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INCENTIVE, CHOICE, AND SUBJECTIVE UTILITY AS DETERMINANTS FOR AFFECTIVE EVALUATION OF STIMULI

by

Dennis Lee Coon

A Dissertation Submitted to the Faculty of the DEPARTMENT OF PSYCHOLOGY In Partial Fulfillment of the Requirements For the Degree of DOCTOR OF PHILOSOPHY In the Graduate College THE UNIVERSITY OF ARIZONA

1973
I hereby recommend that this dissertation prepared under my direction by Dennis Lee Coon entitled Incentive, choice, and subjective utility as determinants for affective evaluation of stimuli be accepted as fulfilling the dissertation requirement of the degree of Doctor of Philosophy.

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After inspection of the final copy of the dissertation, the following members of the Final Examination Committee concur in its approval and recommend its acceptance:

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SIGNED: Dennis Lee Coon
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I would like to thank my mother for making this all possible: thanks a lot, Mom. Thanks also to Smith-Corona, Maxwell House, Incorporated, City Ice, my lucky stars, my superego, and God in his Heaven. Also deserving credit is the California public school system.

Special thanks are extended to Dr. Terry Daniel, Dr. Robert Lansing, Dr. William MacKinnon, and Dr. Ronald Pool for expending generous amounts of time and effort in my behalf. Each through his advice and encouragement has added significantly to the final success of the research herein presented.

My deepest appreciation goes to Dr. Glenn White, who has served as a model, a guide, a catalyst, and an inspiration for my intellectual growth, and who has, by his friendship, humanized a lengthy and otherwise onerous process.
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ABSTRACT

Pain ratings of a noxious stimulus were made under conditions varying incentive, expected after-effects of exposure, and salience of choice to continue exposure. Expectation of severely aversive after-effects reduced concurrently judged pain, possibly due to a judgmental contrast effect, and also influenced affective ratings of a neutral stimulus presented after the noxious stimulus. For male subjects, concurrently judged pain was reduced when incentives were insufficient (a dissonance effect) or excessive (a reinforcement effect). Salient choice produced greater tolerance of noxious stimulation when subjects expected mildly aversive after-effects but less tolerance when severely aversive after-effects were anticipated. This suggests that the effects of self-observation or enhanced feelings of control, which have obtained in other research, may alter pain perception only in judgmentally ambiguous situations. Other results show that post-exposure pain ratings are not identical to concurrent ratings, but that they are responsive to incentive conditions if social comparison feedback is provided.
INTRODUCTION

Recent research has made it clear that experienced pain is only partially determined by the intensity of the painful stimulus. Studies of masochism (Brown, 1965), hypnotic analgesia (Barber, 1959, 1963), attitudes toward childbirth (Melzack, 1961), suggestion (Neufeld, 1970; Wolff and Horland, 1967), and instructions (Blitz and Dinnerstein, 1968, 1971) have all demonstrated that internalized frames of reference or standards can alter experienced pain. These studies raise the question of whether one's motivation to endure pain affects its subjective intensity. Research on verbal manipulation of the degree of choice and justification given subjects for exposure to painful electric shocks suggests that it does. Zimbardo, Cohen, Weisenberg, Dworkin, and Firestone (1966) found that pain perception was significantly modified when subjects freely chose to expose themselves to shocks. Under these conditions, shocks were rated less painful than when volunteering was strongly encouraged and justified (i.e., they were coerced). Zimbardo et al. proposed that insufficient justification for exposure to shock induced cognitive dissonance which subjects reduced by minimizing the painfulness of the shock. An alternative explanation could be cast in terms of self-observation (Bem, 1965, 1966, 1967; Bandler, Madaras, and Bem, 1968).
Choice and justification have also been manipulated in traditional research concerning the effects of incentive on attitude change following the performance of attitudinally discrepant behaviors. When subjects have no choice about the performance of counter-attitudinal behaviors, larger incentives produce greater attitude change—a reinforcement effect (Scott, 1957; Janis and Gilmore, 1965; Rosenberg, 1965). However, when psychological choice is high (implying voluntary commitment), the relationship between incentive and attitude change is inverse (Linder, Cooper, and Jones, 1967; Sherman, 1970; Holmes and Strickland, 1970; Kauffmann, 1971; Elms and Janis, 1965). Thus the smaller the external justification for engaging in a behavior (under conditions emphasizing freedom of choice), the more likely the inference that one's behavior reflects genuine beliefs.

The present experiment was designed to test the hypothesis that exposure to a painful stimulus is conceptually analogous to engaging in attitudinally discrepant behavior, in the sense that judgments of painfulness should reflect the joint effects of positive and negative incentives to expose oneself to pain, and of the salience of one's choice to do so.

A secondary question concerned whether these variables effect a change in perceived painfulness during exposure to the stimulus. Incentive and choice conditions
may only affect post-exposure re-evaluations of a stimulus, or they may affect concurrent and post-exposure judgments differentially. The previously noted effects of performing attitudinally discrepant behaviors have typically been assessed only after performance of the behavior.

Conditions in this study also permitted an inquiry into the effects of the subjective utility associated with exposure to a stimulus. On the basis of research concerning the physiological role of pleasure, Cabanac (1971) has suggested that stimuli are affectively evaluated in relation to internal states such that: pleasant = useful. For example, under conditions of internal hyperthermia, cold or cool stimuli (even when normally slightly painful) are judged pleasant, whereas, warm or hot stimuli are deemed unpleasant. The opposite response is given by hypothermic subjects. In short, stimuli that tend to return the individual's internal milieu to physiologically desirable levels are pleasant, whereas those having low or negative homeostatic utility are unpleasant. If physiological utility serves as a criterion for affective response, it seems possible that subjective utility might do likewise for cognizing organisms.
METHOD

Subjects
Forty-eight male and 48 female college students were randomly assigned to experimental and control conditions. Sixty-four subjects served in equal numbers in various experimental conditions, and 32 subjects served as controls.

Design
Initially, subjects judged the painfulness of a stimulus. Variables for this phase of the experiment included: expected aversive consequences of exposure to the stimulus (mild or severe), positive incentives for exposure (small or large), salience of subject's choice to endure the stimulus (choice or no choice), and subject's sex. Continuous pain ratings during exposure to the stimulus were recorded at ten second intervals and the first six, together with the previously listed variables formed a $2 \times 2 \times 2 \times 2 \times (6)$ mixed design. Latency (in seconds) to voluntary termination (quit-point) was employed as a second dependent measure and yielded a $2 \times 2 \times 2 \times 2$ fixed-effects design.

In a second phase, subjects rated a neutral stimulus on a pleasantness-unpleasantness dimension. Variables listed above were presumed to still be operative.
Additionally, the purported subjective utility (high or low) of exposure to this stimulus was manipulated, yielding a 2 x 2 x 2 x 2 x 2 fixed-effects design.

Control subjects also judged the neutral and the pain-producing stimuli.

In a final phase, subjects again rated the painfulness of the original pain stimulus. Variables for this post-rating were the same as for the original concurrent ratings but were collapsed across sex, and included a social comparison variable (no feedback vs. "longer than average endurance" feedback). This produced a 2 x 2 x 2 x 2 x 2 fixed-effects design. Control Ss also made post-exposure ratings.

**Stimuli and Apparatus**

Pain was produced by having each subject place the tips of his fingers (left hand) in circulating ice water (cold pressor) to a depth of 6 cm. A uniform water temperature of 4°C was maintained by continuous circulation. Water from the exposure tray drained over block ice and was returned by an electric pump. Subjects registered their discomfort by turning a large dial mounted on a console (placed at subject's right hand). This dial denoted subject's responses on a circular "pain thermometer" scale which ranged from zero to 100, and was divided numerically by units of five. The scale was also divided into sectors and was
labeled: 0 = no pain, 1-20 = slight pain, 21-40 = moderate pain, 41-60 = strong pain, 61-80 = intense pain, and 81-100 = extremely intense pain. A variable resistance rheostat was actuated by the dial and pain ratings were read and recorded by the experimenter from an ammeter in an adjacent room.

A small remotely controlled signal light was mounted at the top of the console above the pain-scale dial, and two push-button electrical switches were mounted between the light and the dial. One button was painted red and was labeled "stop button." Subjects depressed this button to inform the experimenter that they had removed their hand from the water. The other button was unmarked and in conjunction with instructional variations served as a basis for the choice salience manipulations. Each button, when depressed, lighted a small lamp at the experimenter's station to signal subject's responses.

The ice water tank was secured to the left side of a small table top and the response console to the right side. A neutral stimulus was created by a 150 watt flood lamp mounted between the two, 25 cm above the center of the table. Subjects placed their hand directly under this light (palm down) in a 20 by 15 cm rectangle marked on the table top with yellow tape. Affective ratings of the neutral stimulus light were made by reference to a scale (mounted on the wall) which ranged from -20 (very unpleasant) to +20 (very
pleasant) with zero designated a neutral judgment, and intermediate values (-10 = unpleasant, +10 = pleasant) also labeled.

Procedure

Upon arriving, subjects were given an instruction sheet describing the purported purpose of the experiment. Subjects were led to believe that the experiment involved physiological recording. This provided the justification for exposure to, and judging of, the painful stimulus. At this time the voluntary nature of participation was emphasized and reticent subjects were encouraged not to participate. Only two subjects, both females, chose not to participate. Before exposure to the stimulus, subjects were fitted with fake electrodes to heighten the credibility of the cover story. Subjects were then led to a small room and were seated at a table arrayed with the apparatus described above. Preliminary instructions regarding proper placement of the left hand in the ice water and use of the pain scale dial were given and the experimenter connected the subject's electrodes to a dummy electrode terminal. Subjects in the small positive incentive conditions were then told, "The longer you can leave your hand in the water, the greater the chances that I can obtain a usable recording." Subjects in the large positive incentive conditions were told, "The longer you can leave your hand in the water, the greater the
chances that I can obtain a usable recording. Since this will be painful, I have arranged a bonus to encourage your best effort. I cannot afford to offer to pay you directly, but what I will do is hold a drawing after the experiment for all those who participated. The prize will be $20, and you will receive one chance for each ten seconds you leave your hand in the water."

Subject's attention was then directed to the signal light and the two buttons on the console. **Low choice salience** subjects were told to "Watch this light. It is timed to flash every ten seconds. Each time it flashes push this button" (experimenter pushes button). "This will help maintain a constant level of distraction for all subjects." **High choice salience** subjects were told, "Watch this light. It is timed to flash every ten seconds. Each time it flashes, if you think you are willing to continue for 10 seconds more, push this button." Pain ratings were recorded at 10 second intervals. Quit-point latencies were also recorded. If a subject failed to self-terminate prior to two minutes of exposure, he was asked to do so by the experimenter.

Subjects were then told, "Now, please place your left hand, palm down, in the center of the yellow square." As the neutral stimulus light was turned on, subjects were told, "Please leave your hand in this position. The reason for this is that the light tends to reduce the
after-reaction and I want to record this change" (high subjective utility condition), or they were told, "I am continuing the recording, so please leave your hand in that position for a few moments" (low subjective utility condition). After one minute the light was turned off and subjects were asked to rate the light on the pleasantness-unpleasantness scale. The experimenter then re-entered the experimental room and while removing the subject's electrodes announced, "That was good. You left your hand in the water much longer than average" ("longer than average" feedback condition), or the experimenter avoided commenting on the subject's performance unless directly questioned, in which case the reply was a non-committal "Fine" (no feedback condition).

After being moved to another room, Ss were asked to fill out a "post-experimental questionnaire" on which they reported age, sex, and class standing, and then made a post-exposure rating of the pain stimulus in response to the following request: "The procedure used in this experiment is being considered for use in a long-term study. Therefore, it would be helpful if we could obtain some idea about your overall reaction to the pain stimulus used. Please indicate the overall painfulness of placing your fingers in the water by drawing a line across the scale below." Subjects responded by drawing a line across an unbroken line 18 cm long which was labeled "no pain" on one end, and
"unbearable pain" on the other. Subjects were then questioned about the experimental manipulations, debriefed, and released. Except for the deletion of the experimental manipulations, procedures for control subjects were identical to those for experimental subjects.
RESULTS

Effects of positive incentives, expected aversive consequences (negative incentives), choice salience, and sex on the first six stimulus-concurrent judgments of pain were assessed in a 2 x 2 x 2 x 2 x (6) mixed analysis of variance. Expectation of severely aversive consequences ($X = 27.5$ on arbitrary pain scale) resulted in significantly lower judged painfulness, $F (1, 48) = 5.74, p < .025$, than did expectation of mildly aversive consequences ($X = 37.0$).

Length of exposure to cold pressor had a predictably significant effect on pain ratings, with longer exposures giving rise to increased pain, $F (5, 240) = 241.84, p < .001$.

A significant interaction was obtained between exposure time and aversive consequence conditions, $F (5, 240) = 2.37, p < .05$. Means for various exposure times are plotted in Figure 1 as a function of aversive consequence conditions. Control means are also depicted for comparison, and all graphed means are summarized in Table 1. The Tukey method (Winer, 1962) indicates that an expectation of severe aversive consequences significantly reduced judged pain for all exposure times ($Ps < .05$) except 10 seconds ($P > .05$).

Pain ratings also reflected a significant interaction between sex, aversive consequences, and positive incentives, $F (1, 48) = 4.01, p < .05$. Individual cell
Figure 1. Plot of mean pain rating of the noxious stimulus as a function of duration of exposure and expected aversive consequences.
Table 1. Mean Pain Rating on an Arbitrary 100 Point Scale as a Function of Expected Aversive Consequences and Length of Exposure to Noxious Stimulation

<table>
<thead>
<tr>
<th>Expected Aversive Consequences</th>
<th>Length of Exposure to Noxious Stimulus in Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Mild</td>
<td>8.6</td>
</tr>
<tr>
<td>Severe</td>
<td>5.0</td>
</tr>
<tr>
<td>Control</td>
<td>9.7</td>
</tr>
</tbody>
</table>
means for this interaction are presented in Table 2. The Tukey method indicates that none of the individual treatments differed significantly ($P > .05$). However, Figure 2, depicting the combined effects of positive and aversive consequence conditions indicates that female subjects were largely un-affected by the positive incentive conditions, with the severe aversive consequences condition producing a reduction in judged painfulness. Corresponding means for male subjects, depicted in Figure 3, show that the lowest mean pain ratings were produced by a combination of the severe aversive consequences and small positive incentive ($\bar{X} = 26.8$), and by mild aversive consequences paired with a large positive incentive ($\bar{X} = 28.7$).

All other main and interaction effects assessed in the mixed analysis of variance were non-significant ($Ps > .05$).

Two additional pain indices, and an affective rating of the neutral stimulus (light) were submitted to a $2 \times 2 \times 2 \times 2$ analysis of variance. Variables for all three analyses were sex, choice salience, expected aversive consequences, and positive incentives. An analysis of self-exposure time (quit-point in seconds) indicates a significant interaction between choice salience and expected aversive consequences, $F (1, 48) = 5.46, P < .025$. When subjects expected mildly aversive after-effects, high choice salience ($\bar{X} = 113.8$ seconds) resulted in longer self-exposure
Table 2. Mean Pain Rating on an Arbitrary 100 Point Scale as a Function of Expected Aversive Consequences, Positive Incentives, and Sex of Subject

<table>
<thead>
<tr>
<th>Expected Aversive Consequences</th>
<th>Positive Incentive Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small</td>
</tr>
<tr>
<td><em>Female Subjects</em></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>36.5</td>
</tr>
<tr>
<td>Severe</td>
<td>28.0</td>
</tr>
<tr>
<td><em>Male Subjects</em></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>43.1</td>
</tr>
<tr>
<td>Severe</td>
<td>26.8</td>
</tr>
</tbody>
</table>
Figure 2. Plot of mean pain ratings of the noxious stimulus as a function of expected aversive consequences and positive incentives for female subjects.

Figure 3. Plot of mean pain ratings of the noxious stimulus as a function of expected aversive consequences and positive incentives for male subjects.
than did low choice salience ($\bar{X} = 104.4$ seconds). When subjects expected severely aversive after-effects, results were reversed; low choice salience ($\bar{X} = 118.9$ seconds) produced longer quit-point latencies than did high choice salience ($\bar{X} = 102.2$). These results are summarized in Table 3.

No other treatment significantly affected quit-point ($P$s > .05).

Table 3. Mean Quit-Point Latency in Seconds as a Function of Expected Aversive Consequences and Choice Salience

<table>
<thead>
<tr>
<th>Expected Aversive Consequences</th>
<th>Choice Salience Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Choice</td>
</tr>
<tr>
<td>Mild</td>
<td>113.8</td>
</tr>
<tr>
<td>Severe</td>
<td>102.2</td>
</tr>
</tbody>
</table>

Pain ratings at the time of self-termination were analyzed as indicated. No main or interaction effects obtained ($P$s > .05).

Post-exposure affective ratings of the neutral stimulus light varied significantly as a function of an interaction between aversive consequence and positive incentive conditions, $F(1, 48) = 9.52$, $P < .005$. Cell means for this interaction are presented in Table 4. The Tukey $\alpha$
Table 4. Mean Pleasantness Rating of Neutral Stimulus on an Arbitrary 20 Point Scale as a Function of Expected Aversive Consequences and Positive Incentives

<table>
<thead>
<tr>
<th>Expected Aversive Consequences</th>
<th>Positive Incentive Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small</td>
</tr>
<tr>
<td>Mild</td>
<td>6.1</td>
</tr>
<tr>
<td>Severe</td>
<td>8.5</td>
</tr>
</tbody>
</table>

method revealed a significant difference (\( P < .05 \)) between the mild aversive consequences-large positive incentive combination (\( \bar{X} = 10.56 \)) and the severe aversive consequences-large positive incentive condition (\( \bar{X} = 2.44 \)).

Affective ratings of the light were not significantly affected by any other treatment (\( P_s > .05 \)). Ratings of the light were unaffected by the subjective utility manipulations. No significant effects obtained (\( P_s > .05 \)).

Post-exposure pain ratings were evaluated to ascertain the effects of social comparison feedback, choice salience, positive incentive, and aversive consequences conditions. A 2 x 2 x 2 x 2 analysis of variance indicates the presence of a significant interaction between feedback and positive incentive conditions, \( F(1, 48) = 6.08, P < .05 \) and between feedback, choice, aversive consequences, and positive incentive conditions, \( F(1, 48) = 4.09, P < .05 \). All other sources were non-significant (\( P_s > .05 \)).
Means for the feedback by incentive interaction are depicted in Figure 4 and summarized in Table 5. When subjects were given no feedback, small positive incentive ($\bar{X} = 10.25$) and large positive incentive ($\bar{X} = 9.63$) conditions failed to differ ($P > .05$). However, when subjects were told that they had endured the pain stimulus longer than average, large positive incentive conditions ($\bar{X} = 11.09$) resulted in significantly greater rated painfulness than did small positive incentives ($\bar{X} = 8.56$), ($P < .05$).
Figure 4. Plot of mean post-exposure pain rating as a function of positive incentive and feedback conditions.
Table 5. Mean Post-Exposure Pain Ratings (in Centimeters on an Arbitrary Scale) as a Function of Positive Incentives and Feedback Condition

<table>
<thead>
<tr>
<th>Feedback Condition</th>
<th>Positive Incentive Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Longer Than Average&quot;</td>
<td>Small: 8.6</td>
</tr>
<tr>
<td></td>
<td>Large: 11.1</td>
</tr>
<tr>
<td>No Feedback</td>
<td>Small: 10.3</td>
</tr>
<tr>
<td></td>
<td>Large: 9.6</td>
</tr>
</tbody>
</table>
DISCUSSION

Concurrent Pain

Several possible interpretations are suggested by the finding that perceived painfulness of a noxious stimulus is diminished by an anticipated increase in pain following exposure to the stimulus. Anticipated pain increase may have aroused cognitive dissonance (Festinger, 1957) which was then reduced by minimizing initial pain ratings. However, if this were the case, manipulation of subject's choice to endure the noxious stimulus should also have affected pain ratings. In a "discrepant" behavior situation, the perception of having choice to behave otherwise is necessary for the arousal of dissonance (Brehm and Cohen, 1962). While it is true that all subjects had the option of terminating the noxious stimulus, variations in choice salience should have altered dissonance and concomitantly pain ratings. Thus, the dissonance explanation advanced by Zimbardo et al. (1966) in a conceptually similar situation fails to adequately account for the current data.

Epstein and Clarke (1970) found that after exposure to a noxious stimulus, subjects anticipating the administration of a severely noxious stimulus rated the stimulus as less intense than did subjects expecting a milder stimulus. A similar effect may have mediated pain reduction in the
present study. Epstein and Clarke attributed their findings to a contrast between the real and the expected stimulus. Their explanation is less plausible in this study because pain ratings were affected by anticipated aversiveness during exposure to the noxious stimulus but not on the post-rating. Epstein and Clarke observed a contrast effect for post-ratings only.

Nisbett and Schachter (1966) showed that the intensity of shock-produced pain can be reduced by altering the perceived source of physiological arousal occasioned by the shock. Subjects in the present experiment may have attributed arousal caused directly by the noxious stimulus to the anticipated severe post-exposure pain. Arousal attributed to the ice-water may have been reduced in this fashion, but Epstein and Clarke (1970) found that physiological arousal during anticipation of noxious stimulation is directly related to anticipated intensity. Thus an anticipated post-exposure increase in pain might initially reduce arousal through misattribution, but it would also be likely to increase arousal through anticipation—thereby negating the misattribution effect.

An alternative interpretation, which is basically congruent with the data is that reduction in judged painfulness was the result of a simple reference scale effect (Sherif and Hovland, 1961). That is, the expected increase in pain may have served as a judgmental anchor at the
extreme end of the scale which forced a truncation of initial judgmental options rather than an alteration of experiential pain.

Although simple judgmental effects may account for the main effect of expected aversive consequences, the interaction of this variable with other treatments suggests that at some levels more complex processes were operative. For male subjects, average pain ratings of the ice water were large for the mild aversive consequence, small positive incentive treatment, and for the severe aversive consequence, large positive incentive combination. In each of these conditions, incentives were congruent with anticipated aversiveness. When mild aversive consequences were paired with a large positive incentive, or when severe aversive consequences combined with a small positive incentive, the noxious stimulus was rated less painful. Thus pain was minimized when incentives to endure noxious stimulation were insufficient (a dissonance effect) and when they were excessive (a reinforcement effect).

Quit-Point

When subjects believed that mildly aversive after-effects would follow exposure to a noxious stimulus, increased choice salience resulted in greater endurance. Why would an individual endure a noxious stimulus longer when his freedom of choice to continue or to terminate is
emphasized? Perhaps the individual's own responses provided information affecting his judgments. Schachter and Singer (1962) have shown that an individual's appraisal of his own bodily state can be influenced by the overt reactions of others. Similarly, Craig and Weiss (1971) showed that observing a model tolerate pain led to higher pain thresholds than those reported by subjects exposed to a less tolerant model. On the basis of such interpersonal effects, Bandler et al. (1968) argued that individuals may use their own behavior in response to a stimulus as a cue for judging its painfulness. Accordingly, when individuals were required to observe themselves escaping a series of electric shocks, they rated discomfort higher than when they received shocks of equal intensity but were required to endure them. The reverse seems to have occurred in the present study. When subjects observed themselves choosing to endure the noxious stimulus, actual endurance increased (but interestingly, terminal pain ratings did not differ).

Such a "self-observation" effect may have served as an auxiliary source of information for judging the stimulus—the implication being that the act of repeatedly choosing to continue implies that the stimulus is not very aversive. Alternatively, repeatedly choosing to continue may imply to the individual that he "wants" to continue—a conclusion which could influence subsequent decisions. Another possibility is that this effect was mediated by increased
feelings of control over the noxious stimulus. Staub, Tursky, and Schwartz (1971) found that when subjects were given control over the intensity of successive shocks, and the predictability and timing of shocks, pain thresholds and number of shocks tolerated both increased. It seems very likely that at least a portion of the effect of choice salience was due to similar alterations in perceived control. This is underscored by the fact that the effects of aversive stimuli are diminished by mere belief in one's ability to terminate them (Bowers, 1968; Glass, Singer, and Friedman, 1969).

In contrast to mildly aversive side-effects subjects, those who expected a severe increase in pain following exposure to the noxious stimulus terminated sooner when choice was maximized. This rather simple and direct reaction to anticipated pain suggests that variations in self-observation, inference, or perceived control are of importance only in situations which permit some judgmental or decisional ambiguity.

Post-Ratings

Dissonance researchers have reported that if rewards or punishments are insufficient to justify performance of an aversive or obnoxious task, the task will subsequently be rated less aversive or unpleasant (Brehm and Cohen, 1959; Aronson, 1961; Brehm, 1962). Thus, for instance, Lewin
(1965) found a greater tolerance for pain as reward for participating in an experiment decreased. For subjects in the present study who were informed that they had tolerated the pain stimulus longer than average, a similar effect obtained: small positive incentives resulted in lower post-exposure ratings of discomfort. However, variations in incentive had no effect on pain ratings made by no-feedback subjects. Since dissonance should have been aroused for this group as well, an alternative explanation seems necessary. However, if it is presumed that provision of group standards engendered a need for social comparison (Festinger, 1954), which produced a more active assessment of incentives, then a dissonance explanation may be tenable.

Shifting to an informational emphasis, inferences drawn on the basis of justification (Nisbett and Valins, 1971) for exposure to the noxious stimulus may provide another interpretation. Knowledge that he had tolerated the noxious stimulus longer than average may have implied to the individual that he did so because he felt less pain. This conclusion would be warranted unless he also felt that he was unusually motivated to endure the stimulus, in which case his behavior would appear to have been externally elicited, and the inference that he experienced less pain would no longer follow.

It is interesting to note that differences in post-exposure pain ratings occurred despite the absence of
significant differences in pain reported at quit-point. This suggests a dissociation between concurrent and post-exposure rating, labeling, categorization, and storage of the pain experience. Factors having one effect on concurrent ratings may have quite another on post-exposure re-evaluations.

It appears that the sensation of pain is not a unidimensional or homogeneous experience. Sternbach (1968) has summarized evidence showing that perceptions and reports of noxious stimuli are the result of a complex combination of social, subjective, and physiological cues. The responsiveness of post-exposure pain ratings to a complex interaction between feedback, choice salience, positive incentives, and aversive consequences, provides a final indication of the complexity of pain perception.

**Rating the Neutral Stimulus**

The intuitively appealing notion that a stimulus believed responsible for a reduction or termination of pain will be more positively evaluated than one having no apparent utility was not confirmed. Timing of pain cessation may account for this failure. Zanna, Kiesler, and Pilkonis (1970) have shown that words paired with the offset of shock are evaluated more positively than words associated with shock onset. But in the current experiment, pain cessation occurred gradually during exposure to the
light. Perhaps pain reduction was too gradual to be clearly attributed to the light. Another possibility is that positive effects of attributing pain reduction to the light may have been countered by disconfirmed expectations about the efficacy of the light. Carlsmith and Aronson (1963) showed that subjects rate both sweet and bitter substances as more unpleasant when expectations about what they will be tasting are disconfirmed.

The only significant difference in ratings of the neutral stimulus light was between the mild aversive after-effects, large positive incentive treatment and the severe aversive after-effects, large positive incentive condition. The mild aversive expectation apparently sponsored more positive affective ratings. This is perhaps best interpreted as a simple suggestion effect.
APPENDIX A

INITIAL INSTRUCTIONS TO SUBJECTS

The experiment you will be taking part in is designed to assess the relationship between physical discomfort and changes in the electrical activity of muscles. The procedures involved are relatively simple. Basically, you will be asked to give judgments concerning the painfulness of a stimulus while changes in muscular response are being recorded with two electrodes connected to an EMG (electromyograph) apparatus.

In case this sounds somewhat ominous, let me give you some more details. The electrodes used consist of two metallic discs, about a quarter of an inch in diameter, which will be taped to your arm. These are harmless and painless. They simply pick up changes in the minute electrical potentials created by muscles as they move or change tension.

If you have ever had your hand in very cold water for any length of time you will recall that it can become painful. In this experiment pain will be induced in exactly this fashion. You will be asked to place your hand in ice water in order to produce pain. Continued exposure to cold can become quite painful, however, you need not fear this
procedure. The water only feels cold at first, and after it becomes painful you will be allowed to remove your hand any time you wish.

Since this experiment involves pain, it must be emphasized that participation is completely voluntary. However, if you don't think you want to participate, please allow me to further describe the experiment to you before you make a final decision. As I have tried to indicate, there is nothing formidable involved, and I feel sure that if you know exactly what will happen you will want to participate.
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