned all switches on the control box to "OFF" as loudly as possible, master switch first, appeared from behind the partition, turned both feedback box switch and adaptor switch to "OFF," and disconnected S. If S had removed any personal articles, she informed him he could have them back now. She then disappeared behind the partition.

The male E gave S a copy of the Creative Imagination Test (See Appendix B), saying, "This is our test of creative imagination. Please follow along with me as I read the instructions out loud." E secured another copy of the test and read the top sheet. S was told that E would time him for twenty seconds as he looked at the first picture.

Then, S was to turn the page and begin writing his story about that picture, for which he would be given a maximum of ten minutes. If he finished early, he should tell E and they would go on; however, if he did not finish in time, that was all right, but they would go on anyway. S was told that he could refer back to the picture at any time while writing the story for that picture. E emphasized that S was to relax, enjoy himself, and answer the questions on the story page only if he felt they were relevant to the story he wished to write. When S indicated he understood the task, E told him to turn to the first picture. If S had not finished with any given story at the end of eight minutes, E said, "You have two minutes left for that story." This procedure was followed for all four pictures.

When S had finished the final story, E took the booklet and gave S the Post-Exposure Questionnaire sheet (See Appendix B), saying, "We have one brief final thing for you to do. Please answer these questions according to how you felt during the experiment." S was given time to read the instructions and complete the ratings. E said, "We'll have a debriefing now." The female E appeared and tried to pinpoint the degree to which the deception had been successful (if this was not obvious from S's behavior). When S was unsure about the degree to which he accepted the deception, E decided whether or not to include the data. Eighteen subjects were replaced using this procedure. The female E explained the entire study to the S and emphasized the need for the deception. The most important point involved convincing the S that he did not necessarily respond in ways he had been led to believe by the polygraph, and that E had no idea how S had actually responded.

Scoring

All stories were scored for manifest sex, manifest aggression, defensive sex and defensive aggression according to the system described by Barclay and Haber (1965). All scoring was done blindly and independently by two raters trained in the scoring system. Before any ratings were done, all stories were detached from their booklets with a code number, the meaning of which was unknown to both raters. All stories were shuffled together so that the stories from all groups would be scored together.

Scoring reliabilities were determined separately for manifest sex and for manifest aggression by calculating the correlation between the two raters. Reliability for manifest sex was +.84, and for manifest aggression the reliability was +.79. Percentage agreement was determined for the defensiveness categories combined, and was calculated to be 72%. For purposes of further analysis, all scoring discrepancies were resolved by discussion.

RESULTS

Check on the Manipulation

An unexpected main effect for feedback was found on the self-report questionnaire for feelings of inadequacy ($F=8.55$, $p<.004$; 1 and 96 d.f.). All self-report judgments and ratings were made on a scale of 1 to 7, meaning "not at all" to "very much," respectively. Subjects who received inappropriate feedback, i.e., high needles for neutral pictures and low needles for sexual pictures, said they felt more inadequate than subjects who were given appropriate needles. The mean for the inappropriate group was 2.28, and the mean for the appropriate needle group was 1.59. This difference suggests that subjects did form socially-based expectations about how they should respond physiologically to the stimuli, and when this expectation was not realized, they experienced a certain uneasiness about their "improper" behavior.

Attractiveness Ratings

For analysis of the needle effects, the eight ratings were combined into four groups of two each, to represent the four needle levels of Low, Moderate, High and Red Light High.[1] The picture positions corresponding to these four levels were as follows: picture positions 1 and 3 received the low needles, 2 and 4 received the moderate needles, 6 and 8 received the high needles, and 5 and 7 were the red light high

positions. The ratings for the four low needle (unaroused) groups were combined in the same manner for comparison, although all needle values were uniformly low for those subjects.

Mean picture ratings for the four needle levels (and corresponding picture positions for the controls) are presented in Table 1. Although an overall upward trend for both aroused (high needle ratings) and unaroused (low needle ratings) groups is apparent, only the ratings for the aroused subjects were significantly linear, using the method of orthogonal comparisons according to Winer (1962) ($F=126.55$, $p<.001$; 3 and 46 d.f.). This linear trend accounted for 79% of the rating variance.

Recall that two picture positions were associated with each needle level, in an alternating fashion. The fact that the ratings closely mirrored the needle levels for aroused subjects means that the ratings yielded a zig-zag pattern when plotted for each picture position. (See Figures 1 and 2.) The ratings for the unaroused groups show a general upward trend, but the sawtoothed nature of the graph is not nearly as distinct because the unaroused groups showed greater variance. A most important fact is that the aroused subjects all showed this sawtoothed pattern in the ratings, regardless of whether they saw the sexual or neutral pictures.

In sum, the rating results produced an overall significant arousal x rating interaction ($F=4.94$, $p<.02$; 1 and 102 d.f.), which was mostly due to the strong linear nature of the aroused groups' ratings. Part of this linear trend was a significantly higher rating for the red light

high needle level for aroused subjects ($F=5.59$, $p<.02$; 1 and 102 d.f.), and an unexpected higher low needle level rating for aroused subjects ($F=4.85$, $p<.03$; 1 and 102 d.f.).

Manifest Sex Results

A significant picture x feedback x picture dominance interaction was found for manifest sexual imagery on the TAT protocols ($F=6.56$, $p<.01$; 1 and 96 d.f.). As can be seen from Table 2, subjects who were defined by the experimental manipulation as "unaroused," i.e., the two low needle groups of Sex Picture-Inappropriate Needle, and Neutral Picture-Appropriate Needle, produced more manifest sex imagery in response to MD pictures than the "aroused" or high needle groups. There was no significant difference on FD pictures.

The groups who received sexual stimuli tended to produce more sexual imagery than their neutral picture counterparts. This kind of inflation in imagery was to be expected, considering the influence that stimulus cues in the immediate environment have on the content of imaginative stories (Atkinson, 1958). The results of this experiment show that the sexual pictures elicited more sexual imagery regardless of needle levels, and they elicited more sexual defensiveness as well.

Defensive Sex Results

Two significant interactions were noted for defensive sex scores, a picture x feedback x picture dominance interaction ($F=7.49$, $p<.007$; 1 and 96 d.f.), and an instruction x picture x picture dominance interaction ($F=4.87$, $p<.02$; 1 and 96 d.f.). Table 3 depicts the first of these results. All groups who received high needle feedback produced

more defensive sex on FD pictures, and all groups who received low needle feedback were more defensive on MD pictures.

The pattern for the instruction x picture x picture dominance interaction was remarkably similar to that for the picture x feedback interaction. From a comparison of Tables 3 and 4, one can see that a close parallel existed between general instructions and appropriate feedback and between sexual instructions and inappropriate feedback. Both instructions and feedback interacted with pictures in a similar manner. This finding will be discussed later.

Manifest Aggression Results

No significant differences between groups were found for manifest aggression. All groups exhibited more aggression on the FD pictures ($F=13.79$, $p<.0003$; 1 and 100 d.f.). The mean score for FD aggressive imagery was 5.13, and the mean score for MD aggression was 4.20.

Defensive Aggression Results

Although the differences between groups in aggressive defensiveness were not significant, three of the four aroused groups showed more aggressive defensiveness on the FD pictures. These were the GSA, SSA, and SCIA groups. One low needle group, the SCA group, also exhibited greater FD defensive aggression, and a possible explanation will be offered in a later section. The four remaining groups --- GCA, SSIA, GCIA and GSIA --- all showed identical FD and MD aggressive defensiveness scores.

It was hypothesized that the subjects who received sexual instructions would produce more Type I sexual defensiveness (loss of

sexual imagery) than subjects receiving general instructions, the latter showing more Type II sexual defensiveness (defensive imagery). Of the four sex instruction groups --- SSA, SSIA, SCA and SCIA --- all had high sexual defensiveness scores except the SSIA group. However, only the SSA group's defensiveness occurred in absence of sexual imagery and could therefore be properly called Type I defensiveness. Sexual instructions, then, did not tend to inhibit expression of manifest sex imagery. The second part of the hypothesis, that general instruction groups would produce high manifest sex as well as defensive sex, was supported.

A summary of TAT protocol findings is given in Table 5. Aroused subjects produced more manifest aggression than manifest sex, and produced all imagery more in response to FD than MD pictures. "Unaroused" subjects produced more manifest sex than manifest aggression, and did so in response to MD pictures. The positive value for manifest aggression for low needle groups reflects the fact that all subjects were more aggressive on FD pictures. In fact, for both FD and MD pictures, more aggressive than sexual imagery was present in this experiment ($F=7.14$, $p<.008$; 1 and 100 d.f.), and more sexual than aggressive defensiveness ($F=23.04$, $p<.001$; 1 and 100 d.f.). This result shows that subjects were made defensive about sexual expression but were more manifestly aggressive in this study, with little accompanying aggressive defensiveness.

DISCUSSION

Support for the Valins findings was clearly present in this experiment, although the emphasis was upon a patterned effect produced by the four needle levels rather than a simple dichotomous change in attractiveness ratings. The linear nature of the ratings suggested that the false feedback could elicit more than just gross distinctions between constant and changing rates in physiological activity, or what the subject believed to be physiological activity.

The overall upward trend in the ratings for control, or low needle, subjects was probably a function of a constantly increasing number of pictures against which to compare each slide. Although Valins did not report this kind of trend, possibly because all pictures were shown twice before any ratings were made, the other studies mentioned earlier which did not include two pre-rating showings, also did not report a similar inflation. In this study, the ratings of the low needle groups reached an asymptote after several pictures had been shown, while the ratings of the high needle groups continued to mount in a manner consistent with needle level. This levelling effect began with the fifth picture. Perhaps four pictures were sufficient to stabilize the subject's idea of the quality of the stimuli, after which he judged all the pictures about the same on attractiveness. The results suggest that the needle did not have as powerful an effect on inhibiting rating

fluctuations by remaining low, as it had on guiding rating changes to correspond to its own pattern.

A novel finding from the present study was that differences in fantasy behavior corresponded to the differences in attractiveness ratings and needle feedback. The fantasy results also replicated results found in earlier fantasy studies, despite the fact that the experimental manipulations were quite different. The subjects given low needle feedback responded for the most part just like other "unaroused" subjects, even though many of these subjects were shown sexual stimuli, and thus could not be considered pure controls in the same sense. This finding indicated that subjects behaved in an unaroused manner if they were told they were unaroused, even if they were presumably aroused by such stimuli in the real environment. On the whole, then, the strength of the needle feedback was very powerful in this study. The experiment represents an integration of the false physiological feedback studies and the fantasy arousal research and does so in a fashion which validates both approaches.

Our data supported the hypothesis that a lowered imagery score would occur in that emotion which was directly aroused by the manipulation, with a correspondingly high defensive score in that same emotion and an increase in imagery in the parallel emotion. Aroused males produced less manifest sex imagery than aggressive imagery, while the controls produced more manifest sex than aggression. Although the aroused subjects were defensive about sex, they were not really more defensive than the controls, who also produced a high rate of sexual defensiveness. This high defensiveness rate of controls was

probably due to the unusual nature of the "unaroused" manipulations. Finally, much more defensive sex than defensive aggression was present in this experiment, which supports the last part of the hypothesis.

It had been predicted that sexual instructions would produce defensiveness over sex expression, with a corresponding loss in imagery. Increased defensiveness did occur for these groups, but only on FD pictures, and was not accompanied by a loss of imagery, except for the SSA group. As predicted, the subjects who received general arousal instructions were capable of expressing sexual imagery, with a corresponding Type II defensiveness.

Those subjects who produced high manifest sex imagery on FD pictures also produced high defensive sex. Those subjects who produced intermediate and low amounts of sex imagery, also tended to produce intermediate and low amounts of sexual defensiveness, respectively. Only SSIA and SSA subjects deviated from this pattern. SSIA subjects showed no defensive sex even though their manifest sex score mean was intermediate, while SSA subjects were moderately defensive, but showed no imagery. Recall that SSA subjects produced the only Type I defensiveness in the study. All sex imagery and defensiveness results produced the same order in the groups with respect to MD pictures.

The same overall pattern of agreement between FD and MD aggressive imagery and defensiveness was found. GCIA subjects showed a Type I aggression pattern, with much more defensiveness than imagery, however. This was found on both FD and MD pictures. GCA subjects were also

highly defensive, but only on FD pictures. The rest of the groups were consistent in the amounts of imagery and defensiveness they produced.

The two interactions for defensive sex were quite similar. Specifically, instructions and feedback appeared to have the same relationship with pictures, so that essentially the same patterns were produced using either general instructions or appropriate feedback, or using sexual instructions or inappropriate feedback. For example, subjects who received sexual instructions and saw neutral pictures were very defensive on FD pictures, just as those subjects who saw neutral pictures and were told they were aroused. Thus, informing a subject that his sexual responsiveness will be tapped had the same effect as telling him that he is indeed responding with high arousal. The interesting point, of course, was that the high arousal could be labelled either as sexual or just "aroused."

Information that the polygraph recorded general arousal functioned like information to the subject that he was responding appropriately. Since both high and low needles were "appropriate," depending on which pictures were being viewed, the fact that the subject believed he was "aroused" or "unaroused" did not matter.

Although one might draw a parallel between general instructions. which enabled the subject to interpret the feedback any way he wished, and appropriate arousal feedback, which could also be made relatively non-threatening, neither consistently produced low or high sexual defensiveness. Within the picture x feedback x picture dominance interaction, the conclusion is that those subjects who are told they are

aroused, regardless of instructions or pictures, respond with FD defensiveness, just as the aroused subjects in the earlier fantasy studies.

With respect to the instruction x picture x picture dominance interaction, the conclusion must be more complicated. If subjects are given either general instructions and sexual pictures, or sexual instructions and neutral pictures, they are more sexually defensive on FD pictures, but that giving them either both sexual instructions and sexual stimuli, or neither, produces very low defensiveness on FD pictures and high defensiveness on MD pictures. Those subjects who receive general instructions and neutral pictures have no particular reason to be sexually defensive, even if they believe they are aroused. A similar conclusion might be drawn about SSIA subjects, for whom the "threat" of arousal did not materialize. No explanation can be offered for the SSA group, who, theoretically, should show the greatest amount of sexual defensiveness, and who actually produced a moderate amount of defensiveness.

There are two reasons why these results do not support an AL interpretation. First, AL does not predict the arousal of any specific emotions but only a general positive or negative affective feeling. One would therefore have no basis for predicting patterns of sex and aggression in the TAT if AL accounted for the rating changes. Secondly, the fact that neither low nor high needles produced a consistent TAT pattern demonstrates that changes in stimulus level per se were not the emotion-arousing factor that accounted for the differences among the groups. Some low and high needle groups resembled each other in

TAT profile more than groups within either the high or low needle groups. AL cannot account for this fact since the stimulus levels changed for all high needle groups and did not change for all low needle groups.

The above discussion implies that the fantasy profiles of the aroused and unaroused groups followed the precedent set by the former studies if one allows for the unique characteristics of the manipulations, such as the fact that many unaroused subjects still received "arousal" stimuli of some kind. Arousal needles made some groups defensive and others not defensive, depending on the context in which they occurred. The end result is that drawing any conclusions about the effect of the instructions variable, or the picture or needle variables in isolation was impossible. The fact that differences in arousal patterns were found provides evidence that the instructions functioned to set up expectations about needle behavior and the subjects' interpretations. Expectations, however, became crystallized only in conjunction with picture content, and were either supported or modified by needle feedback.

Valins had advocated the position that cognitive cues provided by the changes in feedback enabled the subject to meaningfully label "internal sensations." Since the subjects in this study were explicitly informed of the proper labels to attach to "physiological" activity, this study was more of a demonstration that such labels were internalized and acted upon as genuine reflections of a totally subjective and personal experience, which may or may not have had a real existence. The subject's readiness to absorb and utilize the labels to the extent

that their fantasies could be predicted was rather phenomenal. In fact, the subjects were even informed as to what type of label to use in the absence of internal events, which they also did.

Since no actual physiological measures were taken in this study, the type or degree of physiological arousal was unknown. The interaction between the physiological response of the four aroused groups versus the unaroused groups, and between the general and sexual instruction groups would be one way to approach the relative contribution of expectancy set and actual event in emotional arousal, and the physiological difference between a confirmation of an expectancy to be aroused and disconfirmation of an expectancy to remain unaroused. A third set of instructions might be appropriate in such a study, a set in which subjects were told the polygraph measured some specific emotion other than sex. This set would control for the amount of specific information given to the subject about his own responding, without implying sexual arousal.

In sum, this study modified Valins' findings by demonstrating that more was happening during the feedback manipulation than could be detected using only a cognitive rating instrument, such as a simple checklist scale. It showed that cognitive forms of feedback alone not only changed the attractiveness ratings, but the actual psychological experience of the subject. The TAT stories did differentiate the false feedback groups on the basis of sexual and aggressive imagery and defensiveness. Most importantly, the fantasy and rating measures were cosupportive. This study suggests the necessity of a dynamic approach to emotional arousal.

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APPENDICES

APPENDIX A

Historical Review

The line of research from which this study was derived has focused on defining the nature and extent of the cognitive influence in emotional arousal, and has been based on artificial manipulations introduced through both the cognitive and physiological systems. The measurements have been principally cognitive and behavioral. Some work has been done relating subsequent physiological changes to these cognitive events, but no such attempt was made in this particular experiment.

Since both the cognitive and the physiological affective changes occur almost instantly in response to an emotional stimulus, their order of appearance is, for the most part, a theoretical and not a practical issue. Elaborate models of first cause and of interaction of mind and body in emotional arousal have been proposed, and, although they are discussed whenever relevant to the present paper, the recent significant attempts at integrating cognition and physiology have shown a shift in emphasis away from precedence per se toward a definition of the complex interactions between the two networks. The latter kind of approach seems more fruitful to the author at this time.

Before launching into the historical background of the present study, some general comments about the area of emotional arousal and

the research on emotion seem in order. One of the most crucial problems in the author's opinion is the subtle assumptions about the nature of emotional arousal which underlie the measuring instruments used to assess its presence. Unfortunately, the data is often non-falsifiable evidence in favor of these assumptions. Although the idea will be presented in greater detail later, the essential point is that much of the integrative work has been self-limiting, mostly because it has been conducted with static tools. My basic assumption is that emotion is not static, but a constantly fluid and ever-present state of affect toward the present stimulus situation. Therefore, although reference may be made to "unemotional" subjects or groups, the state of "unemotional" is assumed not to exist. This position is congruent with some theoretical arguments to be presented later, and basically implies that one must talk about different emotional states, or degrees of an emotional state, but that "unemotional" is meaningless. In this paper, "unaroused" or control subjects were defined as those groups who were informed of no specific affective changes in their emotional state, and was not meant to infer "unemotional."

A second assumption of the present paper, and one which helped dictate the particular measuring instruments that were chosen, is that emotional feelings do not exist in isolation. This assumption does not necessarily imply a general activation model, but only that emotions are not pure and unitary entities. Finally, the assumption was made that, in order to address a dynamic phenomenon, one must use a dynamic instrument. A major purpose of the present study was to

apply a new yardstick to some effects of what has been termed an "emotionally arousing condition."

The early theoretical attempts to distinguish emotional origins were couched in physiological terms. The primal example of this kind of approach was the James-Lange formulation, in which emotional behavior was embodied in visceral and somatic arousal, and emotional experience occurred only through peripheral feedback to the cognitive system (James, 1884; Lange, 1885).

The crucial distinction in the James-Lange theory was a separation of emotional behavior from emotional experience. Lack of appreciation of this subtle distinction led to some inappropriate criticisms of the approach. Initially, for example, tests of the James-Lange hypothesis focused upon disturbing neural connections between cortex and viscera, since the absence of these afferent and efferent pathways should exclude the production of emotion. However, surgical procedures in animal work revealed that emotional behaviors remained intact in postoperative periods (Bard, in Reymert, 1950; Cannon, 1927; Sherrington, 1900). Indeed, if no distinction was made between emotional experience and behavior, or one assumed they could not occur separately, the persistence of the emotional behaviors in these animals would be proof that emotion could occur without peripheral feedback.

Actually, emotional behavior in organisms with damaged cortico-visceral connections was quite possible within the boundaries of the James-Lange model. With respect to the above studies, the connections between the cortex and the muscles and skin remained intact, thus

allowing for somatic sensations. Admittedly, since the quantity of peripheral sensation should contribute to the intensity of the emotional reaction, and much of this sensory feedback was eliminated by surgery, the fact that none of the authors noted a weakening of the affective response in their animals would seem contradictory.

The borderline results of the decortication studies, plus some early clinical data, contributed to a new model of emotional arousal. The thalamic model was first proposed by Cannon (1927) and later modified somewhat by Bard (1934). Cannon suggested that emotional aspects of behavior were regulated by innate thalamic functions, but that these functions could be inhibited by cortical controls. Without these controls, all sensory stimulation would elicit emotional reactions.

There were two ways in which the reduction in cortical inhibition could be achieved. First, innate emotional stimuli, such as sudden or loud noises, could override cortical control at the thalamic level, leading to simultaneous discharges of impulses over the peripheral nerves and to the cortex. Secondly, in the case of learned emotional reactions, Cannon proposed that stimulation passed through the thalamus to the cortex, where conditioned responses were elicited which released the inhibition. In both cases, the ultimate emotional arousal was the same. The cortex could also stimulate thalamic arousal by emotional memories and fantasies. The total result of this approach was a focus on the thalamus as being responsible for emotional experience by virtue of a relay to the cortex, and for

emotional expression by virtue of relays to the periphery.

The origin of emotional experience was the ultimate debate between the Cannon-Bard and the James-Lange theories. Whereas experience was the perception of bodily expression for James and Lange, both experience and expression were simultaneous consequences of thalamic arousal for Cannon and Bard. For the latter theorists, behavior and experience could easily occur separately in abnormal or surgically prepared organisms because both bodily change and cortical discharge were results of emotional arousal.

The major evidence against the Cannon-Bard model was derived from the same decorticate animal research used to support its development. No attenuation of emotion occurred in animals deprived of the thalamus as well as the cortex, but only when the caudal hypothalamus and brain stem were removed (Bard, in Reymert, 1950). The magnified anger response shown by decorticate cats, which was termed "sham rage" by Cannon and Britton (1925) and used to support the thalamic theory was later attributed to increased tissue sensitivity in the postoperative periods (Bard, 1934), and not to the absence of cortical inhibitions. Furthermore, sham rage was first demonstrated by disconnections between the cortex and hypothalamus, leaving thalamic connections intact.

Although valuable for other purposes, the subhuman evidence on emotion was somewhat irrelevant to testing the James-Lange formulation, since the only proof of the existence of emotional experience was verbal report. James (1884) was quite clear on his position in the case

of the totally anesthetic boy. Unfortunately, studies with humans were few and provided conflicting results. Dana (1921) reported the case of a woman with severe spinal injury who felt emotional experience with no impairment for a year. More recently, Hohmann (see Berkowitz, 1964), gathered twenty-five patients with lesions in various spinal locations and reported that the closer the lesion to the cortex, the fewer the visceral sensations the patients could report and the less the feeling of emotionality. The patients continued to act emotionally, but reported feeling only "as if" they were emotional. This data implied that autonomic arousal was not necessary to perpetuate emotional behavior that had been learned, although the degree to which it was essential for the establishment of the emotional response was still an open question.

Furthermore, if learning could mediate emotional behavior in absence of peripheral feedback, then learning might also account for the fact that emotional experience often seemed to occur more immediately than the latency of visceral changes could possibly allow. The postulated mechanism here was conditioned physiological arousal in response to familiar emotional stimuli. Perception of these stimuli would elicit sensations of physiological arousal before the total arousal actually existed. If learning could serve this function, the contribution of the completed physiological pattern would be doubtful. The issue would become one of how complete the anticipatory emotional experience can be. Nevertheless, the peripheral changes did not seem to be essential for some degree of emotional behavior to

occur in the human subjects described earlier.

One logical consequence of the Jamesian peripheral-origin theory of emotion was the existence of a unique physiological pattern characteristic of each emotional experience. Early research found such a close similarity in the physiological events in different emotions that Cannon regarded the issue as essentially closed (Cannon, 1931). The reason for the lack of discovery of the identifying patterns of arousal was methodological immaturity, for the measuring instruments were capable only of recording the activity of individual visceral organs. Recent research has suggested that the patterns involved in emotional states differ, although the reactions of any specific viscera may be identical. Specifically, investigations of physiological arousal patterns associated with fear and anger have suggested characteristic activity states to separate these emotions (Ax, Beckett, Cohen, Frohman, Tourney and Gottlieb, 1962; Schachter, 1957; Funkenstein, 1955; Ax, 1953). Anger has been described as a norepinephrine-like state, characterized by increases in diastolic blood pressure, muscle tension and galvanic skin responses, and a decrease in heart rate (Ax, et. al., 1962; Funkenstein, 1955). Fear, on the other hand, has been shown to induce increases in respiration, heart rate, skin conductance, systolic blood pressure and muscle tension peaks (Schachter, 1957). The fear reaction has been described as an epinephrine arousal.

Both Ax, et. al. (1962) and Ax (1953) demonstrated intrasubject differences in fear and anger states, and suggested a further intersubject difference in response to stress and pain, that resembles either

epinephrine or norepinephrine arousal. For example, psychotic patients reacted more angrily to pain than normal controls, and showed the norepinephrine pattern, while controls showed the epinephrine pattern. Within the schizophrenic population, these different physiological patterns have been correlated with differences in psychological symptoms and defenses, as well as responsiveness to different treatments and drugs (Funkenstein, 1955).

Wenger, Averill and Smith (1968) have mapped a somewhat unique physiological pattern for sexual arousal, consisting of a complex interplay of sympathetic and parasympathetic arousal as a function of time and emotional intensity. Although both systems were activated during initial phases of sexual activity, sympathetic events predominated during orgasm and parasympathetic events during the postconsummatory period. Typically, sexual arousal has been accompanied by increases in diastolic and systolic blood pressure, palmar skin conductance, galvanic skin response and peripheral vasodilation (Kinsey, Pomeroy, Martin and Gebhart, 1953). Wenger, et. al. found no heart rate change, although increases have usually been associated with sexual arousal.

These physiological changes were not merely quantitative differences in the amplitude of emotional arousal, but represented qualitative differences in responding among the body systems (Lacey, in Appley and Trumball, 1967). A great deal of response similarity has been reported, but when more than three physiological variables have been tapped, preferably from different systems, an arousal profile

has been obtained which points out the fine discriminations to be made among the emotional reactions.

The final area of research which was relevant to the traditional James-Lange, Cannon-Bard controversy was the artificial induction of emotion. The line of reasoning behind this problem assumed that, to the extent that sympathetic arousal induced by an injection of epinephrine would be comparable to responses occurring in an emotional situation, the James-Lange model would have to predict emotional experience. This assumption was not entirely true, since James described a total pattern of parasympathetic and somatic response in conjunction with sympathetic arousal, and the former is only slightly if at all affected by epinephrine. Given the limitation, there should be some kind of emotional effect from the epinephrine injection, however, according to the James-Lange hypothesis.

Subjects given epinephrine injections have reported partial or low intensity emotional experiences. No more than this could reasonably be expected, since no object reference existed for these subjects. In those cases where such experiences did exist, Grossman (1967) has suggested that the feelings represented conditioned emotional responses to the visceral changes. Evidence does exist that subjects who report "complete" emotional feelings after a drug injection may have done so because the experimenter introduced conditioned emotional stimuli into the situation (Marañon, 1924; Cantril and Hunt, 1932; Schachter and Singer, 1962). These environmental cues constitute a large class of stimuli, and seem to include even the needle used to

administer the drug dosage.

The importance of an emotional stimulus in determining the extent to which a subject will react emotionally to artificially induced arousal was the subject of a study by Schachter and Singer (1962). They demonstrated that subjects who were physiologically aroused by an injection of adrenalin showed behaviors consonant with those of another person present in the room, whether that person was euphoric or angry. The crucial factor in producing this "mimic" effect was the degree to which the subject could attribute the physiological state to a specific situational event. Thus, subjects who expected the appropriate side effects of epinephrine did not mimic the stooge's emotional behavior, while subjects with no attributable source for their sensations labelled them according to situational cues. Among placebo controls, who received a benign injection, some showed signs of sympathetic activity. These "self-aroused" subjects exhibited mimic behaviors similar to the subjects who had received adrenalin but were misinformed of its side effects. Placebo subjects who were not self-aroused resembled adrenalin subjects who expected the correct side effects.

The self-aroused placebo subjects were highly significant because they showed that the Schachter and Singer results were not just the consequence of pharmacological manipulation. The cognition of, "That stimulus has affected my body," resulted in a re-evaluation of the emotional stimulus and a change in subsequent behavior. Similar cognitive re-evaluations have occurred in the perception of pain, where

subjects believed their internal sensations were the result either of pills or shock levels (Nisbett and Schachter, 1966). Similarly, cognitive influences on the rated aversiveness of shock have been demonstrated by Staub, Tursky and Schwartz (1971). Subjects who had control over self-administration of shock perceived the stimulation as less painful than yolked controls.

This research on the power of cognition in emotional evaluation of stimuli, coupled with the evidence that induction of a physiological state per se was not enough to produce emotion, led Schachter and Singer to propose a physiological-cognitive interaction theory of emotional arousal. They proposed that autonomic cues triggered cognitive sensations and feelings, which in turn labelled the physical arousal with an appropriate situationally defined emotion. Within the Schachter and Singer system, both physiological arousal and cognitive definition were equally crucial to the production of emotional behavior.

Although the emotional behaviors exhibited by anger and euphoria mimic subjects in Schachter and Singer's study were quite different, the post-experimental verbal reports of emotional experience were more similar. These subjective reports were obtained from a post-experimental questionnaire on which the subject rated the degree to which he felt certain emotions during the experiment. The commonality among subjects was mainly due to the euphoria subjects who overlapped into the anger pattern. The euphoria subjects increased in anger, although to a lesser degree than the anger subjects, and

both groups decreased in feelings of social affection and elation. This finding implied that Schachter and Singer tapped an impurity in emotional arousal by virtue of having asked subjects to report more than one emotional feeling. The emotional behavior that usually accompanied such arousal may well be impure also, but this may not have appeared salient in the study because of imitation of stooge behavior.

A most interesting replication of Schachter and Singer's results has been reported by O'Neal (1971). Subjects were asked to rate the traits of other people from photographs. Previous work had shown that subjects rated traits of people in favored photographs as more similar than those of people in unfavored photos (O'Neal and Miller, 1969). The existence of higher trait intercorrelations among the favored photos than would be obtained by objective methods was termed a "halo" effect. In the 1971 experiment, O'Neal reported that subjects under the influence of caffeine and who were misinformed of it effects --- They thought they had taken a vitamin. --- showed a significantly greater halo effect in rating two other people than informed caffeine subjects or controls. O'Neal attributed the results to the labelling of ambiguous internal sensations as a lack of certainty about the people to be rated, which produced a greater tendency to halo.

The general theoretical formulation of Schachter and Singer placed emphasis on subjective appraisal of situations from past experience. An active interplay of memory with conscious experience was implied

in this appraisal. The viewpoint is worthy of note because it takes strong exception to the static picture of emotion painted by the peripheralist theories, in which emotion is a mere perception of physiological activity.

A complete theoretical structure based on cognitive appraisal and memory in the production of emotion was advocated by Arnold (1960). From the initial sensory experience to the final action, a series of cognitive appraisals occur which are initially intuitive and automatic and finally reflective. Essentially, any stimulus is appraised instantly by affective and recall memories. The recall memory revives sequential events stored in the brain from past experience and the affective memory "attaches" intuitive feelings of like or dislike to the memory, and thus to the present stimulus as well. This appraisal originates and terminates in the limbic system of the brain and results phenomenologically in a felt action tendency to approach or avoid the stimulus. This felt action tendency is emotion (Arnold, 1970).

The tendency to action is mediated through the premotor cortex, where specific motor effects of past emotions have been stored. This neural "action circuit" activates not only voluntary muscles but involuntary muscles and viscera, and thus produces the physiological changes characteristic of each emotion. The physiological events follow emotional experience, then, rather than precede it.

A second appraisal judges the "goodness" or "badness" of action by evaluating the past actions and their successes and failures. The

planning of an action to be taken is the role of the imagination circuit. Arnold suggested that the amygdala is the crucial link in the imagination circuit since removal of the amygdala in lower animals leaves the memory of shock unimpaired but seems to preclude the planning of any effective escape actions (Arnold, 1960). The memory circuit must be left totally intact, of course, so that correct appraisal will occur. In humans, Arnold hypothesized that anger arousal results in imagining what to do to fight effectively. This would be true regardless of whether the anger was actually expressed in that instance or not. These "motor fantasies" reinforce the anger and attack tendencies, and are registered in the premotor cortex as motor engrams which are potential for future activation in aggressive situations.

Even though emotion is a felt action tendency, and has the capacity to organize action, it does not automatically do so. Deliberate judgment, or reflective appraisal, of proper behavior overrides emotional tendencies, even though emotion does determine the physiological effects and will influence the decisiveness or willingness with which action will be taken. Arnold offered no explanations or comments about the origin or mechanism involved in reflective appraisal.

In sum, Arnold proposed that emotion proper is absolutely dependent upon affective memory and appraisal, and will lead to overt acts if judgment supports it. If the "emotional" act is impossible, the emotional feeling may be expressed in other ways. Arnold was not clear what other pathways might be used. Examples throughout her

writings, however, like the fantasies of the angry man ready to fight, suggest that the imagination is functional both in practice for future aggression and in discharge.

The most important aspects of Arnold's theory for this paper are the premises that the combination of affective memory and recall circuits serve to appraise the immediate situation and produce an emotion tendency. This combination of affect and memory of events is the individual's expectancy set about the outcome of the situation. Arnold has also incorporated the inhibition of emotional expression into her theory, in those cases where the person deems the overt expression inappropriate. Such a case will be presumed to exist in the experimental context of the present study.

One might note that Arnold's interpretation of the work done on artificial induction of physiological changes rests on the absolute necessity of the cognitive appraisal component in emotion production. Arousing the physical activation pattern of fear would not produce fear unless appraisal of the situation concurs. In this, her contribution resembles that of Schachter. Her emphasis is primarily on the cognitive, however, whereas Schachter views the cognitive and physiological as equal ingredients in the emotional experience.

The present experiment can be viewed as a time line in which each new stimulus --- instruction, picture, needle --- alters the subject's emotional responses, by producing a series of cognitive appraisals. Each new stimulus, and especially the needle levels,

were presumably interpreted as good or bad (appropriate or inappropriate) depending on past experience and social desirability, as well as in terms of the expectancy which the subject had already formed.

Since overt action was obviously inappropriate during the experimental session, all these evaluations would remain in the imagination circuit, and result in fantasies concerning the nature of effective action. In this study, two kinds of expression have to be addressed, the ratings and the stories. With respect to the former, the increase in ratings that corresponded with increased needle levels was not readily interpretable within Arnold's system. Given the fact that all subjects were forced to rate the pictures, the basic question was why subjects should regard the increase in rating as an appropriate expression of his "emotion." The answer cannot be that the needle confirmed an appropriate expectancy and thus aroused positive affect, because the increased ratings occurred for neutral pictures as well as sexual pictures. Increased ratings also occurred when general instructions as well as sexual instructions were given, thus allowing for anxiety interpretations of the needle as well as the supposedly pleasing sexual ones. The pure AL interpretation cannot resolve the difficulty because definite emotional differences existed among the groups in fantasy. Arnold would have to assume that subjects interpreted the needle effects as pleasant, because the experimental situation was not a directly noxious situation, such as shock administration. Even Valins' suggestion that the subjects utilized cognitive

cues to label their "internal sensations" fails to answer the basic question of positive affection.

The second problem with applying Arnold's system to the present experiment is the nature of the fantasy expression in this study. For Arnold, imagination occurred regardless of whether overt action accompanied it, but, in the absence of action, fantasy was a defensive maneuver. At all times, however, fantasy allowed the person to "go through the motions" of what he would have done if it were proper. In the present study, defensiveness was used to refer to an inability to express arousal imaginatively. Therefore, predictions about fantasy necessarily had to go beyond Arnold.

The present experiment is not a critical test of Arnold's theory because her system is basically a neurological one and demands anatomical manipulations. Schachter and Singer's approach is basically nontestable here also since the "equal" contribution of physiological and cognitive factors in emotional arousal could not be assessed. The only portion of Schachter and Singer's thesis which is addressed is the importance of situational cues in the production of emotional behavior. By manipulating the cognition that defines the "cause of bodily change," individual differences in emotional behavior were predictable. Studies have been mentioned showing that bodily changes alone have little influence on emotional behavior if there are no situational stimuli to which the subject can attribute his feelings.

Nonveridical cognitive cues in the form of false physiological feedback have produced behaviors similar to those expected if the

autonomic arousal actually existed (Valins, 1966, 1967). In these studies, ten color seminudes from Playboy were projected onto a screen for fifteen seconds each, with an intertrial interval of one minute. All subjects in these experiments were males. Tape recordings of heart beats were coordinated with the slides. Three minutes of rest followed the first presentation of the pictures, after which the procedure was repeated and heart rate changes again occurred. Ratings of attractiveness were obtained after the second presentation, when subjects were shown the nudes a third time without feedback.

Both experimentals and controls were instructed to ignore the sounds. Experimental subjects were told, however, that the sounds were their own heart beats, while controls were told the beats represented extraneous sounds. None of the subjects were told what meaning to attach to the heart rate changes.

Subjects who were informed of their own heart rate increases and decreases to sexual slides later rated these pictures as more attractive than slides to which their heart rate supposedly did not change, chose these slides to keep and maintained these preferences several weeks (Goldstein, Fink and Mettee, 1972;Barefoot and Straub, 1971; Valins, 1966, 1967).

Nonveridical feedback has been shown to influence a subject's emotional evaluation of himself and the situation in areas other than sexual arousal. Gerard and Rabbie (1961) used a meter reading to convince subjects of their emotionality in a fear-inducing situation to elicit affiliative behaviors. Also, Bramel (1963) showed subjects

a dial reading of their own "homosexual tendencies" in response to pictures of partially-clothed males, in an attempt to study projection of undesirable traits to members of similar and dissimilar social groups. The authors of both studies were satisfied that the manipulation induced the desired affective response.

There has been some confusion whether the response to false feedback is a purely cognitive phenomenon, or whether cognitions of arousal activate the physiological system which then produces the emotional behavior. Valins (1966) stated that the attractiveness ratings were cognitive, since attempts to monitor the physiological reactions of galvanic skin response and heart rate revealed no differences between experimental and control subjects. Valins said that experimental subjects reported "fewer heart palpitations" on a post-exposure questionnaire than controls did, but since this data was not published, it cannot be evaluated. There is also some doubt as to just what "heart palpitations" are, or whether subjects were referring to comparable subjective experiences when they gave their answers.

Goldstein, et. al. (1972) reported heart rate reactivity of subjects given false heart rate feedback while viewing pictures of nude females and nude males, but due to inappropriate controls, their data was impossible to interpret. First of all, heart rate variability was the only physiological measure taken, with no consideration of direction of change. This can give a very misleading picture of the actual arousal that was occurring. Secondly, experimental subjects heard a

tape recording of clicks, which they were told corresponded to their own heart beats. Controls heard no feedback whatsoever. All subjects were shown eight female nudes in Phase I, and all experimentals experienced heart rate increases on tape. In Phase II, half of the experimentals and controls saw four nude females followed immediately by four nude males. The remaining subjects saw eight more nude females. Half of each group experienced heart rate increases and half constant heart rate feedback during Phase II.

Briefly, the authors reported increased ratings of attractiveness of the female nudes in Phase I in response to increases in heart rate feedback. Actual heart rate was also more variable to the "attractive" slides, although the correlation between actual heart rate and ratings was only +.15. In Phase II, however, subjects who saw nude males showed no relationship between actual heart rate and false feedback, but a strong relationship between the former and ratings of "offensiveness" taken post-experimentally. The authors concluded that when emotion was strong, cognitive cues about arousal were irrelevant, whereas in relatively "nonemotional" states of viewing nude females, cognitive cues played a role in the subject's cognitive judgments about low-key arousal.

Since no control group existed who heard the clicks and believed they were totally irrelevant to their own responding, there is no way to distinguish the emotional component in heart rate from pure habituation behavior. The increase in click rate increased the absolute amount of sensory feedback *per se* as well as giving the subject

information about his heart rate. One might suggest that increased attention to the clicks alone may have produced heart rate decreases in some subjects. Further, those subjects who believed the clicks were their own heart rate may have been defensive about their "increases," which would result in actual heart rate increases. The results would show heart rate variability, but two very different kinds of phenomena would be occurring (Lacey, 1950).

In Phase II, subjects ignored the feedback, especially upon seeing the males. The critical point may not have been that subjects became overwhelmingly emotional and offended by the nude males, and so ignored the feedback, but rather than all subjects had just finished viewing twelve female slides, heard heart rate increases to some of them, and had rated those as more attractive than the rest. The authors ignored the mental set of the subjects when they first saw the nude males. There was no basis for assuming that the subjects would automatically redefine the meaning of the false feedback when they were given a new set of situational stimuli. An initial reaction of shock and fear because of homosexual implications of the clicks may have led to refutation of the feedback as a defensive maneuver.

Passing immediately from female to male nudes and making a corresponding leap from sexual arousal to "offensive" arousal, proceeding to compare the two heart rate patterns with increases and decreases lumped together, and comparing the ratings of attractiveness and offensiveness on the same level (when they were obtained under very

different circumstances), all assumed a great deal about the similarity of the dynamic processes that were occurring. Very different conclusions might have been drawn if the subjects' reactions to male nudes coupled with false feedback was obtained first, and then the female nudes were presented. One has no information even as to how the controls responded, since their heart rate was not presented, nor as to any compensations made in the analysis of heart rate patterns for the orienting responses to the first nude males.

In a better-controlled study, Stern, Botto and Herrick (1972) monitored heart rate and GSR activity during false feedback. Heart rate increases on the tape were correlated with increased attractiveness ratings and with an initial increase in real heart rate for the first ten seconds after slide presentation and then by deceleration and mild recovery. Those subjects told the sounds were extraneous demonstrated no initial acceleration, but gradually decelerated to a maximum nadir five seconds earlier than the false feedback group, recovering then to baseline. GSR showed a sharp decline and recovery.

A second part of this experiment added a "task-involved" group who was instructed to pay attention to the extraneous sounds. The Valins effect in the attractiveness ratings was replicated for this group, and the actual heart rate patterns resembled the patterns when subjects believed the sounds were their own responses. The authors noted no differences between the task-involved and heart rate increase groups in heart rate behavior; however, the task-involved group showed a typical orienting response heart rate pattern, while the peak

acceleration of the false feedback group was delayed approximately five seconds. The exact nature of this difference is difficult to assess because the authors provided no beat-by-beat analysis of heart rate behavior. Therefore, no firm conclusions may be drawn about the degree of similarity between the two groups' heart rate patterns.

On the basis of what they believed to be very close heart rate patterns, Stern, et. al. concluded that much of the increased attractiveness ratings is due to an attention factor. Unlike Valins, Stern, et. al. found no changes in ratings for the group who heard heart rate deceleration, which they attributed to the less easily discriminated rate decrease than increase. The overall conclusion, that rating changes are due to attention factors while the lack of rating changes are a function of inattention, is of dubious value.

With respect to the false feedback literature as a whole, however, one finding does seem relatively stable; namely, increased attractiveness ratings and behavioral preferences are associated with changes in bogus heart rate feedback. Valins (1966) has proposed that the primary ingredient for this emotional behavior is cognitive utilization of cues, which may be either physiological or cognitive. The question of whether a person will react emotionally at any given time depends on the degree to which he feels a need to label the internal sensations which he may be feeling. The distinguishing factor that separates emotional from nonemotional people or behaviors, then, is not differences in sympathetic reactivity (Valins, 1967), but the

degree to which the autonomic events (or what the subject believes to be autonomic events) adequately function as emotional cues.

If a person feels a need to label these internal sensations, Valins (1966) and Barefoot and Straub (1971) have suggested a scanning process whereby the person selectively searches the situational environment for appropriate stimuli to justify the arousal. Barefoot and Straub reported that subjects who were not allowed to view the slide for more than five seconds were not affected by the false physiological feedback when they rated the pictures, whereas those subjects who were given twenty seconds to view the slide did exhibit the increased ratings.

Brief mention of the scanning process was made by Valins (1966) and was tested in a later experiment by having subjects rate specific features of the slides (Valins, 1967). Occasionally subjects reported attributing the heart rate changes to causes other than attractiveness if they could not convince themselves that they liked the slide; however, most subjects found justification for the heart beats from a closer inspection of the slide details. There was a significant difference between the rated details of reinforced and nonreinforced slides.

The fact that the subjects in Valins' studies reported being aware of their attempts to justify their physiological "arousal" by searching the picture, but did not feel they were distorting the picture, received support from a subsequent study. Valins (1967) debriefed the subjects totally, showed them all the equipment and

convinced them that the feedback was false before obtaining the attractiveness ratings. "Aroused" subjects continued to prefer the nudes to which they had received the increased feedback.

While the attractiveness rating changes have proven to be a stable finding, they provide almost the only direct evidence for Valins' fairly elaborate hypothesis about emotional arousal. Validation of the entire arousal manipulation in the false physiological feedback studies has relied on these rating scales and the subjects' verbal reports. While this information is not undesirable, and has often been an important feedback correlate in personality research, it should not be used as the only dependent measure successively without validation attempts. This is true because verbal report data is highly susceptible to demand characteristics and social desirability factors, as well as rater biases.

More specifically, rating scales impose a structure upon the nature of the affective experience which the author feels is undesirable, unnecessary and possibly restrictive. More sensitive measures of emotional arousal exist as measurement options which may allow a more complete picture of the dynamics of Valins' manipulation. A major question of this paper addresses the purity of sexual arousal as the feedback studies, i.e., the rating scales, have presented it. The hypothesis is that a false feedback manipulation affects much more than a liking for the pictures that are being shown, that the increased ratings are only a part of the psychological processes and defenses that react to nonveridical information.

Since rating scales are highly structured instruments, they result both in severe limits on the response options of subjects, and in a mandate that subjects perform surgery upon their affective experience in order to report it. Specifically, rating scale items force the subject to section his feelings to extract "anger" or "sadness" or "euphoria" and to estimate the absolute intensity of these discrete sensations. The issue is that the procedure assumes a separateness which may not exist. Of course, the language used to describe emotion may itself be artificial for the same reason. Although one has no choice but to utilize the language available, techniques to tap emotion in a fluid manner by imposing as little structure as possible are available. Such techniques are preferable because they allow the subject to use variable kinds and numbers of words to describe his thought processes. The question becomes one of the relationship between ratings of attractiveness and emotional arousal, of more than just a sexual nature, which may be occurring.

The Thematic Apperception Test (TAT) is a technique used to assess emotional arousal from the content of imaginative thought. This nonrestrictive expression of cognitive events which the imaginative format fosters is a major advantage of the TAT over rating scales and similar procedures. Two basic assumptions which underlie the fantasy analysis should be noted. First, the story written in response to any given picture is assumed to be organized into a logical coherent form by the intellect but to receive its meaning from the emotional state of the organism. The form which the fantasy

takes is the result of the subject's projection of his own preoccupations and circumstances onto the ambiguity of the picture (Murray, 1938). Evidence to support this assumption is presented shortly, and demonstrates the appropriateness of the fantasy medium for affective expression.

The second assumption is that the actual fantasy content is multiply-determined by three interrelated components. First the subject is assumed to have a response repertoire which he brings with him into the experimental situation. The responses which comprise this repertoire have obtained a certain probability of occurring through past experience with cues in the environment. There are assumed individual differences in the salience of these cues in real life, and in the probability that a subject will react to them in any given manner. Some responses seem to have a strong probability of occurring even in absence of strong cues. Lowell (1952), for example, reported that some subjects responded with high Need for Achievement (nAch) regardless of whether that motive was experimentally induced or even actively minimized by the experimental context. The word "motive" here is used to refer to a conditioned response to a cue associated with an affective state (McClelland, Atkinson, Clark and Lowell, 1953). Thus, a fork is a cue associated with the pleasurable sensation of eating or being satisfied, and the motive a conditioned emotional reaction to the fork. The motive is an anticipatory emotion which redintegrates the original affect (pleasure) and the situation and goal associated with it. Since

motives are affects, an emotion-inducing situation is assumed to arouse corollary motives as well.

The second determinant of the strength and nature of the imaginative response is the environmental cues in the experiment. These cues involve emotion-arousing manipulations to be discussed below.

In addition to the immediate manipulation, various and often subtle picture cues from the TAT instrument itself affect story content. Methodologically, Reitman and Atkinson (in Atkinson, 1958) reported a serial position effect in which nAch fantasy scores dropped in the second four pictures when compared to the score for the first four stories. This may have been due to a set of response variability. Rubenfeld (1964), however, reported an opposite effect. Presenting pictures which elicited many sexual fantasies early in a series was associated with more imagery on later pictures.

Rubenfeld's results seemed to be an interaction of position and content cues. Studies in which content cues are used as independent manipulations of fantasy responses show that arousal levels of subjects are affected by picture cues independent of the external situation (Barclay and Haber, 1965; Barclay, 1969, 1970). The content cues are assumed to be the immediate eliciting stimuli of emotional expression because of their similarity to those environmental cues that elicit emotion in real life.

If these influences determine the strength of the fantasy response, experimental manipulation of the motive state through the immediate situation, holding picture cues constant, should produce differences

in motive-related responses in TAT stories. After an initial study in which Atkinson and McClelland (1948) found that the number of food references in subjects' protocols increased as a function of hours of deprivation, similar designs elicited arousal of nAch, Need for Affiliation, fear and aggression (McClelland, Clark, Roby and Atkinson, 1949; Shipley and Veroff, 1952; Walter and Atkinson, in Atkinson, 1958; Feshback, 1955). In all these studies, a higher frequency of imaginative responses of a type judged related to the motive in question were recorded for the groups under the more highly motivated conditions.

In the sexual area, the straightforeward frequency count of motive subcategories and major thema has been shown inadequate to assess the nature of the arousal. The major difficulty encountered by a frontier study in the field was the lack of sexual imagery in stories written by subjects exposed to sexually-arousing experimental conditions when compared to controls (Clark, 1952). Previous research and theory would have predicted that sexual imagery should increase after subjects viewed slides of nude females. A second experimental group, however, who saw the same slides and wrote stories while under the influence of alcohol at a fraternity beer party did support the expectation. An analysis of guilt responses in the protocols showed that the greater the sex imagery, the greater the expressed guilt. Clark explained his results by saying that nonalcoholic subjects who were aroused expressed little sex imagery because guilt produced by the arousal stimuli was greater than the arousal. The controls felt

no anxiety over sexual expression, but the expression itself elicited response-produced guilt in their protocols. The reverse was supposedly true for alcoholic subjects, mainly because the guilt over sex expression in the aroused group was inhibited.

Clark was making a distinction between stimulus-produced guilt and response-produced guilt, the latter occurring in conjunction with imagery while the former precluded it. Clark assumed at this point that stimulus-produced guilt does not occur in protocols.

A reanalysis of the Clark data revealed that the amount of Freudian symbolism over sex was curvilinearly related to manifest sex scores, resulting in high symbolism for high and low manifest sex stories and low symbolism for moderate manifest sex stories (Clark and Sensibar, 1955). The principle difference between high and low manifest sex subjects, then, was the existence of symbolism in addition to imagery in the high manifest group. This suggested that stimulus-produced guilt is expressed in the stories in absence of direct imagery. This distinction between types of guilt was later formalized into two types of general defensiveness (Barclay and Haber, 1965). Type I defensiveness occurs in absence of imagery and is assumed to function at an unconscious level. However, when both manifest imagery and defensiveness appear simultaneously, the latter is presumed to be a response-produced anxiety which appears as a response to the act of writing sexual imagery. Type II defensiveness is more of a conscious process (Barclay, 1970).

Clark also found a decrease in manifest aggression in the stories

written by aroused subjects, which he attributed to a comparable anxiety over the expression of aggressive impulses. This relationship between sexual and aggressive arousal has been documented by studies in which anger arousal produced increases in sexual and aggressive imagery and defensiveness in TAT fantasy (Barclay and Haber, 1965; Barclay, 1969, 1970). These studies found that males who were aggressively aroused by an insulting experimenter expressed more manifest aggression on TAT protocols than control males. The aroused males also expressed more sexual imagery than the control males, and this increase in manifest sex was most significant in response to TAT pictures in which the female played the dominant role (FD), as opposed to an "appropriate" or male-dominant (MD) situation. Unaroused males expressed more sexual imagery to MD pictures in both the Barclay studies (1969, 1970), but produced more imagery to the FD pictures in the Barclay and Haber experiment. Aggressively aroused males showed more sexual defensiveness on MD pictures while controls were more defensive on MD pictures. The reverse was true for defensive aggression.

These findings suggest a pattern of emotional expression, as verbalized through fantasy, that appears when subjects are aggressively aroused. An aroused male becomes overtly aggressive in general, and especially in situations characterized by inappropriate social stimuli, i.e., female dominance. He is less defensive about these aggressive feelings than is an unemotionally aroused male faced with the same situation. The aroused male responds to a dominant female with

increases in sexuality as well, but he is very defensive about these sexual feelings.

All three of these fantasy studies were characterized by more sexual than aggressive imagery and more aggressive than sexual defensiveness. Since the experimental manipulation was aggressive, this finding is an interesting parallel to Clark's finding that a sexual manipulation produced a depressed sexual imagery score in aroused subjects. Barclay (1970) hypothesized that the subject may inhibit expressing his direct feelings because he perceives the experimental situation as inappropriate. The result is indirect expression through a corresponding emotion, either sex or aggression, while the initial arousal can only be expressed defensively. Defensive imagery should follow manifest imagery also, as a consequence of writing a directly sexual or aggressive story. If a subject is sexually-aroused, then, and he perceives expression of his arousal as inappropriate behavior, he inhibits manifest sexual expression and becomes defensive about sex. Since sexual and aggressive arousal are positively linked, he expresses his feelings through aggressive imagery. The subject is presumably unaware of his aggressive arousal. Type II defensiveness should also be present in the stories as a function of aggressive imagery.

Type I defensiveness does not occur if the subject is aroused by a distant stimulus, such as a television episode. Barclay (1971) found that subjects sexually aroused by a love-making scene expressed more TAT manifest sex and more defensiveness about this expression

than controls or subjects aroused to other emotions. These subjects also expressed more aggressive imagery than subjects in other groups. One might hypothesize that the remote nature of the arousing situation, plus the emphasis placed on the role of the subject as an observer and evaluator of the episode, might function to reduce the saliency of the subject's own arousal to the point of reducing the need for defensive maneuvers. The problem with this interpretation is the absence of any real reason why the remoteness should not have simply reduced the level of initial sexual arousal.

The obvious alternative explanation for the sex-aggression link in the fantasy studies is general activation. However, Barclay (1969) found that nAch and nAff did not increase in TAT protocols of aroused males, and Barclay (1971) and Barclay and Little (1972) both reported that the production of anxiety or laughter in the subjects did not yield any significant difference in sex or aggression over control procedures. The increase in aggression for sexually aroused subjects, however, was cross-validated.

Physiological evidence has further validated the differences in fantasy between aroused and control males. Aroused males secreted more acid phosphatase (AP) in their urine when sexually aroused by slides of nude women (Barclay, 1970a), or when aggressively aroused by an insulting experimenter (Barclay, 1969). AP has been described as an enzyme secreted by the prostate gland during sexual arousal. The presence of AP is therefore strong validating evidence that the subjects were genuinely aroused.

Now the relationship between physiological differences and

experimental arousal manipulations and TAT fantasy differences in sexual and aggressive imagery and defensiveness has been established. Subjects who are exposed to aggressive and sexual manipulations, and who become aroused as a result, show more AP secretion than unaroused males, and demonstrate different fantasy stories. If the fantasy differences between groups can be found, one can safely conclude that differences in arousal existed at the time the stories were written. The importance of this conclusion becomes clear when one recognizes that the Valins manipulation is subject to an alternative explanation, one which appears to have been overlooked to this point. This is an adaptation level (AL) explanation.

AL was first introduced by Helson (1938) to integrate psychophysical phenomena of visual constancy and contrast and it is best conceived as a range within which a stimulus evokes a neutral or indifferent response. The location of the range along the stimulus dimension(s) is determined by the pooled effect of the stimulus values which have occurred up to any given point, and is changed as each successive stimulus is accommodated into the new range level.

The concept of AL has been modified to address social behaviors (Blake, 1958; Haber, 1958). From this perspective, AL is defined as any subjective established norm or reference point which anchors the judgments of any new stimulus event. Blake cited studies in which the action of another person immediately prior to the subject's involvement affected the nature of the latter's participation, so that if another person chose to sign a petition in the presence of the

subject, the subject was more likely to sign it himself. Blake hypothesized that the prior action of another served to initiate a social norm and contributed significantly to the AL of the subject. Blake assumed that, despite the subject's lack of awareness of his own conformity to another's behavior, he was indeed adapting to an ever-changing AL in social conformity.

The Blake studies are important because they show people will behave in a fashion which maintains the momentary AL established by prior events. However, AL is relevant to the Valins studies because stimuli falling outside the existing neutral range also evoke behavioral changes. McClelland, et. al. (1953) utilized AL to define positive and negative affective changes that occur in response to stimuli of this kind. Here, AL becomes a subjective reference point anchoring expectations about future events. The amount of discrepancy that exists between the expectation and the event determines the nature of the affective response to the event, which in turn is the foundation of motivated behavior. Relatively small variations from expectation are pleasantly arousing while larger discrepancies evoke fear and other negative emotions. This model of course implies some immediate cognitive evaluation of the discrepancy before affect can appear and thus resembles Arnold's approach.

Although McClelland, et. al. admit damaging limitations to their model, i.e., large discrepancies occasionally produce positive affect if they are very favorable, they do maintain that this model is an appropriate one to describe the nature of motivated change.

One of the major difficulties with the AL interpretation of affective responding would seem to be the complexity involved in determining the location of the boundary between positive and negative affect at any given time. How much of a discrepancy is "too much"? Cofer and Appley (1964) noted that this boundary may be characterized by a second neutral area, but little evidence can be found to bolster this position.

With respect to the Valins experiments, AL was determined by the first group of slides and baseline heart rate feedback on the tape. This rate became the subject's expectation about his own heart rate. When the rate changed, a discrepancy from AL occurred. The subject was not likely to define the change as negative, since the situation was a "pleasant" one of viewing nude slides. Very large discrepancies, however, might have produced alarm. The major difference between the AL interpretation of the increased attractiveness ratings and the sexual arousal interpretation, which both infer positive affect to account for the ratings, is that the affect in the former case is merely a positive response to the small change in stimulus input level. The fact that Stern, et. al. found the increased ratings in response to the task-involved extraneous sound condition supports the AL interpretation. Of course, the maintenance of the picture preferences over five weeks might still be due to scanning effects, for the subjects would still need to bolster their ratings with subjective opinions about the slides.

One conclusion is definitely clear. Before the attractiveness

rating changes from the false feedback studies can be accepted as a reflection of emotional arousal and treated as an empirical finding in the area of emotion, the alternative AL hypothesis must be tested. The present study was designed for that purpose, as well as to integrate the rating scale changes with other less-superficial measures of emotional response.

Appendix B

Instruction and Feedback Materials

INSTRUCTIONS TO THE SUBJECT

The experiment in which you are participating is studying a possible relationship between creative imagination and physiological responses, such as heart rate. For example, when a creative person looks at pictures, his heart rate and respiration rate may act differently than for a person who is not creative. We are going to show you some pictures and, at the same time, record your heart rate, respiration and galvanic skin response (GSR). The GSR is a measure of electrical skin conductance, which often changes when people pay attention to stimuli in their environment.

Your physiological responses will be recorded by a polygraph machine, which will trace your heart beats, etc. on graph-like paper. After the experiment is over, these graphs can be studied and the physiological responses can be detected.

Some subjects have told us they would like to know what the polygraph is recording, so we have installed a meter which you can see. The needle in the meter will tell you what physiological changes are being detected. Please do not let the meter distract you from looking at the pictures.

When you have finished looking at the pictures, we would like you to fill out a booklet and questionnaire. We are not completely sure what we can learn from the booklet, but we hope it may tell

us something about your creative ability. The questionnaire is designed to let you tell us how you feel about the experiment.

Are there any questions?

SUBJECT'S INFORMATION SHEET

The machine used in this experiment is a polygraph. It is a complex device which measures several body responses at the same time. It is a combination of an electrocardiograph and a galvanometer which makes it an accurate indicator of the subject's heart rate as well as his GSR.

It operates by electrodes which are used to create an electrical circuit, picking up responses from parts of the subject's body which are connected to the wires and sending the impulse through the electrodes to be interpreted and rated by the polygraph. The intensity of the electrical input into the polygraph determines the position of the needle on the face of the polygraph. Hence, as in this experiment, if the subject is highly sexually stimulated, the electrodes will transmit a highly charged electrical current which in turn will cause the needle to rise on the scale indicating sexual excitability.

It has been shown in previous experiments that the galvanic skin response (GSR) is greatly affected by the degree of moisture in the skin. Therefore, for example, if the subject's hands are sweaty, a greater current will pass through the electrodes and the needle on the polygraph will indicate a high sexual impulse.

The reading given by the polygraph (also sometimes called a lie detector) is a combination of the information obtained through the electrodes attached to strategic parts of the subject's body which have picked up impulses in varying degrees and relayed an

electrical current composed of the charges from all the readings. Consequently, the reading on the polygraph is indicative of the whole body's reaction to sexual stimuli.

In situations where a subject is being asked questions by a policeman for example, in order to find out if he is telling the truth, it is necessary only for the subject to believe what he is saying for the polygraph to register that he is telling the truth. However, since in this situation the subject is not asked to respond to questions directed to him, there is often a discrepancy in what the subjects thinks to be his emotional state and what the polygraph indicates as a result of electrical impulses the subject is not consciously aware of existing.

The purpose of this study, which is under the direction of Dr. Andrew Barclay, is to determine the degree of influence outside stimuli have on the subject's level of sexual excitability. Thank you very much for your cooperation in helping with this study.

PICTURE EVALUATION CHECKLIST

Instructions: You will be shown a series of eight pictures by the experimenter. After you have viewed each picture for the required length of time, the experimenter will say, "Check." At that time, please rate the picture you have just seen in the attractiveness scale below by circling the number that best expresses your reaction. A rating of "1" indicates "not at all attractive," whereas a rating of "4" means "moderately attractive." A rating of "7" means "extremely attractive." When you have finished rating, the experimenter will show you the next picture.

	1	2	3	4	5	6	7
	not at all			moderate			extremely
Picture 1:	1	2	3	4	5	6	7
Picture 2:	1	2	3	4	5	6	7
Picture 3:	1	2	3	4	5	6	7
Picture 4:	1	2	3	4	5	6	7
Picture 5:	1	2	3	4	5	6	7
Picture 6:	1	2	3	4	5	6	7
Picture 7:	1	2	3	4	5	6	7
Picture 8:	1	2	3	4	5	6	7

CREATIVE IMAGINATION TEST

This is a test of creative fantasy (imagination). In order to get the best possible response, look at each picture for ten to twenty seconds. Try to see what is taking place, then use the page following the picture to write a story about it. We have provided questions to guide your responses but feel free to write whatever you wish even if it does not follow the order or concept implied by them. The stories should be continuous wholes rather than answers to questions.

It has been found that the best stories are written by people who relax, let themselves go, and write whatever comes into their heads even though some aspects of the story may not make too much sense at the time. Naturally, there are no "right" or "wrong" stories, so relax and have a good time.

POST-EXPOSURE QUESTIONNAIRE

Instructions: Now, we would like your reactions to the study. Below we have listed a series of adjectives describing some possible reactions. Please rate each adjective on the degree to which you feel it is appropriate to the way you felt during the experiment. The units of the scale mean the same as they did when you rated the individual pictures.

	1	2	3	4	5	6	7
	not at all			moderate			extremely
anxious	1	2	3	4	5	6	7
indifferent	1	2	3	4	5	6	7
nauseous	1	2	3	4	5	6	7
aggressive	1	2	3	4	5	6	7
sexually aroused	1	2	3	4	5	6	7
tense	1	2	3	4	5	6	7
disgusted	1	2	3	4	5	6	7
embarrassed	1	2	3	4	5	6	7
inadequate	1	2	3	4	5	6	7
bored	1	2	3	4	5	6	7
delighted	1	2	3	4	5	6	7
guilty	1	2	3	4	5	6	7
angry	1	2	3	4	5	6	7
hungry	1	2	3	4	5	6	7

If your main reaction to the study is not covered in the above, please list it here. Thank you.

Table 1. Mean picture ratings for needle x arousal levels.

Condition	Needle Level			
	Low	Moderate	High	Red Light
Aroused	7.01	8.67	9.71	11.03
Unaroused	6.90	7.96	9.34	9.70
Mean	6.96	8.31	9.52	10.37

Table 2. Mean manifest sex scores: Pictures x feedback.

Feedback	Pictures			
	Sex		Neutral	
	FD	MD	FD	MD
Appropriate	4.07	4.26	3.88	4.73
Inappropriate	4.03	5.23	4.07	3.65

Table 3. Mean defensive sex scores: Pictures x feedback.

Feedback	Pictures			
	Sex		Neutral	
	FD	MD	FD	MD
Appropriate	.7692	.5385	.5000	.5769
Inappropriate	.2692	.7692	.6538	.2692

Table 4. Mean defensive sex scores: Instructions x pictures

Instructions	Pictures			
	Sex		Neutral	
	FD	MD	FD	MD
General	.7308	.6154	.3846	.4615
Sex	.3077	.6923	.7692	.3846

Table 5. Mean TAT category values x arousal

Arousal	TAT Category					
	Manifest Sex	Manifest Aggression	Defensive Sex	Defensive Aggression	Total MS-MA	Total DS-DA
Aroused	+ .11*	+1.11	+ .30	+ .15	-1.47	+ .65
Unaroused	-1.01	+ .73	- .29	+ .02	- .25	+ .65

*Positive values represent greater FD scores.

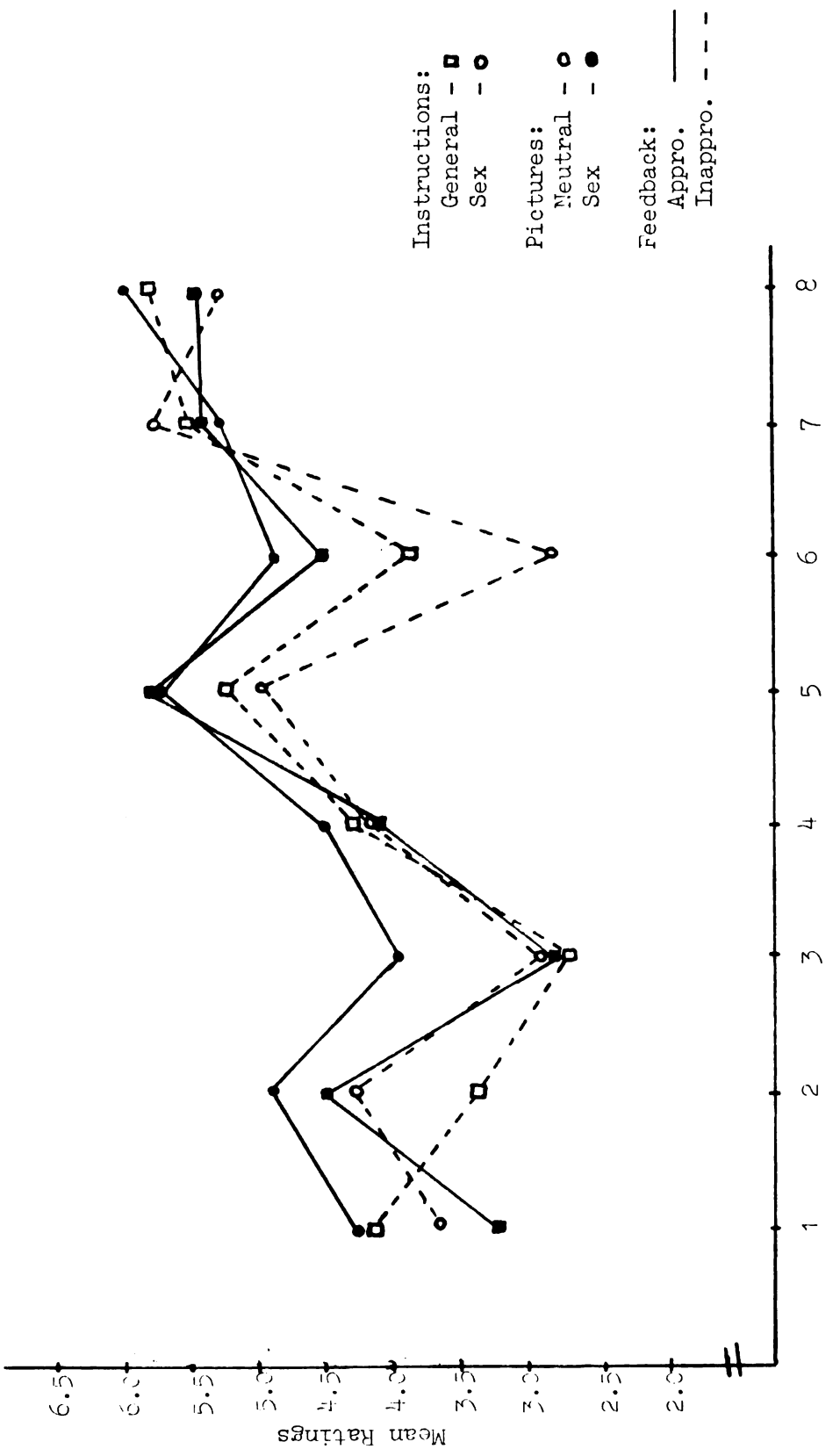

Figure 1. Mean picture ratings for aroused subjects.

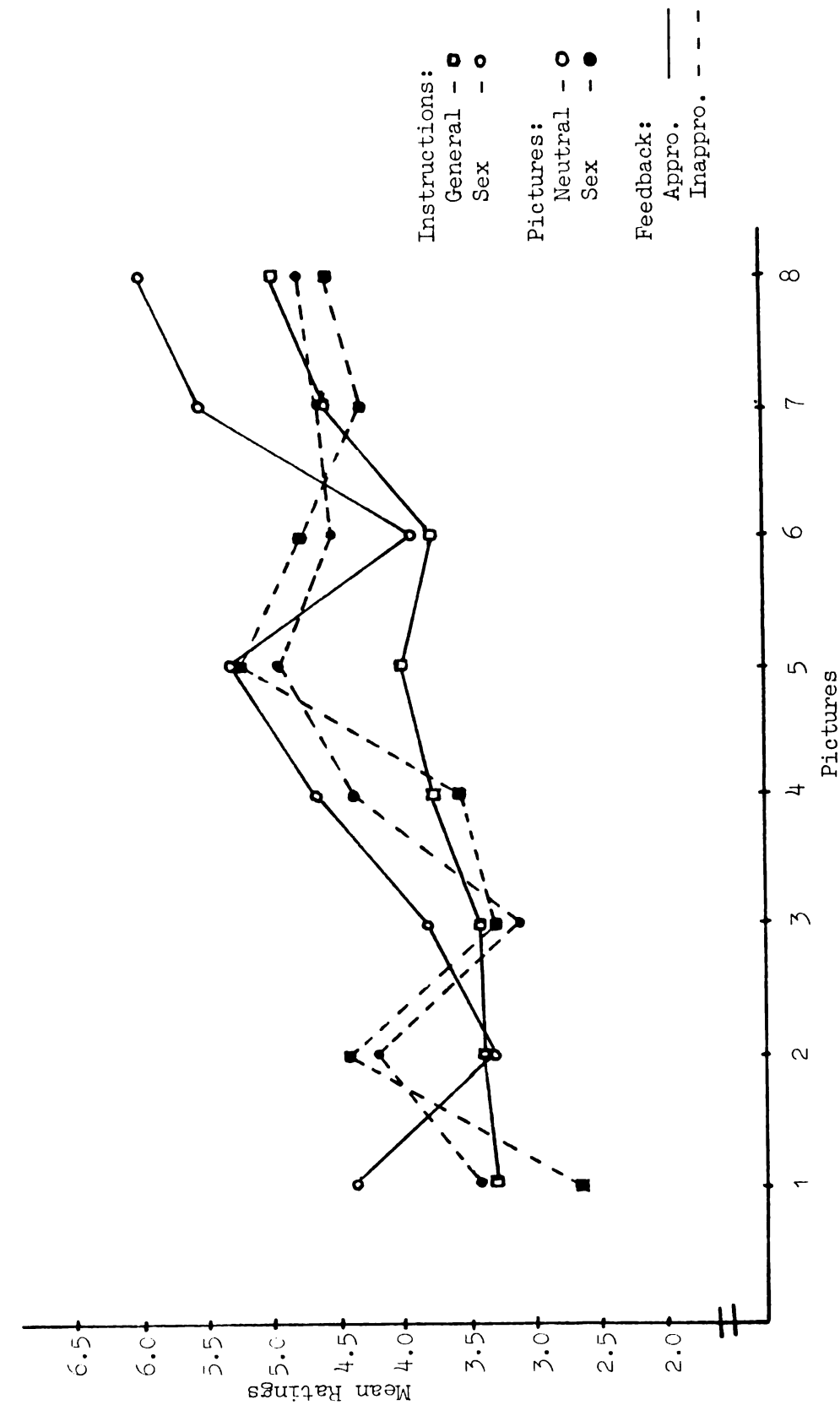

Figure 2. Mean picture ratings for unaroused subjects.

APPENDIX D

Footnotes

1. Red light levels refer to those high needles which fell into the top one-fourth of the scale, and therefore lighted the red light. Needle levels labelled "high" peaked in the top part of the scale, but did not trigger the red light.