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HABITUATION TO COMPLEX EMOTIONAL STIMULI [1]

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On each of three sessions, *Ss* viewed 20 presentations of an isolated accident (experimental group) or a benign (control group) motion picture scene. At the end of each session, *Ss* also saw the complete movie from which these scenes were taken. Skin conductance, self-reported distress, and, to a lesser extent, heart rate showed considerable carry-over of habituation from the accident scene viewed in isolation to the same scene embedded in the complete movie; there was however, very little generalization of habituation to other, similar accident scenes in the same movie. Also of interest is the fact that the heart rate response to the isolated accident scene was primarily deceleration, while cardiac acceleration was the primary response when the accident scene was viewed in the context of the complete film. The implication of these results for analogue studies of desensitization therapy is discussed.

The study of habituation is one of the oldest in psychology, but is still fraught with unsolved conceptual and empirical problems. The most detailed theories of habituation have evolved from the study of conditioned or unconditioned responses to simple stimuli, often in spinal animals where the influence of higher nervous centers has been surgically interrupted (Groves & Thompson, 1970; Thompson & Spencer, 1966). There has been surprisingly little systematic research on habituation to complex emotional stimuli (Lazarus, 1968), even though habituation figures prominently in various theories of personality and adjustment. For example, the theoretical formulations of Sokolov (1963) regarding the orienting and defensive reactions has stimulated attempts to relate individual differences in habituation to broader dimensions of personality, especially anxiety and introversion–extraversion; nevertheless, most experiments conducted within this framework have dealt with relatively simple stimuli such as tones (e.g., Katkin & McCubbin, 1969; Mangan & O'Gorman, 1969). It has also been suggested (Lader, Gelder, & Marks, 1967) that habituation is the mechanism underlying desensitization therapy, as opposed, say, to reciprocal inhibition (Wolpe, 1958) or cognitive reappraisal (Lazarus, 1968; Wilkins, 1971). Unfortunately, the lack of normative data on habituation to complex emotional stimuli makes a suggestion such as this difficult to evaluate.

The purpose of the present experiment was to explore the course of habituation to an emotionally complex stimulus, an accident scene from a motion picture, and to examine the generalization of habituation to closely related stimuli. Two ancillary aims of the study were, first, to compare individual differences in habituation to a complex stimulus with that to a simple tone stimulus and, second, to assess personality correlates of habituation. These last two aspects of the study are not reported here, however, since individual differences in habituation proved to be quite unreliable, thus making meaningful compari-

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sons impossible. Some reasons for this unreliability are discussed elsewhere.[5]

METHOD

The experiment consisted of three identical sessions. During each, *S*s were presented with (*a*) a series of 20 tones, (*b*) a series of 20 scenes (either emotion inducing or benign) excised from an industrial accident film, and (*c*) the complete accident film. The experimental sessions were separated by at least 1 day, but never by more than 4 days.

Subjects and Treatment Groups

Sixty-eight male student *S*s completed the experiment. They were recruited with posted sign-up sheets and paid $1.88/hr. The *S*s were divided into two groups. The experimental group ($N = 45$) experienced 20 repetitions of a stressful accident scene on all three sessions, while the control group ($N = 23$) experienced 20 repetitions of a benign scene from the same movie. Otherwise, both groups went through exactly the same procedure.

Emotional Stimuli

A 12-min. industrial accident film, "It Didn't Have to Happen," provided the emotional stimuli. The complete film, which was presented at the end of each session, portrays three wood-shop accidents: in the first, a worker lacerates his fingers in a planer; in the second, another workman amputates two joints of a finger in a milling machine; and in the third, a circular saw drives a board through the abdomen of a workman. In previous research (Lazarus, 1968), reactions to these accident scenes have been found to be quite resistant to habituation.

The second accident scene from the film, in which a workman loses his finger, was presented repeatedly to the experimental group during the habituation trials, that is, before the presentation of the complete film. The scene, which lasted 25 sec., included an anticipatory buildup, the accident itself, and a brief postaccident period in which the workman is shown holding his hand with blood gushing from the finger stub. The benign scene presented to the control group lasted 22 sec. and consisted of a safety lecture given by the shop foreman.

Twenty copies were made of both the accident and control scenes, and two filmstrips, one stressful and the other benign, were constructed. Each filmstrip contained the following sequence of events. After the presentation of a scene (either accident or control, depending on the filmstrip), there were several seconds of dark leader. Instructions to "mark your rating scale" followed, allowing *S* 6 sec. to indicate his psychological reactions to the immediately preceding scene. Finally, there were another 22 sec. of dark leader before the scene was repeated. This made for a 30-sec. interstimulus interval, the entire sequence being repeated 20 times for the stressful filmstrip and likewise for the benign filmstrip.

[5] A. Koriat, J. R. Averill, & E. J. Malmstrom. Individual differences in hallucination: Some methodological and conceptual issues. Unpublished manuscript, 1972.

Procedure

At the beginning of the first experimental session, *S* was informed that he would listen to a series of tones and see some motion pictures and that this same format would also be followed for the remaining sessions. (For reasons stated in the introduction, responses to the tone—a 1,000-Hz., 75-db. signal—are not discussed in this report.) After consent was obtained, heart rate (HR) and skin conductance (SC) electrodes were attached and their function explained. At this point, further information was given about the repetitious nature of the stimuli and their order of presentation. The content of the films was not disclosed, nor was the fact that the same stimuli would be presented at each session.

Following these preliminary instructions, any procedural questions were answered. The *S* then was asked to relax. Five minutes later, a signal was given indicating that the tones would begin in 15 sec. The same procedure preceded presentation both of the isolated scenes and of the complete movie. Thus, there was always a 5-min. rest and a 15-sec. warning before initial stimulus onset.

Response Measures

Physiological responses were recorded continuously on a Beckman Type-R dynograph. Beat-by-beat HR was recorded from standard EKG electrodes on the left arm and right leg, using a Beckman cardiotachometer. Skin resistance was recorded from the thenar and hypothenar surfaces of the palm of the nonpreferred hand, using Beckman silver-silverchloride electrodes 1 cm. in diameter. A modified Wheatstone bridge impressed a relatively constant current (10 μa.) across the electrodes. Before data analysis, all resistance measures were transformed to log SC.

Psychological responses were obtained following each of the 20 exposures of either the accident or control scenes during the habituation trials and also at the end of each session following the presentation of the complete movie. Self-ratings of affective disturbance during the 20 exposures were made on 10-point scales anchored at one end by the phrase "very tranquil, calm, secure" and at the other end by "very distressed, anxious, troubled." Following the presentation of the complete movie, this same scale was used to obtain self-ratings of reactions to each of the three accident scenes separately.

RESULTS

Responses to Repeated Presentation of Accident and Control Scenes

The physiological responses to the 20 presentations of the accident and control scenes within each session were analyzed as follows. For HR, the fastest and slowest heart beats during the 10 sec. immediately preceding the onset of the scene were averaged to give a base reading for that presentation. This HR base was subtracted from the fastest and slowest beats during the scene to yield acceleration (ACC) and deceleration (DEC) scores. For SC, two scores were calculated. The SC base was the level immediately preceding the onset of a scene, and SC response was the maximum conductance during the scene minus SC base. For self-reported affect there was only one score, namely, the stress rating immediately following each scene.

For statistical analyses, the 20 presentations of the scenes within each session were divided into five sequential blocks of four exposures each. Mean responses within each block were calculated, thus providing five levels of exposure (Trials 1–4, 5–8, . . ., 17–20). Three two-way analyses of variance were applied to these data (Exposures × Sessions, Exposures × Groups, and Groups × Sessions).[6] The results of these analyses are presented separately for HR, SC, and self-report. For simplicity, analyses of base-level scores are not presented since they contribute little to an interpretation of the overall results.

Heart rate. In general, ACC increased and DEC decreased over trials, the main effects of exposures being significant beyond the .0005 level in both cases (for ACC, $F = 6.46$, $df = 4/228$; for DEC, $F = 10.78$). The only other significant effect was an Exposures × Groups interaction for DEC ($F = 2.50$, $df = 4/228$, $p < .05$). The control group (which viewed the benign scene) showed slightly more habituation of the decelerative response than did the experimental group (which viewed the accident scene).

[6] These afforded essentially the same information, except for the three-way interaction, as a three-way analysis with repeated measures and unequal *N*s, for which no computer program was available. A Groups × Sessions analysis using the *difference* between the first and last exposure blocks as a dependent variable yielded no significant results, indicating that there probably were no three-way interactions. Wherever the same effects, for example, exposures or sessions, appeared in two analyses, the more conservative *F* ratio is reported.

Interpretation of the above results is facilitated by an inspection of Figure 1, which shows near beat-by-beat changes in HR during selected exposures of the accident and control scenes. The responses shown in Figure 1 were derived as follows: for the second, tenth, and eighteenth exposures on Sessions 1 and 3, the fastest beat-to-beat HR was read in successive 3-sec. intervals beginning 9 sec. before the scene onset. (These particular exposures and sessions were selected on a priori grounds; the high cost of data reduction and the low expectation of additional information argued against the inclusion of more scenes.) There were three readings during the base period and eight readings during the accident scene (seven during the slightly shorter control scene).

Figure 1 shows that on the initial trials of each session, at least, the HR response to both the control and experimental scenes was predominantly decelerative. As the preceding statistical analyses indicate, however, deceleration became less striking and acceleration more prominent with repeated exposures, a trend which is also evident in Figure 1.

Skin conductance. SC responses showed a typical, negatively accelerated curve of habituation over trials. This was especially evident for the experimental *S*s who, as would be expected, started at a higher level of reactivity than did the control *S*s. By the last block of trials on the third session, both experimental and control *S*s were responding at approximately the same level (.013 and .010 log micromhos, respectively). Statistically, there were significant main effects for exposures ($F = 28.00$, $df = 4/248$, $p < .0005$) and sessions ($F = 4.00$, $df = 2/124$, $p < .05$), indicating both within- and between-sessions habituation. Moreover, there was a significant Exposures × Sessions interaction ($F = 3.00$, $df = 8/496$, $p < .005$), reflecting the decrease across sessions in the slope of the habituation curve. There were also significant differences between groups ($F = 5.28$, $df = 1/61$, $p < .05$), along with Groups × Exposures ($F = 3.64$, $df = 4/244$, $p < .01$) and Groups × Sessions ($F = 6.15$, $df = 2/122$, $p < .005$) interactions. That is, the experimental *S*s showed greater overall reactiv-

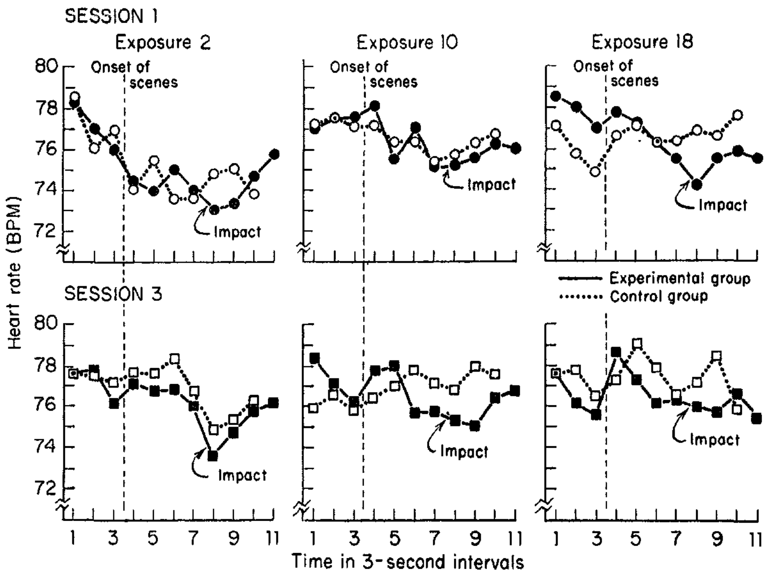

FIG. 1. Mean HR during the isolated accident and control scenes for the second, tenth, and eighteenth exposures on Sessions 1 and 3. (Readings represent the maximum HR in successive 3-sec. intervals, starting 9 sec. before the onset of the scenes. The point of impact (severance of a finger in a milling machine) is indicated for the accident scene.)

ity, steeper gradients of habituation, and a different course of between-sessions habituation than did the control *S*s. With regard to the latter, the control group showed little between-sessions habituation, having already reached an asymptote by the end of Session 1.

Self-report. Ratings of distress followed a course of habituation similar to that of the SC response. There was a monotonic decrease in distress ratings across exposures ($F = 4.66$, $df = 4/256$, $p < .005$) and across sessions ($F = 36.03$, $df = 2/130$, $p < .0005$), and the experimental group reported greater overall distress than did the control group ($F = 7.59$, $df = 1/64$, $p < .01$). All three two-way interactions were significant at a level of less than .0005. Specifically, the Exposures × Groups interaction ($F = 11.22$, $df = 4/256$) reflects the fact that the control group showed little stress and hence little habituation; the Exposures × Sessions interaction ($F = 7.85$, $df = 8/520$) results from the fact that more habituation occurred on the first two sessions than on the last; and the Groups × Sessions interaction ($F = 10.32$, $df = 2/128$) expresses the greater between-sessions habituation of the experimental group.

Responses to the Complete Accident Film

The complete accident film was shown at each session following the 20 presentations of the accident (experimental group) or benign (control group) scenes. Maximum HR and SC levels within 10-sec. epochs were read at 36 points during the film (see Figures 2 and 3). Specifically, 9 readings were made surrounding each of the first two accident scenes, 12 readings surrounding the third accident scene, and 6 readings at approximately 1-min. intervals during the benign portions of the film (beginning immediately prior to film onset, but following its announcement). Figure 2 presents the HR responses of the experimental and control *S*s during Session 1 (the curves for the remaining two sessions overlapped these considerably). Figure 3 contains the SC data for both Sessions 1 and 2, thus portraying the course of habituation over sessions.

Three kinds of physiological scores were obtained from the data illustrated graphically

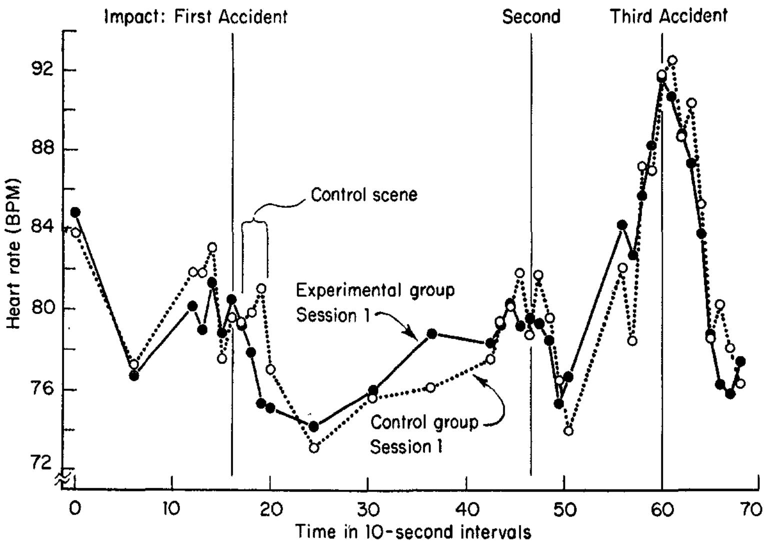

FIG. 2. Mean HR during first presentation of the complete accident film (Session 1) for experimental and control groups. (The points of impact of the three accident scenes are indicated, as well as the location of the benign scene viewed by the control group during habituation.)

in Figures 2 and 3. First, there were measures of *basal levels*, that is, activity during nonthreatening portions of the film. As noted above, readings were made at approximately 1-min. intervals between accident scenes. The minimum or single least reactive of these readings preceding each accident was used as a measure of basal activity for that accident, and the mean of these three measures was used to assess basal activity during the entire film. Second, *reactivity scores* were obtained by subtracting the basal activity score preceding each accident from the maximum reading during the 30 sec. surrounding that accident (i.e., the 10-sec. epoch containing the point of impact and the two adjacent

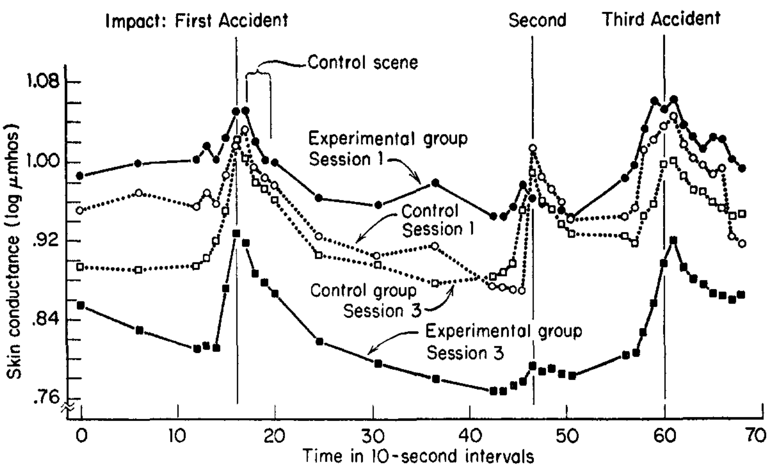

FIG. 3. Mean SC during first and third presentations of the complete accident film (Sessions 1 and 3) for experimental and control groups. (The points of impact of the three accident scenes are indicated, as well as the location of the benign scene viewed by the control group during habituation.)

ones). Finally, *reaction to the control scene* was measured by taking the difference between the maximum response during the control scene and that during the preceding (first) accident scene.

We will consider first the responses to the three accident scenes, with special reference to the second (habituated) accident. As in the case of responses to the 20 presentations of the scene, three two-way analyses of variance were applied to these data, with the three accidents replacing exposures as one of the factors. The analyses were as follows: Accidents × Groups, Sessions × Groups, and Accidents × Sessions.

Heart rate. The differential impact of the three accident scenes was reflected in a highly significant main effect for accidents ($F = 33.30$, $df = 2/124$, $p < .0005$). This is of little interest, however, since the accidents differed in severity as well as in position within the film. Of greater interest is the Accidents × Groups interaction ($F = 3.95$, $df = 2/122$, $p < .05$), which indicates that the experimental and control conditions had different effects, depending upon the accident scene. Specifically, both groups showed an approximately equal reaction to the first accident. On the other hand, specific comparisons indicated that responses to the second and third accidents were significantly less for the experimental group ($p < .05$) than for the control group. That is, there was some carryover of habituation from the second accident scene viewed in isolation to the same scene viewed within the context of the entire film. Moreover, there was a slight, but not dramatic (see Figure 2), generalization of habituation to the third accident.

There was also a significant main effect for sessions ($F = 4.40$, $df = 2/124$, $p < .05$). This does not imply simple between-sessions habituation, however. Rather, reactivity increased from the first to second sessions, but decreased on the third. This was true for both groups, that is, there was no significant Groups × Sessions interaction. This was not, however, the case for each accident: response to the third accident showed a progressive decline over sessions (Accidents × Sessions interaction, $F = 10.55$, $df = 4/248$, $p < .0005$).

Skin conductance. In general, SC showed considerable habituation to the accident scene but also a high degree of specificity; that is, there was no generalization to the first or third accidents (see Figure 3). Statistically, the three accidents produced a highly significant main effect ($F = 15.17$, $df = 2/126$, $p < .0005$), and the Groups × Accidents interaction also was highly significant ($F = 30.86$, $df = 1/124$, $p < .0005$). The latter was due almost entirely to the difference between groups in response to the second accident, which was also significant at less than the .0005 level on the basis of specific comparisons. The groups did not differ significantly on either the first or third accidents; indeed, the experimental group showed slightly more reactivity to these accidents than did the control group. In contrast to the HR data, there was no significant main effect for sessions in the case of SC reactivity.

Self-reported affect. To assess self-reported affect, *S*s were asked to rate the stressfulness of each of the three accident scenes on a 10-point scale similar to the one they had used for rating the isolated scene during the habituation trials. These stress ratings proved to be the variable most sensitive to the experimental manipulations, yielding significant effects for accidents ($F = 47.88$, $df = 2/130$, $p < .0005$), sessions ($F = 74.84$, $df = 2/128$, $p < .0005$), groups ($F = 4.29$, $df = 1/64$, $p < .05$), Groups × Accidents ($F = 13.45$, $df = 2/128$, $p < .0005$), and Accidents × Sessions ($F = 4.98$, $df = 4/260$, $p < .001$). Only the Groups × Sessions interaction failed to reach significance.

The significant effect for groups reflects the lower distress ratings made by experimental *S*s. This simple main effect is somewhat misleading, however, for it is due almost entirely to the second accident scene. Specific comparisons on the first and third accidents yielded no significant group differences, whereas the difference between experimental and experimental and control *S*s on the second accident scene was significant at less than the .0005 level. As in the case of SC, and to a lesser extent HR, generalization of habituation appears to have been meager.

The significant sessions effect is the result of a progressive reduction of distress ratings over sessions. This is in contrast to the physiological data, which generally showed a rise during the second session. The significant Accidents × Session interaction results from the fact that the differences between accidents became less pronounced over sessions.

Levels of basal activity. In addition to influencing reactions to the accidents scenes per se, the habituation trials might also have affected basal activity during the film. In the case of HR, there were no significant groups, sessions, or interaction effects for basal levels. This was true of the mean of the three (minimum) readings preceding each accident and of the single reading preceding the second accident considered separately. For SC there was a significant group effect on mean basal level ($F = 7.34$, $df = 2/122$, $p < .001$), with the experimental group showing lower conductance. Moreover, there was a Groups × Sessions interaction ($F = 3.27$, $df = 2/122$, $p < .05$). The experimental group had higher basal levels on the first session than did the control group and showed a monotonic decrease over sessions. The control group, on the first hand, showed an increase in SC between the first and second sessions, decreasing again on the third session. In general, it would appear that viewing the accident scene raised the general level of arousal during the first showing of the film but thereafter facilitated habituation of basal activity.

Reaction to the control scene. A Groups × Sessions analysis of variance was performed on reaction to the control scene. The results can be summarized quickly: there were no significant group, sessions, or interaction effects. In other words, any differences between experimental and control groups previously described are due primarily to the former group's having viewed the accident scene and not to the latter group's having viewed the control scene.

DISCUSSION

Two aspects of the above results deserve comment: first, the failure to observe any marked generalization of habituation; and second, the decelerative HR response to the accident scene viewed in isolation as opposed to accelerative response to the accidents viewed in the context of the entire film. With regard to the first point, repeated exposure to the isolated accident scene did lead to marked reduction in emotional arousal (at least in terms of SC and self-reported distress) when that scene was embedded again in the complete film. However, there were few differences between the experimental and control groups in their reactions to either the first or third accident scene or to the film as a whole. The only exceptions to this lack of generalization were the slightly lower HR response of the experimental *S*s to the third accident and the differential changes in SC basal levels indicated by the significant Sessions × Groups interaction. In the latter instance, the experimental group showed a higher level of basal SC during the first viewing of the film. This was followed by a progressive decline, with experimental *S*s showing lower conductance than control *S*s on the third session.

It might be argued that the present experimental design was not an appropriate test of generalization, since the first and third accident scenes were viewed in the context of the entire film and not in isolation like the second (habituated) accident scene. As just noted, however, there was considerable carry-over of habituation from the second accident scene viewed in isolation to the same scene embedded in the film. Hence, the failure to obtain generalization was not simply due, say, to "spontaneous recovery" resulting from a change in context. Moreover, an alteration of context is inherent in most practical situations where the generalization of response decrement is of concern. This is true, for example, with regard to desensitization techniques, where the reduction of emotional reactions to more than a few isolated stimuli (real or imagined) cannot be accomplished in therapy itself; when the person leaves the clinic, it must be assumed that his newly acquired control will generalize to many new situations.

Three general factors might be postulated to account for the limited generalization of habituation observed in the present experiment: (*a*) the nature of the *S*s; (*b*) the nature of the stimulus; and (*c*) the nature of the response. With regard to *S*s, most studies reporting the generalization of habituation have been performed on infrahuman animals (Thompson & Spencer, 1966). It is possible that human *S*s, with their ability to cognitively restructure a situation, typically may show different patterns of habituation than do lower organisms (see Lazarus, 1968). With regard to the nature of the stimulus, it is notoriously difficult to dimensionalize similarity among emotionally complex events, such as the accident scenes used in the present experiment. However, neither the human capacity for reappraisal nor hidden stimulus differences seem adequate to account entirely for the lack of generalization in the present data. As Epstein, Burstein, and Smith (1971) have shown, gradients of generalization even to simple tone stimuli are rather elusive phenomena in human *S*s. Elsewhere (Burstein, Epstein, & Smith, 1967), they suggest that this is due, in part, to the frequent use of galvanic skin responses (GSRs) to test for generalization. Burstein et al. hypothesized that the orienting component of the GSR may be so sensitive as to obscure those aspects of the response which might otherwise show generalization. Although this hypothesis is based on studies of the generalization of conditioned responses, rather than the generalization of habituation, the same line of reasoning can be applied *mutatis mutandis* to the latter case as well.

In the present experiment, there was some indication of generalization of habituation in the case of HR reactivity and in SC basal levels, but not in terms of SC responses or self-reported affect. The failure to obtain generalization of habituation in the case of SC responses to the specific accident scenes may be due to the extreme sensitivity of this variable. That is, since nearly any stimulus will elicit a change in skin conductance, stimuli closely related to the habituated one may evoke a full response, thus giving the appearance of no generalization. This same explanation cannot readily account for the failure to obtain generalization of habituation in the case of self-reported affect, but it does highlight the issue of which type of response measure is the most appropriate for studies of habituation and related phenomena.

This same issue has recently been raised by Mathews (1971) with regard to analogue studies of desensitization. He cited evidence which suggests that HR is more useful than SC as a measure of response to phobic imagery and also in the assessment of the outcome of desensitization techniques. He advises the use of SC when real, as opposed to imagined, stimuli are presented and as a measure of relaxation. Mathews based these conclusions, in part, on the findings of Barlow, Leitenberg, Agras, and Wincze (1969) that the habituation of skin conductance responses to imagined phobic stimuli (snakes) did not generalize to the real object (although Barlow et al. did find some evidence for generalization in the reverse direction). Also, Mathews cited recent evidence (e.g., Lacey, 1967) which suggests that the heart accelerates not only during emotional arousal but also during mental effort (hence, cardiac acceleration should be especially sensitive to phobic imagery); on the other hand, cardiac deceleration frequently accompanies attention to external stimuli. We basically agree with Mathews that HR may be a sensitive index of psychological processes, often allowing finer qualitative distinctions than does SC. However, some qualifications must be added, qualifications which may be illustrated by the patterns of HR response obtained in the present experiment.

The HR response to the second accident viewed in isolation was initially deceleration, with acceleration becoming evident only after repeated exposure (see Fig. 1). On the other hand, the HR response to the three accident scenes viewed in the context of the entire film was primarily acceleration (see Fig. 2), and the effect of habituation was a reduction in this acceleration. Due to differences in time scale, it is difficult to compare directly responses to the isolated scene with those of the intact film. (This difficulty is not unique to the present experiment; it arises whenever comparisons are made among different experiments reported in the literature.) An examination of Figure 2 indicates that some deceleration did occur shortly before the impact of the first and second accident scenes in the complete movie. This is consistent with prior findings that cardiac deceleration is the dominant response immediately prior to a time-locked threat, for example, electric shock (Jennings, Averill, Opton, & Lazarus, 1970). In the present case, the presentation of the accident scene in isolation perhaps did not allow time for acceleration to occur before the short-term decelerative response became prepotent. Whether or not this hypothesis is correct, it is evident that there are a variety of factors in addition to the type of threat which determine the direction of the HR response to a noxious stimulus. The amount of prior experience and duration of anticipation are two such factors which must be considered before the HR response can be interpreted without ambiguity.

In conclusion, habituation to complex emotional stimuli is a problem of considerable theoretical and practical significance, but one which has received surprisingly little experimental investigation. Most studies have used relatively simple stimuli (primarily tones), even when the purpose has been to relate habituation to such psychological dimensions as anxiety and extraversion. This rather anomalous state of affairs is perhaps due to the technical problems encountered in the use of complex stimuli. Some of these problems are well illustrated in the results of the present experiment.

REFERENCES

BARLOW, D. H., LEITENBERG, H., AGRAS, W. S., & WINCZE, J. P. The transfer gap in systematic desensitization. *Behavior Research and Therapy,* 1969, 7, 191–196.

BURSTEIN, K. R., EPSTEIN, S., & SMITH, B. Primary stimulus generalization of the GSR as a function of objective and subjective definition of the stimulus dimension. *Journal of Experimental Psychology,* 1967, **74**, 124–131.

EPSTEIN, S., BURSTEIN, K., & SMITH, B. Stimulus generalization of the GSR following a variety of conditioning and pseudoconditioning procedures. *Psychophysiology,* 1971, **8**, 714–726.

GROVES, P. M., & THOMPSON, R. F. Habituation: A dual-process theory. *Psychological Review,* 1970, **77**, 419–450.

JENNINGS, J. R., AVERILL, J. R., OPTON, E. M., JR., & LAZARUS, R. S. Some parameters of heart rate change: Perceptual versus motor task requirements, noxiousness, and uncertainty. *Psychophysiology,* 1970, **7**, 194–212.

KATKIN, E. S., & MCCUBBIN, R. J. Habituation of the orienting response as a function of individual differences in anxiety and autonomic liability. *Journal of Abnormal Psychology,* 1969, **74**, 54–60.

LACEY, J. I. Somatic response patterning and stress: Some revisions of activation theory. In M. H. Appley & R. Trumbull (Eds.), *Psychological stress: Issues in research.* New York: Appleton-Century-Crofts, 1967.

LADER, M. H., GELDER, M. G., & MARKS, I. M. Palmar conductance measures as predictors of response to desensitization. *Journal of Psychosomatic Research,* 1967, **11**, 283–290.

LAZARUS, R. S. Emotions and adaptation: Conceptual and empirical relations. In W. Arnold (Ed.), *Nebraska Symposium on Motivation.* Vol. 16. Lincoln: University of Nebraska Press, 1968.

MANGAN, G. L., & O'GORMAN, J. G. Initial amplitude rate of habituation of orienting reaction in relation to extraversion and neuroticism. *Journal of Experimental Research in Personality,* 1969, **3**, 275–282.

MATHEWS, A. M. Psychophysiological approaches to the investigation of desensitization and related procedures. *Psychological Bulletin,* 1971, **76**, 73–91.

SOKOLOV, Y. N. *Perception and the conditioned reflex.* New York: Macmillan, 1963.

THOMPSON, R. F., & SPENCER, W. A. Habituation: A model phenomenon for the study of neuronal substrates of behavior. *Psychological Review,* 1966, **73**, 16–43.

WILKINS, W. Desensitization: Social and cognitive factors underlying the effectiveness of Wolpe's procedure. *Psychological Bulletin,* 1971, **76**, 311–317.

WOLPE, J. *Psychotherapy by reciprocal inhibition.* Stanford, Calif.: Stanford University Press, 1958.

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