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SELF-OBSERVATION AS A SOURCE OF PAIN PERCEPTION[1]

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The hypothesis was tested that an individual's perception of a stimulus as uncomfortable or painful is partially an inference from his own observation of his response to that stimulus. Ss were required to observe themselves either escaping or enduring a series of electric shocks, all of the same physical intensity. As predicted, Ss rated the felt discomfort produced by the shocks to be greater in the "escape" condition than in the "no-escape" condition. Appropriate controls and auxiliary data helped to rule out alternative explanations of the obtained difference, and the record of Ss' galvanic skin responses suggested that actual physiological arousal was not serving as the basis for the Ss' discomfort ratings.

An individual's perception of pain is only partially a function of the "pain producing" stimulus. This is apparent from the wide cultural differences in labeling stimuli as painful (e.g., childbirth; Melzack, 1961), from research on the long-familiar placebo effect (Beecher, 1959, 1960), and from the phenomena of hypnotic analgesia (Barber, 1959, 1963) and masochism (Brown, 1965). On what basis, then, does an individual infer that a particular stimulus is painful?

Recent research has indicated that the justification for enduring the aversive stimulation is one kind of information which may influence an individual's judgments of pain. Individuals who volunteered to participate in an experiment using painful electric shocks reported the shocks as less painful and were physiologically (GSR) less responsive than individuals who were forced to be in the experiment (Zimbardo, Cohen, Weisenberg, Dworkin, & Firestone, 1966). Other research on emotional states has indicated that situational cues (in addition to actual physiological arousal) provide a second type of information which may influence an individual's judgments of bodily states, including pain and discomfort (Schachter & Singer, 1962). In fact, it has been shown that both the intensity of shock-produced pain and the willingness to tolerate such pain can be manipulated by supplying the individual with an alternative explanation for the physiological arousal he is experiencing (Nisbett & Schachter, 1966).

A recent analysis of self-perception by Bem (1965, 1966, 1967) suggests a third kind of information which may influence an individual's self-judgments of pain or discomfort. Bem's experimental work demonstrates that individuals use their own overt behavior as a basis for inferring their attitudes, their beliefs about external events, and the truthfulness of their own confessions. Self-perceptions, according to Bem, may thus be viewed as inferences that are functionally similar to the inferences an outside observer would draw from observing the individual's behavior. This suggests the possibility that an individual may actually use his own overt behavior in response to an aversive stimulus as evidence for deciding that the stimulus was, in fact, uncomfortable or painful. For example, an affirmative reply to the question, "Was that last electric shock uncomfortable?," may be functionally equivalent to the individual's (or an outside observer's) saying, "It must have been; I (he) attempted to escape it as quickly as possible." In other words, an individual's behavioral response to an aversive stimulus, often treated as a dependent variable in pain research, may serve as an independent variable and partially control his perception of the stimulus as uncomfortable or painful.

The present experiment explored this hypothesis by requiring the subject to observe

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himself either escaping or enduring a series of electric shocks, all of the same physical intensity. The subject was then asked to rate the amount of discomfort he experienced from each shock. It was hypothesized that the discomfort should be greater for the shocks from which the individual escaped than for shocks which he endured, since this is the inference that an outside observer of his behavior would draw. Appropriate controls were included in an attempt to rule out alternative explanations of any obtained difference between conditions. The subject's galvanic skin response (GSR) was also monitored to assess the possibility that actual physiological arousal serves as the basis for the subject's self-judgments of discomfort.

Method

Twelve male college students were hired for individual experimental sessions "to help us determine shock levels for future research." Upon arrival each subject was seated in a comfortable chair in a small acoustically tiled room. A small rectangular box with a Plexiglas covering faced the subject. Contained within the box were three 25-watt light bulbs (red, green, and yellow), which could be controlled by the experimenter from a separate room. A 7-point shock rating scale, which ranged from "not uncomfortable" to "very uncomfortable," was displayed on the wall in front of the subject. Each subject was told that the experiment involved electric shock and that the upper and lower limits of the scale would be determined prior to the start of the experiment by a pretest. The shock electrodes were taped to the subject's left hand and connected to a Lafayette Instrument Company inductorium. The GSR electrodes (zinc), of the Lykken type (Lykken, 1959), were attached to the subject's right hand. A zinc-sulfate electrode paste was used. GSR was monitored by a Fels dermohmeter and recorded on a Esterline-Angus recorder.

After the subject's basal skin resistance was determined, a series of eight .5-second shocks, of varying physical intensities, was administered. The subject was asked to rate the discomfort produced by each shock in terms of the rating scale on the wall in front of him. A physical intensity of shock rated 6 in this pretest was used for all shocks during the ensuing experiment.

Following this pretest, the subject was instructed that there would be three different conditions during the experiment. He would feel a shock and .5 second later one of the three colored lights in the box in front of him would be illuminated, signaling the condition. The subject was told to hold the button on the left arm of the chair in his left hand. This button, at the experimenter's discretion, enabled the subject to terminate the shock. The subject was then told what to do in each of the three conditions.

Escape Condition

> This is the red condition [turned on red light]. In the red condition you will be able to turn off the shock by pressing the button in your left hand. In this condition, the red condition, you *should* press the button and turn off the shock. However, if the shock is not uncomfortable you may elect to not depress the button. The choice is up to you.

No Escape Condition

> This is the green condition [turned on green light]. In the green condition the button in your left hand will enable you to turn off the shock. In this condition, the green condition, you *should not* press the button and turn off the shock. However, if the shock is so uncomfortable that you feel you must turn it off, you may. Again, the choice is up to you.

Reaction-Time Condition

> This is the yellow condition [turned on yellow light]. The yellow condition is a reaction time condition. We are interested in recording only the time that it takes you to press the button once the yellow light comes on. Therefore, please press the button as soon as the yellow light is illuminated. Your depression of the button *may* or *may not* turn off the shock.

Following each shock the subject was asked to rate the discomfort produced by each shock on the "shock rating scale." During the experiment each subject received 30 shocks of the physical intensity which he had rated 6 in the pretest.[2] If not terminated by the subject, duration of shock was 2 seconds. To ensure in all conditions that each subject received a minimum of shock which could not be avoided, .5 second elapsed between the onset of shock and the onset of the light. The "escape" and "no escape" lights were reversed for half of the subjects; green for "escape" and red for "no escape," and the order of lights was randomized for each subject.

Thus, for the 10 shocks paired with the "escape" light, the subject pressed a button and terminated the shock. For the 10 shocks paired with the "no escape" light, the subject did not press the button which would have allowed him to terminate the shock. For the 10 shocks paired with the "reaction time" light, the subject pressed the button as soon as the light was illuminated. For five of these trials pressing the button terminated the shock. For the remaining five "reaction time" trials, pressing the button had no effect on the shock.

It will be noted that the subject's overt behavior is the same in this reaction-time condition as it is in the escape condition; he presses the button when

[2] Four shocks, all of a physical intensity rated 1 in the pretest, were also administered. These shocks serve to add credibility to the implication that different levels of shock were used during the experiment.

the light is illuminated. But, the subject is not given the implied choice of pressing or not pressing the button in the reaction-time condition, and, as the instructions make clear, pressing the button does not necessarily terminate the shock. Thus, the button press should no longer be seen by the subject as a *self-determined "escape" response and he should not* infer his discomfort from it. Discomfort ratings should therefore be significantly higher in the escape condition than in the reaction-time condition.

Demand Control Condition

It is conceivable that the predicted differences between conditions could arise in the present experiment as an artifact. That is, subjects may be led to entertain hypotheses about the purpose of the experiment which would lead them to anticipate more severe shocks in the escape condition than in the other conditions, thus producing a "demand characteristic" artifact of the type discussed by Orne (1962). To check on this possibility, an additional 10 subjects were employed who were treated the same as the experimental subjects except that they were not required to experience the 30 constant shocks. Instead, following the pretest and the instructions for the three conditions, they were asked to fill out a questionnaire about their anticipations concerning the experiment. The crucial questions were:

I expect to receive the following levels of shock during the course of the experiment (circle each expected level):

a. in the Red condition	1	2	3	4	5	6	7
b. in the Green condition	1	2	3	4	5	6	7
c. in the Yellow condition	1	2	3	4	5	6	7

During the course of the experiment I expect the average shock in the Red condition to be (circle answer):

greater than
equal to
less than

the average shock in the Green condition.

A final question asked the subject to explain his answer to the latter item.

The total experiment, then, assesses the hypothesis that an individual's observation of his own behavior can serve as a source of evidence for his perception of pain or discomfort. The hypothesis predicts that discomfort ratings in the escape condition should be greater than those in the no escape and reaction-time conditions.

RESULTS AND DISCUSSION

The experimental test of the hypothesis required the successful manipulation of the subjects' escape and no escape behavior. Accordingly, two of the subjects were excluded from the analysis since they escaped on all trials in both the escape and no escape conditions. The remaining 10 subjects escaped on 96% of the escape trials and did not escape on 85% of the no escape trials. Removal of the few incorrect trials does not alter the conclusions reached, and the analysis reported here includes them, providing a conservative test of the hypothesis.

The main prediction is that the ratings of discomfort produced by the shock in the escape condition will be greater than those in the no escape condition. It is seen in the first column of Table 1 that the mean ratings of discomfort in the escape condition are significantly higher than those in the no escape condition ($p < .01$, two tailed).

Table 1 further reveals that the button press must be seen as a self-determined "escape" response if it is to serve as the basis of inference for the individual's discomfort judgment. The reaction-time condition, which

TABLE 1

MEAN SHOCK-DISCOMFORT RATINGS AND COMPARISON OF DIRECTION OF RATINGS FOR THE EXPERIMENTAL GROUP

Condition	M rating[b]	Direction of M rating	No. S	Direction of M rating	No. S
Escape (A)	5.14	Escape > No escape	8	Escape > Reaction time	8
No escape (B)	4.72	Escape = No escape	1	Escape = Reaction time	0
Reaction time (C)	4.66	Escape < No escape	1	Escape < Reaction time	2
	t		p		p
A vs. B	3.88**	Exact probability[a]	.01	Exact probability	.01
A vs. C	2.40*				
B vs. C	0.30				

[a] Exact probability is defined as the probability of a distribution "at least as deviant as" the one considered.
[b] $n = 10$.
* $p < .05$, two-tailed.
** $p < .01$, two-tailed.

TABLE 2

MEAN SHOCK-DISCOMFORT RATINGS AND COMPARISON OF DIRECTION OF RATINGS FOR THE DEMAND CONTROL GROUP

Condition	*M* rating[a]	Direction of *M* rating	No. *S*	Direction of *M* rating	No. *S*
Escape (A)	3.93	Escape > No escape	4	Escape > Reaction time	4
No escape (B)	4.38	Escape = No escape	3	Escape = Reaction time	4
Reaction time (C)	4.10	Escape < No escape	3	Escape < Reaction time	2
	t		p		p
A vs. B	−0.82	Exact probability	.74	Exact probability	.53
A vs. C	−0.47				
B vs. C	0.85				

[a] $N = 10$.

required the subject to push the button but did not permit him to interpret his response as a self-determined escape response, yields discomfort ratings significantly lower than those in the escape condition ($p < .05$, two tailed) and not significantly different from those found in the no escape condition.

Columns 2 and 3 reveal the consistency of the predicted effects: 8 of the 10 subjects rated "escape" shocks as more uncomfortable than either "no escape" or "reaction time" shocks. The exact probability of this distribution is less than .01 by a Chapanis (1962) multinomial significance test.

Although these results are consistent with our conceptual analysis, it is necessary to examine a number of alternative explanations that might account for the obtained difference.

First, because the subject terminated all shocks in the escape condition, these shocks were necessarily of a shorter duration than those in the other conditions. It might be the case, then, that discomfort was simply a function of shock duration, with shorter shocks being perceived as more severe. This explanation is somewhat implausible, and is not supported by our other data. In the reaction time condition, the five nonterminated shocks were rated slightly more uncomfortable than the five terminated shocks (4.80 versus 4.52, $t = 2.14$). Shock duration would thus not seem to be able to account for the obtained differences between experimental conditions.

Second, a "demand characteristic" artifact may account for the observed rating difference. For some reason the subjects may have hypothesized that the experimenter would administer more intense shocks on those trials on which they were urged to escape. This possibility was checked, it will be recalled, by running a separate demand control condition, in which 10 additional subjects were asked to fill out a questionnaire about their anticipations concerning the experiment. In one question subjects were asked to circle the levels of shock expected in each condition. If a "demand" type of artifact were to account for the observed rating difference, it would be expected that the mean of the levels of shock circled in the escape condition would be greater than the mean of the levels circled in the other conditions. In fact, as seen in the first column of Table 2, the means show an insignificant reversal. In addition, when asked to circle whether the expected average level of shock in the escape condition was to be greater than, equal to, or less than the expected average level of shock in the no escape or reaction time condition; 6 of the 10 subjects reported the expected average shock in these two conditions to be equal to, or greater than, the expected average shock in the escape condition (Columns 2 and 3 of Table 2). Clearly, these results do not differ from chance expectation. Thus, these subjects' expectations would appear to run counter to the experimental hypothesis as often as they would confirm it artifactually. A "demand characteristic" artifact, then, does not appear to offer an alternative explanation of the results.

Finally, the research of Schachter and Singer (1962), Nisbett and Schachter (1966), and Valins (1967) suggests that subjects might use actual physiological arousal as a basis for self-judgments of discomfort. That is, if the subjects were more aroused in the escape condition than in the other conditions they might have rated the shocks as more painful for that reason. To assess this possibility subjects' GSR was monitored.[3] GSR was defined as a change in resistance occurring 1–4 seconds following shock onset. The mean GSR converted to change in log conductance × 1000 (Montagu & Coles, 1966) for the escape condition is 28.88; for the no escape condition it is 29.78; and for the reaction-time condition, 33.27. None of these differences is significant, and, further, the ordering of subjects' ratings of discomfort is the exact reverse of these. There is no evidence, then, that the subjects' ratings of discomfort were dependent on any internal cues that covary with changes in GSR. We conclude, then, that the obtained rating differences can be attributed to subjects' inferences from observation of their own response to the electric shock.

It may be that hypnotic analgesia and placebo "pain-relief" reflect the operation of the same process illustrated in this experiment. That is, through hypnosis or placebo suggestion the individual is led to suppress an avoidance or escape response to the aversive stimulus, and his perception of pain or discomfort is in turn predicated upon his observation of that response inhibition. Thus, in contrast with the usual interpretation of such phenomena, which argues that the perception of pain is directly affected by the suggestion, the present interpretation views the suggestion as merely a way of altering the individual's overt behavior, with the perception following as a self-judgment from his observation of that behavior.

[3] GSR data for one of the subjects could not be obtained owing to equipment failure.

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