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**The Modification of Selective Recall  
Of Central and Incidental Task  
Features by Emotional Arousal**

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Abstract

Two types and levels of emotional arousal were experimentally varied in separate studies. The effects of high and low levels of frustration and of fear on the recall of various features of the arousal situation were assessed. Task-irrelevant (incidental) stimuli were more poorly recalled as emotional arousal increased. On the other hand, task-relevant (central) stimuli were better recalled under conditions of high emotional arousal. A unique control group varied the experienced level of arousal while maintaining the instructional set used to arouse emotion in the experimental group. These dissonance "control" subjects who committed themselves voluntarily to a fearful situation for minimal justification, behaved as did the low arousal subjects.

The Modification of Selective Recall  
Of Central and Incidental Task  
Features by Emotional Arousal<sup>1</sup>

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Although our legal system of justice recognizes that reason may be overwhelmed by strong passions, our fundamental belief in the right of rationality makes us view as weak or unusual those individuals who let passions sway their perception and judgment. To what extent does the arousal of emotion guide our behavior and direct our attention?

The present research represents a step in the direction necessary to answer this broad question. Our ultimate theoretical concern rests with understanding the dynamics of mob behavior, of the irrationality and "strong emotional responses" which usually accompany the formation of mobs and the mass social action so prevalent now in our society.

Our empirical concern, however, begins with a focus on the effects of variations in level and quality of emotional arousal on the process of utilization of different types of information available in the arousal situation.

In two related studies, frustration and fear were aroused at low and high levels and their effects on recall of situational

information were assessed. The first study measured only memory for incidental stimuli, while the second compared memory for incidental (or irrelevant) stimuli with that for central (or relevant) stimuli. Does arousal lead to a general "attentional gating" and reduction of informational input or to a selective filtering of stimuli?

### Method

#### Overview

The answer to this question was sought using a laboratory arousal of the emotion of frustration in the first study and of fear of bodily danger in the second study. In addition to the major dependent measure of recall of situational stimuli, other measures were taken to evaluate the effectiveness of the arousal manipulations. The second study incorporated a unique control group to supplement the high and low fear arousal treatments. The purpose of this group was to equate them with the high arousal group in terms of the objective instructional and procedural aspects of the experiment, but have them be more like the low arousal group in their subjective interpretation of the situation. This control was achieved by using a cognitive dissonance procedure in which voluntary exposure to a motivation

state (for low justification) has been found to effectively lower the experienced level of motivation (Zimbardo, 1969).

### Subjects

The frustration study used 18 male and female undergraduates, while the fear study utilized 36 coeds, all recruited from Stanford University.

### Procedure

Frustration Arousal: An easy versus hard manual dexterity task provided the basic element in the arousal of frustration manipulation. All subjects had to pass a loop of wire (at the end of a stylus) along a two foot length of wire without touching them together. To make this "skin the cat" task easy, the loop was large; to make it hard, the loop was quite small. To increase the salience of failure, the high frustration group heard a loud, raucous buzzer sound each time the loop touched the wire--signalling a return to the start position. In contrast, failure by the low frustration group was signalled by a small light. All subjects expected the task to continue for one hour or until the criterion performance was achieved: two successful excursions by the high frustration group, and five by the low frustration group.

At the end of 12 minutes' activity, the task was unexpectedly terminated. By that time none of the high frustration subjects had made the trip successfully while all of the lows had at least two successes, and one steady, fast subject had already gone across the five required times.

In describing how they felt about the task, immediately after being taken out of the experimental room to an anteroom (where they were to complete the recall measure), seven of the nine subjects in the frustration condition described their state using adjectives like annoyed, irritated, upset, and frustrated. None of the low frustration subjects described their state in any way which could be scored by a "blind" judge as emotionally aroused, or negative.

The recall task required the subject to identify various features of the arousal situation which were irrelevant to task solution and geographically distant from the problem. These included: description of a clock on the wall, the number of windows opened, the number of chairs in the room, the color of the room, etc. A perfect recall score would have been 15 items correctly mentioned.

Fear Arousal: Fear was aroused in female subjects by leading them to believe that as part of a study relating learning to physiological activity, their blood pressure would have to

to be continuously monitored. They were told that the medical technician (who allegedly was to take these measurements) would be using a newly developed sensitive recording device. For the Low Fear treatment, the blood pressure device was portrayed as an electronic metering instrument coupled to an arm cuff. However, for the High Fear treatment, a small pressure-sensitive device would have to be inserted so that it touched an artery on the S's non-preferred arm. An impressive array of biomedical apparatus along with an alcohol odor helped to establish the credibility of this arousing expectation.

The perceived justification for undergoing this experience was also systematically varied to establish three conditions: low fear with high justification, high fear with high justification, and high fear with low justification.

High justification instructions stated: "This is a very important experiment. The perfection of accurate measuring devices for physiological responses is probably necessary before any new breakthroughs in learning can be made. In a more limited perspective, the data in this experiment will be most helpful in studies of test anxiety and school performance."

Low justification instructions in contrast stated: "This is primarily a methodological study, and you will probably not find it too interesting. I'm pretty sure of how the results will turn out, but I'd like to try it."

All subjects were then given the option of continuing or dropping out of the study. Those choosing to continue (12 of 15 in High Arousal, High Justification; 11 of 12 in High Arousal, Low Justification, and 10 of 10 in Low Arousal, Low Justification) were given a printed instruction sheet which outlined a series of physical activities they would have to go through prior to the blood pressure recording phase. They were given two minutes to memorize the instructions. Then during a five-minute waiting period, the subjects familiarized themselves with the special memory drum to be used subsequently and also completed a self-report physical state questionnaire (a check on their arousal).

The major dependent variable was a test of "base-line attention." Subjects were given another printed instruction sheet which varied from the original instructions in two ways: a) slight differences in items central (or relevant) to the blood pressure task, and b) slight differences in items incidental (or irrelevant) to the focus of arousal. An example of a central change is: extend right hand rather than left hand. Examples of incidental changes are: use of numbers rather than letters for the instructions, digits written out rather than numerals, the date, the doctor's name, etc.

Evaluation of recall of central item instructions was also made by having the subjects actually perform the sequence of activities as described in their instruction sheet.

After this measure of recall (or utilization of relevant/irrelevant information), all subjects were thoroughly debriefed, thanked for their participation, and rewarded monetarily.

#### The Dissonance Control Group

The control for instructional set followed the strategy of having two groups which anticipated the same environmental events (the insertion of the recording device), but nevertheless creating variations in their level of perceived fear. It was assumed that voluntary commitment to this fearful condition under conditions of minimal extrinsic justification would generate a state of cognitive dissonance. Effective reduction of this dissonance ought to take the form of changing those cognitions associated with fear, e.g. "I agreed to do it because it probably won't be so bad (painful, unpleasant) anyway." Thus, it was expected that this high fear arousal group would react more like those given the low than the high arousal treatment.

Assessment of the experienced symptoms of arousal validate the contention that our fear arousal manipulations were successful. On each of five self-report measures, the low

arousal group and the dissonance group were more similar to each other than either was to the high arousal group. On two of the measures, experienced nervousness and feelings of tiredness, this treatment difference was statistically significant ( $F = 3.10$ , d.f. = 2,30,  $p < .05$  for nervousness,  $F = 5.91$ , d.f. = 2,30,  $p < .01$  for tiredness). The subjects given the high fear arousal treatment reported feeling more tired (although they did not engage in any different activity from the other subjects), as well as more nervous. They also felt their heart rate was faster than did subjects in the other groups, and they were more tense, but not significantly so.

### Results

The effects of both types of emotional arousal on information processing can be summarized simply: under conditions of high arousal recall of incidental (peripheral or non-instrumental) stimuli is attenuated, while recall of central (or instrumental) stimuli is accentuated.

The main data for both studies is presented in Table 1. Frustrated subjects have poorer recall of incidental stimuli ( $t = 2.69$ ,  $p < .02$ ), while level of fear arousal and centrality of information interact significantly; high fear increasing

central learning and decreasing incidental learning relative to low fear ( $t = 2.24, p < .05$ ).

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Table 1 About Here  
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An analysis of variance of the data in the fear study was performed after an arcsin transformation of the central and incidental learning scores (since the data were in proportions). A Newman-Keuls procedure comparing the mean differences between the three treatment groups revealed the high and low arousal treatments to be significantly different ( $p < .05$ ), the dissonance group not to differ from its low arousal counterpart ( $p > .50$ ), but to approach being significantly different from the high arousal group [ $t = 1.73, p = .10$ ] all two-tailed tests].

Another way of analyzing the data which offers more substantial evidence of the effect of arousal on cue utilization comes from comparing the percentage of subjects in each of the three fear groups who performed the central task perfectly, without any errors. Ninety-two percent of the high arousal group did so, while only 45 percent of the dissonance group and 30 percent of the low arousal group performed the required task accurately. The overall chi square of 9.64 is highly significant

( $p < .01$ ), and the high arousal group differed from each of the other groups which do not differ from each other.

### Conclusions

It appears reasonable to conclude that emotional arousal engenders a selective filtering of information. That which is relevant for arousal-related action is attended to, learned and recalled; that which has no instrumental value in the situation is not.

However, the conditions under which this interaction holds require much more study. Although our obtained results would support a model of a rational, efficient information-processing organism, we are aware of its limiting conditions. What happens when the central information is such that it has no instrumental value in coping with the situation, or is itself the chronic cause of the arousal (as in test anxiety)? We have tried to demonstrate an effect across qualitatively different emotional states, but does that imply that it is level of arousal rather than emotional content that is important? Can we anticipate similar results for anxiety arousal (unconsciously-based arousal) as for objective fear arousal? A final question to be posed for future research is whether the selective filtering found in this study would occur in the mob situation, or whether the

complexity of the arousal situation itself would lead to a simplification of cognitive processing, with all incidental cues dropping out and only the most salient of the relevant ones being available to guide behavior.

The use of the dissonance procedure as an experimental control also deserves mention. On the one hand, those subjects behaved exactly as predicted; they cognitively altered their perceived emotional state as evidenced on all the arousal indicators, and behaved on the central learning measures as if they were not aroused or concerned about their impending fate (of having something implanted under their skin). Thus, viewing them as a control group, we can be more confident that arousal differences rather than task specific experimental instructions are responsible for the observed differences in the dependent variable. However, psychological theorizing, like life, is rarely as simple as we would like it to be. The dissonance group, assumed to be denying their initially experienced fear, effectively did so only on the central, obvious task where they behaved like the unaroused subjects. On the incidental learning task, their performance is not better than the aroused subjects, in fact, it is poorest of all. This result is reminiscent of the pattern found by

Mansson (1969). His high dissonance subjects overreacted, or over-denied their arousal on measures clearly related to the arousal. However, on a neutral, irrelevant projective measure, they revealed that they were still in the dynamic process of trying to suppress and control their arousal rather than being truly unaroused.

Understanding of the effects of acute and chronic arousal states on cognitive structures and information processing has received sporadic interest from psychologists for some time, (cf. Allport and Postman's 1945 analysis of rumor; Easterbrook's 1959 formulation of cue utilization; Zaffy and Bruning's 1966 concern with anxiety and range of stimulus usage; and, Bruning, et al.'s 1968 analysis of socially induced drives). The time is ripe for a systematic and concentrated investigation of this basic human problem, that of how man coordinates reason and passions in order to act.

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Table One  
Arousal Level and Mean Correct  
Recall Performance (S.D. in parenthesis)

## Experiment One (Frustration)

	<u>High</u>	<u>Low</u>
Incidental Learning	3.1 (1.96)	5.2 (1.30)

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## Experiment Two (Fear)

	<u>High</u>	<u>Low</u>	<u>Dissonance</u>
Central Learning —	5.9 (.29)	5.1 (.88)	5.2 (1.17)
Incidental Learning	1.1 (1.03)	1.3 (1.16)	.45 (.82)

Footnotes

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