

Rudimentary Determinants of Attitudes: Classical
Conditioning Is More Effective When prior
Knowledge about the Attitude Stimulus
Is Low than High

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Petty and Cacioppo's (1981, 1986) elaboration likelihood model of persuasion predicts that the classical conditioning of human attitudes is similar to other peripheral attitude change mechanisms in that conditioning should be more powerful when preexposure to and prior knowledge about the conditioned stimulus is low rather than high. To test this hypothesis, neutral words (high prior knowledge) and pronounceable nonwords (low prior knowledge) were matched in terms of subjects' prior attitudes and served as the conditioned stimuli. Forty-three subjects participated in a 2 (Gender: male, female) \times 3 (CS-US Contingency: word followed by electric shock, nonword followed by electric shock, word and nonword paired randomly with electric shock) \times 2 (Experimental Stimulus: word,

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nonword) mixed-model factorial design. As predicted, the classical conditioning of human attitudes was more effective when nonwords than when words were followed by electric shock. Experiment 2 was a simulation experiment in which 22 students from the same subject pool read descriptions of the experimental conditions used in Experiment 1 and responded to questions about (a) subjects' attitudes toward the stimuli following the various CS-US contingencies, and (b) how the experimenter wanted the subjects to rate the stimuli. Results revealed that subjects expected (and believed the experimenter anticipated) simply that whatever stimulus was associated with shock would also become disliked. © 1992 Academic Press, Inc.

Stimuli associated with a highly charged emotional situation take on the affective qualities of that situation and can subsequently have a profound impact on mental life and behavior. (LeDoux, Romanski, & Xagoraris, 1989, p. 238)

The putative potency of classical or Pavlovian conditioning to influence people's visceral reactions (literally and figuratively) to people, objects, and events (e.g., Baeyens, Crombez, Van den Bergh, & Eelen, 1988; Martin & Levey, 1978; Rozin & Zellner, 1985) stands in stark contrast to the coverage it receives in reviews of contemporary attitude theories (see review by McGuire, 1985) and attitude texts (e.g., Okeefe, 1990; Oskamp, 1991; Rajecki, 1990). Our aim in this paper is to reexamine the potential contributions of classical conditioning to theory and research on human attitudes. We pursued this aim along two fronts.

First, we sought to expand our understanding of the conditions under which factors or associations that are peripheral to the merits of an attitude object can influence an individual's attitudes. Contemporary attitudes research has demonstrated that simple source features such as the credibility of the communicator (e.g., Petty, Cacioppo, & Goldman, 1981), the likability of the communicator (Chaiken, 1980), and the celebrity status of an endorser (Petty, Cacioppo, & Schumann, 1983) serve as simple persuasive cues when situational factors lower an individual's motivation or ability to think about issue-relevant information (e.g., under conditions of low personal relevance). In addition, communicator credibility is a more important determinant of attitudes under conditions of high than low distraction (Miller & Baron, 1968 (cited in Baron, Baron, & Miller, 1973); Kiesler & Mathog, 1968), and simple attributional reasoning (e.g., self-perception) is more likely to influence the attitudes of subjects who possess low than high prior knowledge about the attitude topic (e.g., Wood, 1982). The same pattern of results has been found in research on the effects of dispositional factors that moderate the extent of issue-relevant thinking. Thus, variables such as the attractiveness of a communicator (Cacioppo & Petty, 1984) and the ostensible reaction of an audience (Axsom, Yates, & Chaiken, 1987) serve as more powerful persuasion cues for individuals low than high in need for cognition (see Cacioppo, Petty, Kao, & Rodriguez, 1986).

Our focus in the present research was on another process for modifying attitudes that Petty and Cacioppo (1981, 1986) predicted would be enhanced under the same conditions as other peripheral processes: classical conditioning. That is, classical conditioning was expected to influence attitudes more the less motivated or able subjects were to think about reasons for their attitudes. For instance, individuals who feel neutral about a stimulus because they know nothing about it are less able to derive their attitudes based on issue-relevant thinking and therefore are more likely to derive their attitudes based on contextual cues and heuristics than are individuals who feel neutral about a stimulus represented in memory within a more extensive network of associations and experiences.

An interesting study by Wood, Kallgren, and Preisler (1985) provides data consistent with the assumption that subjects engage in less issue-relevant thinking and are more reliant on cues when they have low rather than high access to relevant information in memory. Subjects in Wood et al. (1985) were instructed to list as many beliefs and experiences as they could about several issues, including preservation of the environment. The number of beliefs and experiences each subject listed was summed to form a retrieval index. Subjects were then categorized as possessing high, moderate, and low prior knowledge about preservation of the environment based on this retrieval index. In addition, subjects were exposed to either short or long persuasive messages that contained either three strong or three weak arguments supporting an antipreservation position. Results indicated that the post-message attitudes of subjects with access to relevant information (i.e., high and moderate prior knowledge) were influenced more powerfully by argument quality, whereas the postmessage attitudes of subjects with low access to relevant information (i.e., low prior knowledge) tended to be influenced more by the cue of message length.

Of theoretical interest in the present research was the predicted difference in the operation of classical conditioning as a function of an individual's access to attitude-relevant information in memory. Instead of categorizing subjects into groups based on the number of associations they could generate about a stimulus, however, we varied prior knowledge by using unfamiliar nonwords (low prior knowledge) and familiar words (high prior knowledge) toward which subjects felt neutral. We expected classical conditioning to be a more powerful determinant of attitudes towards nonwords than words.

Second and relatedly, attitude theory and research for the past several decades has focused primarily on self-reports of attitudes, issue-relevant cognitive responses, heuristic information processes, and intentional behaviors (see reviews by Chaiken & Stangor, 1987; Cialdini, Petty, & Cacioppo, 1981; Cooper & Croyle, 1984; McGuire, 1985; Tesser & Shaffer, 1990). Early attitude theorists, however, recognized that behaviors

toward a group (e.g., a racial minority, homosexual individuals) could form a pattern suggestive of a negative attitude even though the individuals might not admit, even to themselves, that they harbored a negative attitude toward the group (Adorno, Frenkel-Brunswick, Levinson, & Sanford, 1950; Katz, 1960). Zajonc's (1980) influential paper on the primacy of affect further underscored the importance in the relationships between thoughts and feelings (e.g., Millar & Tesser, 1986) and feelings and behavior (e.g., Cacioppo & Tassinary, 1989; Isen, 1987). From this work, a view is emerging that attitudes are evaluations based on beliefs, feelings, past behaviors, and/or innate behavioral organizations (e.g., preparedness), and that individuals may have multiple and sometimes evaluatively discrepant attitude representations toward the same object which may or may not be accessed at the same time (Breckler & Wiggins, 1989; Millar & Tesser, 1989; Tesser & Shaffer, 1990; Zanna & Rempel, 1988; Cacioppo, Petty, & Berntson, 1991). Research on multiple, coexistent representations of attitudes and on the affective and cognitive processes underlying attitude formation, therefore, may be aided by the specification of conditions in which attitudes are altered by linking a rudimentary affective response, as might be evoked by electric shock, to attitude objects. In the Discussion, we elaborate on the notion that an attitude representation, derived from issue-relevant thinking and instantiated in beliefs, forms an object-evaluation bond that predicts intentional behaviors; and an attitude representation, derived through classical conditioning and instantiated in feelings, forms an object-evaluation bond that predicts less rational (e.g., affective) and impulsive behaviors.

THE CLASSICAL CONDITIONING OF ATTITUDES

The historical roots of classical conditioning can be traced to research on reflexes. Accordingly, the initial focus of classical conditioning theory was on the mechanical rather than the informational processes that were involved in the creation of an association between two events (Dawson, Schell, Beers, & Kelly, 1982; Gormezano & Kehoe, 1975; Pavlov, 1927; Rescorla, 1988; Rescorla & Wagner, 1972). When attitude theorists first began to investigate how attitudes were learned, therefore, classical conditioning was thought to consist primarily of: (1) the administration of a conditioned stimulus (CS) and an unconditioned stimulus (US) in a manner that is independent of the performance of any particular response; and (2) the measurement of a target response from among the effector systems elicited by the US (Gormezano, 1966).

Staats and Staats (1957) applied a classical conditioning formulation to attitude formation and change when they suggested that if a subject is exposed to an affectively neutral CS, such as an object or issue, at the same time as an aversive (or pleasant) US, the CS will come to evoke a conditioned affective response even in the absence of the US. In Staats

and Staats' (1957) studies, nonsense syllables were presented visually for 5 s each while positive, neutral, or negative words were presented orally by the experimenter. The subject's task was ostensibly to learn to recognize both auditory and visual stimuli, and the subject was instructed to repeat immediately the word delivered by the experimenter. Each of several nonsense syllables was presented a total of 18 times during the conditioning phase, and the set of nonsense syllables was presented in a random order. The nonsense syllable YOF was always paired with positive or with negative words, whereas the nonsense syllable XEH was always paired with emotionally loaded words of the opposite valence. After completion of the conditioning phase, subjects rated each nonsense syllable on a 7-point scale ranging from pleasant to unpleasant and recalled as many words as possible. Subjects were also asked to specify what they believed was the purpose of the experiment. A few subjects identified the contingency between the nonsense syllables and the evaluative nature of the words, and the data from these subjects were deleted prior to analysis. Data from the remaining subjects indicated that the nonsense syllable associated with unpleasant words was rated as being less pleasant than was the nonsense syllable associated with pleasant words.

These results have been replicated in studies in which the conditioned stimuli were national names (Staats & Staats, 1958, Experiment 1), familiar masculine names (Staats & Staats, 1958, Experiment 2), neutral adjectives (Staats, Staats, & Biggs, 1958, Experiment 1; Zanna, Kiesler, & Pilkonis, 1970), evaluative adjectives (Staats et al., 1958, Experiment 2), slides of persons or paintings (Baeyens et al. 1988; Byrne & Clore, 1970; Levey & Martin, 1975), geometric figures (Sachs & Byrne, 1970), ballpoint pens (Allen & Madden, 1985; Gorn, 1982), product advertisements (Stuart, Shimp, & Engle, 1987), and foods and flavors (Rozin & Zellner, 1985; Zellner, Rozin, Aron, & Kulish, 1983). The unconditioned stimuli have been almost as diverse and have included electric shock (Staats, Staats, & Crawford, 1962; Zanna et al., 1970), loud noise blasts (Staats et al., 1962), unpleasant odors and free lunches (Razran, 1940), music (Allen & Madden, 1985; Gorn, 1982), pleasant or unpleasant color pictures (Baeyens et al., 1988; Levey & Martin, 1975; Stuart et al., 1987), emotionally laden words (cf. Staats, 1968, 1969), sweetening (Zellner et al., 1983), and disgusting objects such as a roach (Rozin, Millman, & Nemeroff, 1986). Moderating factors such as the preexposure to the CS, the aversiveness of the US, and the number of CS-US pairings have also been investigated (e.g., Baeyens et al., 1988; Corn, 1982; Stuart et al., 1987).

Staats and Staats (1957, 1958; Staats, 1968, 1969) interpreted their early results as evidence (1) that human attitudes can be classically conditioned, and (2) that it is "possible to condition the attitude component of the total meaning responses of US words to socially significant verbal stimuli,

without subjects' awareness" (Staats & Staats, 1958, p. 39). Despite the apparent replicability of the result, questions have been raised about the classical conditioning interpretation. First, the notion that attitude conditioning is nonconscious was suggested by Staats and Staats' (1958) finding that subjects could not state the contingency between the attitude stimulus and the US with which it was paired. In several subsequent studies, detailed questions or interviews were used to probe what subjects knew (or could quickly come to know) about the CS-US contingency. Results indicated not only that most subjects were aware of the CS-US contingency, but that attitude change was observed primarily in subjects who were aware of the CS-US contingency (e.g., Insko & Oakes, 1966; Page, 1969, 1974). Of course, a subject's ability to state the CS-US contingency does not necessarily mean any covariant attitude conditioning was artificial. Thus, Baeyens et al. (1988), Rozin and Zellner (1985), and Levey and Martin (1975) have distinguished between signal learning (e.g., contingency-awareness) and evaluative (attitude) conditioning in classical conditioning research.

A second reason contingency awareness has been of interest is that demand characteristics may account for much of the attitude change observed in these studies (e.g., Page, 1973, 1974; Page & Kahle, 1976). Page (1969), for instance, replicated the Staats and Staats (1958) study and found that the only subjects who showed the conditioning effect were those who were aware of the CS-US contingency and were aware of the experimenter's hypothesis. Insko and Oakes (1966) were apparently the first to argue that contingency awareness does not necessarily mean that the attitude change observed in classical conditioning procedures is attributable to experimental demands, and they provided evidence for attitude change in a classical conditioning procedure among subjects who were aware of the CS-US contingency but who were unaware of the demand characteristics. In addition, a few studies have attempted to eliminate this demand-characteristics interpretation by using complex cover stories and by measuring attitudes in what subjects believed was a separate experiment (e.g., Berkowitz & Knurek, 1969; Gorn, 1982; Zanna et al., 1970; cf. Allen & Madden, 1985).

Previous social psychological research on the classical conditioning of human attitudes, however, has typically failed to include an appropriate control group with which to gauge the presence and direction of conditioning. For instance, studies of attitude conditioning that have tried to eliminate experimental demands (e.g., Zanna et al., 1970) have infrequently included noncontingent presentations of the CS and US (pseudoconditioning control groups) to control for possible effect of repeated presentations of the CS and the US. Pseudoconditioning control groups have been used in a few studies of advertising, however. In a recent study, Stuart, Shimp, and Engle (1987) examined the effects of slides of pleasant

scenes (US) on "Brand L toothpaste" (CS) after one or 10 pairings. They found that one 5-s presentation of a slide of Brand L toothpaste followed by one 5-s presentation of a slide of a pleasant scene was sufficient to produce a more favorable attitude toward Brand L toothpaste, compared to latent inhibition, CS only, and two random pseudoconditioning control groups. Results following 10 trials indicated the presentations of the pleasant scene produced the most positive attitude toward Brand L toothpaste, the next most positive attitude toward Brand L toothpaste in a latent inhibition group, and the least positive attitude toward Brand L toothpaste in the CS-only and pseudoconditioning control groups. There have also been failures to replicate attitude conditioning using advertisements (cf. Macklin, 1985). In addition, preexposure in Stuart et al.'s (1987) study was achieved by exposing groups to a number of 5-s presentations of the CS (8 at the 1-trial level and 20 at the 10-trial level) without the US. Only one previous paper has addressed the impact of the relative presence or absence of semantic information about the attitude object (i.e., the CS) on classical conditioning. In a series of studies, Shimp, Stuart, and Engle (1991) examined the strength of conditioning for familiar/high knowledge brands of cola (e.g., Coke) versus unfamiliar/low knowledge brands (e.g., Elf). Consistent with the elaboration likelihood model, unfamiliar brands showed greater conditioning to a positive US. However, because subjects held attitudes that were initially more favorable toward the familiar than the unfamiliar brands, ceiling effects may have contributed in part to the differential positive conditioning. In the current research, the operation of classical conditioning as a function of an individual's access to attitude relevant information in memory is examined controlling for initial attitudes.

How precisely one should construct pseudoconditioning control groups is a matter of some debate. Rescorla (1967) suggests including a control group in which the CS and the US are presented in a random fashion (i.e., noncontingently) to control for pseudoconditioned or spontaneous responses. The random pairing of CS and US provides a conservative baseline against which to compare classical conditioning effects. This is due to the fact that random CS-US presentations means that CS and US pairings can occur within the overall schedule of events, and these occasional pairings, which can be viewed as constituting partial reinforcement schedules, may themselves produce substantial conditioning effects (e.g., see Ayres, Benedict, & Wichter, 1975). An alternative control group is to present the CS and the US noncontiguously (e.g., Gormezano & Kehoe, 1975). This procedure is also imperfect, however, because one side effect of CS-US noncontiguity is a negative CS-US contingency. Thus, the CS can come to serve as a safety stimulus when using a noncontiguous CS-US control group and a negative US. We adopted a discriminative conditioning procedure and we included conservative pseu-

doconditioning control groups in which the "CS+" and "CS-" were paired randomly with the US. The classical conditioning of attitudes is suggested if a differential evaluative response develops following conditioning trials but does not develop in the pseudoconditioning control group.¹ Furthermore, if classical conditioning is a more powerful determinant of human attitudes when individuals are unable (or unmotivated) to evaluate the attitude object in light of relevant information stored in memory, then the differential evaluative response following conditioning should be stronger for nonwords (low preexposure/prior knowledge) than for words (high preexposure/prior knowledge).

EXPERIMENT 1

Method

Subjects and Design

Forty-three undergraduate students (25 males and 18 females) participated in exchange for extra credit in their introductory psychology class. The experimental design was a 2 (Gender: male, female) \times 3 (CS-US Contingency: word followed by electric shock; nonword followed by electric shock; and word and nonword paired randomly with electric shock) \times 2 (Experimental Stimulus: word, nonword) mixed-model factorial in which Gender and CS-US Contingency served as between-subjects factors and Experimental Stimulus served as a within-subjects factor. Subjects were assigned randomly to CS-US Contingency.

Stimulus Materials

An assumption underlying the present study was that subjects' prior knowledge about (i.e., semantic integration of) familiar words would be greater than their prior knowledge about unfamiliar nonwords. Words

¹ A note on nomenclature. We use the term classical conditioning procedure to refer to the operational manipulations examined in this experiment, whereas we use the term classical conditioning to refer to the associative process by which changes observed in the classical conditioning procedures might have occurred. For instance, Staats and Staats (1957) clearly demonstrated changes in attitude reports as a function of the classical conditioning procedures, but whether these changes were due to classical conditioning, pseudoconditioning, or demand characteristics was less clear. Not all classical conditioning processes are equally informative about the operation of classical conditioning processes. Classical conditioning procedures which assess or control for pseudoconditioning and demand awareness, for instance, can provide less equivocal evidence for the operation of classical conditioning than classical conditioning procedures which do not. Second, one might question whether it is sensible to talk about attitudes toward nonwords and words. The words used in this research were nouns and, therefore, represented persons, places, or things (see Methods). In addition, there is a long and productive history of research and theory based on people's attitudes toward novel or nonsense stimuli (e.g., Chinese ideographs, nonsense syllables, polygons, p-o-x triads, unfamiliar individuals; e.g., see Zajonc, 1968). As in this previous research, we found subjects willing and able to express attitudes about the words and nonwords.

and nonwords can differ in other respects as well, however, including their physical attributes and affective tone. Because these latter attributes were not of interest, 15 six-letter words and 15 six-letter structurally similar, highly regular nonwords were selected from Massaro, Taylor, Vanezky, Jastrzembski, and Lucas (1980) and served as the pool of potential conditioned stimuli. The Massaro et al. (1980) list includes familiar nouns and related nonwords generated by rearranging the letters in each word to produce a pronounceable nonword. This rearrangement of letters was constrained to be consistent with single letter, bigram, and trigram frequencies established by Kucera and Francis (1967) for familiar English words. The words consisted of master, permit, finger, mother, stream, bridge, reason, trials, lawyer, poetry, winter, result, breath, garden, and player, whereas the nonwords consisted of trames, primet, fering, thomer, tasmer, begrid, sarone, sartil, weraly, petory, triwen, surtel, thaber, nagred, and rapley. During pretesting, subjects were asked to read a list of "English and NonEnglish words" (i.e., the 30 words and nonwords selected from Massaro et al., 1980) and to rate each on two 9-point rating scales in terms of its hedonic value (1 = "very pleasant," 9 = "very unpleasant") and familiarity (1 = "very familiar," 9 = "very unfamiliar"). Each subject's ratings was used to select the two stimuli to be used during the classical conditioning procedure: one of the 15 words listed above whose pleasantness rating was rated "5" (neutral) and whose familiarity rating was below "5" (familiar), and one of the 15 nonwords listed above whose pleasantness was rated "5" (neutral) and whose familiarity rating was above "5" (unfamiliar) for the nonword.

Apparatus

Electric shock (16 Hz square wave) was delivered by a battery-operated shock generator (Farrall, Model Mark-300) to Tursky concentric electrodes secured on the back of the subject's calf with a velcro strap. This instrument includes a timer circuit for precise control of the duration of the shock and a current-limiting circuit that yielded a maximum output of 2 mA. The shock duration in this research was 0.25 s.

The 3/4-turn potentiometer for controlling applied current was replaced by a 10-turn potentiometer to allow finer-grain adjustments. In theory, this allowed applied current to be adjusted in approximately .002 mA gradations. In practice, variations in skin characteristics across subjects make it difficult to predict precisely the absolute amount of current flowing across the skin of an individual given an applied voltage. To minimize individual differences in the electrical admittance of the skin, the electrodes were coated with a saline-soaked sponge prior to their application. Nevertheless, shock intensity was expressed in terms of the potentiometer reading (0-1000) rather than in terms of applied current. These values can be thought of as having at least ordinal scale properties.

Procedure

Subjects were informed prior to their recruitment that the study investigated the physiological response to mild electric shock. Subjects completed the pretest, the procedure for the presentation of "English and NonEnglish words" and electric shock was described, and informed consent was obtained. Following completion of the pretest, subjects were scheduled to participate in the experiment.

Each subject was tested individually while seated alone in a comfortable reclining chair in a sound-attenuated testing room. A slide projector was positioned behind the subject to project slides of the words and nonwords onto a white 19-in. (48.26 cm) screen suspended from the ceiling approximately 2 m in front of the subject. The shock electrode was affixed to the subject's calf, and two Beckman Ag/AgCl electrodes were attached to the subject's left palm. Subjects were led to believe that the latter electrodes were used to monitor the physiological responses to mild electric shock. In fact, no physiological measures were taken.

At the beginning of the experimental session, each subject was informed that they would view slides of an English word and a NonEnglish word and that some slides would be followed by electric shock. Each subject determined the intensity of the electric shock to be used as the US. The subject was instructed to set the level of shock to be "annoying but not painful." This was accomplished by initially presenting the shock at a level that was barely perceptible and gradually increasing the intensity until the desired level was reached. Subjects were able to change the intensity level or cease participation at any time without loss of credit. None chose to do so.

The experimental session consisted of 16 trials: eight presentations of a single word and eight presentations of the nonword. Each experimental stimulus presentation was 7 s in duration, and the interstimulus interval was varied randomly between 30 and 40 s. The presentation of the experimental stimuli and the electric shock was automated.

Subjects were assigned randomly to one of three CS-US Contingency Conditions once subjects were ready to begin the automated conditioning phase. In the Word-Shock Condition, the offset of each word presentation (CS+) was associated with a 0.25-s electric shock to the calf (US), whereas the nonword (CS-) was never followed by electric shock. In the Nonword-Shock Condition, the offset of each nonword presentation (CS+) was associated with a 0.25-s electric shock to the calf (US), whereas the word (CS-) was never followed by electric shock. In both these conditions, the order of the 16 experimental stimulus presentations was randomized with two constraints: (1) the first stimulus presentation was a CS+, and (2) the CS+ was never presented more than three times in succession.

In the Random Shock Condition, the 16 7-s experimental stimulus (word and nonword) presentations were again ordered randomly with a 30–40 second interstimulus interval. In addition, a 0.25-s electric shock was presented following the offset of either the word or nonword on eight of the 16 experimental trials. On which eight trials the shock occurred was determined randomly with the following constraints: (1) the first stimulus presentation was followed by an electric shock, (2) the electric shock was never presented on more than three trials in succession, and (3) the electric shock followed the word and the nonword an equal number of times. Thus, the pseudoconditioning group was treated in precisely the same manner as were the two conditioning groups except for the CS–US contingency.

Following the last stimulus presentation, the shock electrode was removed, and subjects rated the same list of 15 six-letter words and 15 six-letter nonwords used in pretesting on two 9-point rating scales to indicate each word's pleasantness (1 = "very pleasant," 9 = "very unpleasant")² and familiarity (1 = "very familiar," 9 = "very unfamiliar").³ Upon completion of this post-test, subjects were given credit, thanked for their participation, and dismissed. At the conclusion of the study, subjects received a written debriefing.

Results

A preliminary analysis was performed to determine whether the unconditioned stimulus was comparable across experimental conditions. The shock intensity set by each subject was submitted to a 3 (CS–US Contingency) \times 2 (Gender) ANOVA. Shock intensity could range from 0–1000. A main effect for Gender indicated that female subjects selected a

² The pleasantness scale was used for three reasons: (1) subjects can easily evaluate both initially meaningful and initially meaningless stimuli using this scale; (2) pleasantness ratings have been found to be particularly sensitive to affective dimensions of judgment; and (3) previous research on attitude development and attitude change, including but not limited to classical conditioning of attitudes, has made productive use of this scale (e.g., see Fishbein, 1980; Insko and Adewole, 1979; Kunst-Wilson & Zajonc, 1980; Staats & Staats, 1957; Zajonc, 1968).

³ Prior knowledge about the conditioned stimulus was operationalized by the use of frequently used words (high preexposure/prior knowledge) and word-like nonwords (low preexposure/prior knowledge). Not only was the word used in the conditioning of a particular subject rated in the subject's pretest as being much more familiar than was the nonword ($M_{word} = 1.00$, $M_{nonword} = 8.72$), but the stimulus selection procedure ensured that there was no overlap in the distribution of the familiarity ratings of words and nonwords. Post-test familiarity ratings were submitted to a 3 (CS–US Contingency) \times 2 (Experimental Stimulus) mixed-model ANOVA. The only significant test was a main effect for Experimental Stimulus, which was attributable to subjects rating the word to which they were exposed during the conditioning procedure as more familiar than the nonword ($M_{word} = 1.00$; $M_{nonword} = 4.95$), $F(1, 40) = 64.63$, $p < .001$. No other test approached significance ($F_s < 1$).

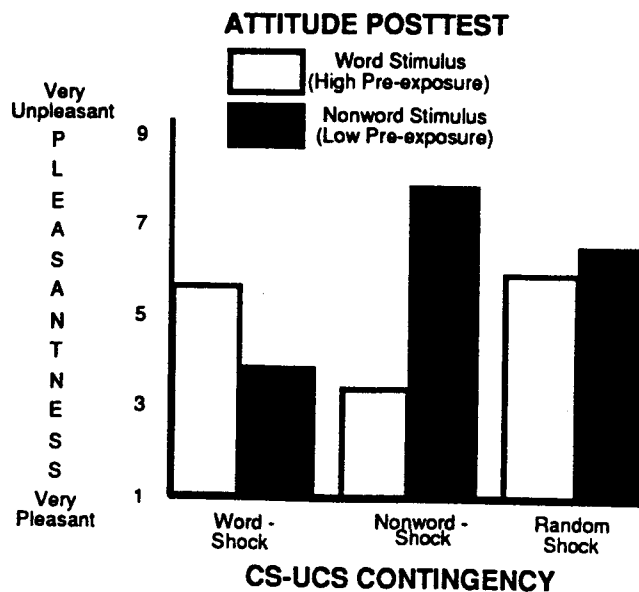


FIG. 1. Experiment 1: The classical conditioning of attitudes. Displayed along the ordinate are the mean pleasantness ratings for the word and nonword to which subjects were exposed during the conditioning procedure. Word-Shock denotes the word served as the CS+ and the nonword served as the CS-. Nonword-Shock indicates the word served as the CS- and the nonword served as the CS+. Random Shock means the word and nonword were paired randomly with electric shock. Higher numbers indicate more negative attitudes.

less intense level of electric shock than did male subjects ($M_{females} = 486$; $M_{males} = 538$), $F(1, 37) = 9.09$, $p < .01$, but neither the main effect for CS-US Contingency nor the CS-US Contingency \times Gender interaction approached significance ($F_s < 1$).⁴ Hence, any observed differences in the efficacy of the classical conditioning procedures cannot be attributed to spurious differences in the strength of the unconditioned stimulus.

Pleasantness ratings on the post-test were submitted to a 3 (CS-US Contingency) \times 2 (Experimental Stimulus) mixed-model ANOVA. Cell means are depicted in Fig. 1. Significant main effects were found for CS-US contingency, $F(2, 40) = 5.10$, $p < .02$, and Experimental Stimulus, $F(1, 40) = 5.71$, $p < .03$. These main effects were qualified by a CS-US Contingency \times Experimental Stimulus interaction, $F(2, 40) = 21.85$, $p < .001$. Inspection of Fig. 1 reveals that the form of the two-way interaction is in accord with the conditioning hypothesis. A t test was conducted next to determine whether the post-test pleasantness ratings of the word and the nonword were affected by pseudoconditioning. This test did not approach significance ($t < 1$).

The data were next decomposed using a specific set of contrasts that

⁴ This was the only gender effect obtained in this research. Because no other test approached significance, all remaining analyses reported in the text were conducted collapsing across Gender.

conformed to the experimental hypotheses. Because any pattern of means other than that predicted by the elaboration likelihood model and by Pavlovian conditioning theory would lead to the rejection of a conditioning interpretation of the post-conditioning pleasantness ratings, the power to detect the predicted conditioning effects was maximized by the calculation of one-tailed contrasts. The first tested the efficacy of the discriminative conditioning procedure in the nonword-shock condition relative to the random shock condition. Specifically, we contrasted the difference between the pleasantness ratings of the nonword and the word following nonword-shock pairings versus the difference between the nonword and the word following random shock pairings. The contrast was significant, $t(40) = 3.69, p < .001$.

The second was designed to examine the discriminative conditioning procedure in the word-shock condition relative to the random shock condition. This analysis contrasted the difference between the pleasantness ratings of the word and the nonword following word-shock pairings versus the difference between the word and the nonword following random shock pairings. This contrast was also significant, $t(40) = 2.82, p < .01$. These initial contrasts suggest that pseudoconditioning cannot account for the post-test pleasantness ratings of the word and nonword following the conditioning procedures.

The third contrast focused specifically on the hypothesis that the differential evaluative response following conditioning should be stronger for nonwords than for words. This analysis contrasted the difference between the pleasantness ratings of the nonword when it served as the CS+ and the CS- versus the difference between the pleasantness ratings of the word when it served as the CS+ and the CS-. That is, the contrast was constructed to test whether the conditioning differences for the nonword (comparing it as a CS+ and as a CS-) was stronger than the conditioning difference for the word. Consistent with the experimental hypothesis, this contrast was statistically significant, $t(40) = 1.80, p < .05$.⁵

⁵ Simple main effect tests were also calculated. In the first, the posttest pleasantness rating of the nonword in the nonword-shock condition (i.e., nonword_{CS+}) was contrasted with the posttest pleasantness rating of the word in the word-shock condition (i.e., word_{CS+}). As expected, this contrast was significant, $t(40) = 2.90, p < .01$. A comparable contrast was conducted to examine the posttest pleasantness ratings toward the CS- following the nonword-shock and word-shock conditioning procedures. This test did not approach statistical significance ($t < 1$). There are several alternative approaches to testing the experimental hypothesis that were considered because they weighted the means somewhat differently. For instance, one could test whether the discriminative conditioning of the word and the nonword in the nonword-shock condition was stronger than the discriminative conditioning of the word and the nonword in the word-shock condition. Consistent with the experimental hypothesis, this contrast was also statistically significant, $t(40) = 2.28, p < .05$. Alternatively, one could include the factors of Time (pretest, posttest) and Gender in the analyses

Discussion

The results conformed to the experimental hypotheses. The classical conditioning of attitudes toward a stimulus about which individuals knew nothing (e.g., an unfamiliar nonword) was stronger than was the conditioning of attitudes toward a stimulus about which subjects knew a great deal (e.g., a familiar word). This distinction was not found following pseudoconditioning. These results were obtained using a classical conditioning procedure, but was classical conditioning the mechanism responsible for the changes in pleasantness ratings we observed?

The word and the nonword serving as the CS did not differ in terms of the subjects' initial attitudes because these stimuli were selected based on the pretest to be equal and neutral. However, the pretest also revealed that the mean pleasantness rating in the entire pool of stimuli was more positive for the words ($M_{words} = 3.32$) than for the nonwords ($M_{nonwords} = 5.30$). Hence, the selection of a word that was rated as "5" might be more subject to regression to the group mean in a direction that would mask a conditioning effect than would selection of the nonword rated as "5." If regression to the mean was operative, it should also contribute to differences in the post-test pleasantness ratings of the word and the

of the pleasantness ratings. The results of a 3 (CS-US Contingency) \times 2 (Gender) \times 2 (Experimental Stimulus) \times 2 (Time) mixed-model ANOVA parallel those reported in the text, including the theoretically predicted CS-US Contingency \times Experimental Stimulus \times Time interaction on the pleasantness measure, $F(1, 37) = 21.59, p < .001$. This three-way interaction was decomposed by conducting a 2 (Gender) \times 2 (Experimental Stimulus) \times 2 (Time) mixed-model ANOVA within each experimental condition. (1) Analyses of the pleasantness ratings that obtained when the nonword served as the CS+ and the word served as the CS- revealed a significant main effect for Experimental Stimulus, $F(1, 13) = 54.28, p < .001$, and a significant Experimental Stimulus \times Time interaction, $F(1, 13) = 47.12, p < .001$ (see Fig. 1). When this interaction was decomposed using simple main effects tests, results revealed attitudes toward the CS+ (i.e., nonwords) became significantly more negative as a result of the conditioning procedure, $F(1, 13) = 42.66, p < .001$, and attitudes toward the CS- (i.e., words) became significantly more positive as a result of the conditioning procedure, $F(1, 13) = 11.20, p < .01$. (2) Analyses of the pleasantness ratings when the word was the CS+ and the nonword was the CS- revealed significant main effects for Experimental Stimulus, $F(1, 12) = 7.01, p < .001$, and Time $F(1, 12) = 4.92, p < .05$, which were qualified by a Experimental Stimulus \times Time interaction, $F(1, 12) = 6.55, p < .05$ (see Fig. 1). However, when this interaction was decomposed using simple main effects tests, results revealed no attitude change toward the CS+ (i.e., words), $F(1, 12) = 1.20, n.s.$, whereas attitudes toward the CS- (i.e., nonwords) became significantly more positive as a result of the conditioning procedure, $F(1, 12) = 17.51, p < .001$. These analyses suggest that attitude change following the conditioning procedure was more effective when the CS+ was a nonword rather than a word. (3) Finally, analyses of the pleasantness ratings when the word and the nonword were paired randomly with electric shock revealed a completely different pattern of data. The only significant test was a main effect for Time $F(1, 12) = 4.78, p < .05$, which indicated attitudes toward both words and nonwords became more negative following this pseudoconditioning procedure (see Fig. 1).

nonword in the random shock group. However, the t test designed to contrast the post-test pleasantness ratings of the word and the nonword following random shock did not approach statistical significance. Hence, regression does not appear to account for the results of Experiment 1.

Another possible interpretation is that the evaluative ratings of words are more stable (e.g., due to their relative accessibility or ease of retrieval) than are the evaluative ratings of nonwords and, therefore, the attitudes toward a word might be more resistant to change than the attitude toward a nonword. To examine this hypothesis, we calculated the test-retest reliabilities of the pleasantness ratings of words and nonwords across all conditions that were *not* used in the conditioning procedure. Results revealed that the test-retest reliability was higher for the words ($r = .73$) than for the nonwords ($r = .42$, $Z = 3.04$, $p < .01$). Next, separate assessments of the test-retest reliability of the words and nonwords not used in the conditioning phase were performed within each of the experimental conditions. Contrary to the notion that the evaluative ratings of words are more stable than are the evaluative ratings of nonwords, these analyses revealed no difference in these test-retest reliabilities following random shock or following the conditioning of words (r s ranged from .59 to .77, p s $> .15$). Instead, the differential test-retest reliability of words and nonwords was limited to the condition in which a nonword served as the CS+: $r_{\text{words}} = .68$, $r_{\text{nonwords}} = .05$, $Z = 2.67$, $p < .01$. Thus, the conditioning of a nonword may have rendered the evaluation of other nonwords less stable, but these data do not favor the notion that the evaluative ratings of the words used in this study generally are more stable than are the evaluative ratings of the nonwords used.

Although not expected due to the heterogeneous nature of the nonwords, the low test-retest reliability for nonwords not used in the conditioning procedure may reflect stimulus generalization. To examine this possibility, we subjected the mean pleasantness ratings of the words and nonwords not used in the conditioning phase to a 3 (CS-US Contingency) \times 2 (Stimulus: words, nonwords) \times 2 (Measurement Time: pretest, posttest) ANOVA. The three-way interaction did not approach significance, and no support was found for the notion that the unused words were rated more negatively following a nonword serving as the CS+ than in the remaining conditions.⁶

⁶ One final piece of evidence favoring the operation of classical conditioning comes from an exploratory analysis we performed using the shock intensity set by subjects prior to conditioning to predict the posttest pleasantness ratings of the words and nonwords. Differences in electrical admittance and pain threshold across individuals, and differences in the electrical admittance across applications of the shock electrode, make this analysis imprecise. Nevertheless, the shock intensity may serve as a gross index of the strength of the US in the conditioning procedure. Results revealed that even though the shock intensities were comparable across conditions (see above), shock intensity predicted posttest pleas-

In sum, the evidence favoring the classical conditioning interpretation of the present results is obtained by a process of elimination. Words and nonwords differ along a number of dimensions other than preexposure and prior knowledge. Nevertheless, the results of our ancillary analyses are against pseudoconditioning, regression to the mean, or differential attitude stability contributing significantly to the posttest pleasantness ratings we observed.

Evidence was obtained in this study for the conditioning of words and nonwords, although the conditioning effect was stronger for the latter. This suggests that classical conditioning may be more powerful in attitude development than in attitude change. However, the experimental hypothesis concerning the effect of classical conditioning on attitudes toward the word and nonword makes a relative, not an absolute, prediction of differences. Given a sufficiently strong US and a sufficient number of conditioning trials, such as those used in Experiment 1, subjects' attitudes toward words became more negative than prior to conditioning but, in addition, subjects' attitudes towards nonwords viewed under a comparable CS-US contingency became even more negative. Hence, classical conditioning can contribute to attitude changes as well as to attitude formation.

The fact that subjects in Experiment 1 knew neither that the CS-US Contingency was manipulated between-subjects nor that the experimental hypothesis involved a specific form of an interaction between CS-US Contingency and Experimental Stimulus renders demand characteristics a less plausible account for the evidence we found for the experimental hypothesis. Nevertheless, a second experiment was conducted to examine whether this effect could possibly reflect the operation of demand characteristics. To simulate a worst-case scenario (e.g., subjects became aware of the various CS-US contingencies that were being tested), a within-subjects design was used in Experiment 2.

EXPERIMENT 2

Staats and Staats (1958) originally proposed that attitudes could be classically conditioned across a wide variety of settings, and that these attitudinal influences were achieved without awareness of CS-US contingencies. The contingency between the experimental stimuli and the unconditioned stimulus were conspicuous in Experiment 1, but we assumed

antness ratings of the CS+ in the condition in which the nonword served as the CS+ ($r = .514$, $p = .05$), but not in the condition in which the word served as the CS+ ($r = .03$, n.s.). As would also be expected by a process of classical conditioning, (1) shock intensity did not predict the posttest ratings of the CS- in either condition (all $ps > .25$) and (2) shock intensity did not predict the posttest pleasantness ratings of either words or nonwords following pseudoconditioning ($r_{\text{word}} = .30$, $r_{\text{nonword}} = .24$, $ps > .25$).

that subjects would not correctly deduce the predicted interaction. Given the historical specter of demand characteristics as an alternative interpretation for attitudinal effects observed in classical conditioning paradigms, Experiment 2 was conducted to determine if subjects could infer the attitudinal effects of the CS-US contingency documented in Experiment 1 when subjects were given information about *all* of the experimental factors (e.g., CS-US contingency) through the use of a within-subjects design.

Specifically, an observation experiment was conducted in which 22 subjects read descriptions of the experimental stimuli and the CS-US contingencies. Subjects were instructed to read each description and to predict (a) how subjects in each of the experimental conditions would rate the words and nonwords, and (b) how the experimenter wanted subjects in each of the experimental conditions to rate the words and nonwords. Contingency awareness does not entail the operation of experimental demands, it simply fails to rule out their possible operation. However, if subjects in this within-subjects experiment cannot predict the predicted interaction, then demand characteristics becomes a less plausible account for the results found with fewer subjects per cell in the mixed-model design of Experiment 1.

Method

Subjects and Design

Twenty-two undergraduate females were recruited from introductory psychology to participate in an observer simulation of Experiment 1. The design was a 2 (Experimental Stimulus: word, nonword) \times 3 (CS-US Contingency: word followed by shock; nonword followed by shock; random pairings of word and nonword with electric shock) \times 2 (Experimental Instruction: predict subject's rating, predict experimenter's expectation) within-subjects factorial.

Procedure

The subjects' task was to role play and indicate how subjects who actually participated in the study responded. Subjects were given a written description of each experimental condition, followed by the same 9-point rating scales regarding pleasantness (1 = "very pleasant," 9 = "very unpleasant") and familiarity (1 = "very familiar," 9 = "very unfamiliar") as used in Experiment 1. After reading each condition, subjects were instructed to try to predict how subjects who actually participated in this condition rated the "English word" and "NonEnglish word" using the pleasantness and familiarity scales. Next, subjects were instructed to read each condition, but this time to indicate how subjects in the actual experiment should have responded if the subjects were trying simply to

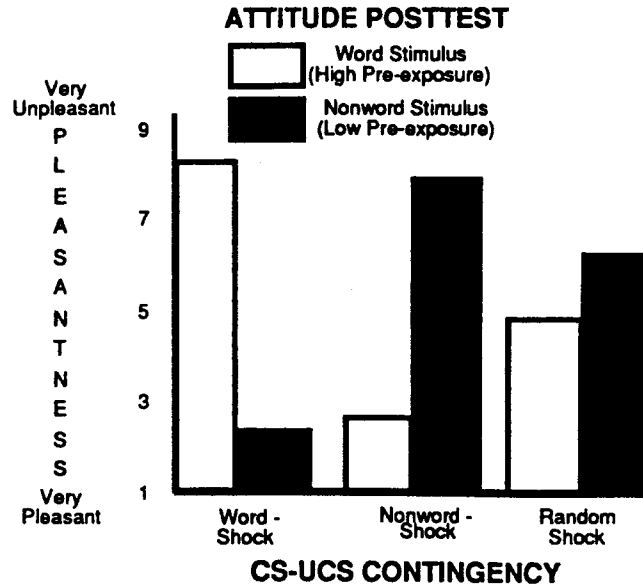


FIG. 2. Experiment 2: An observer simulation study of attitude conditioning. Displayed along the ordinate are the mean pleasantness ratings for the word and nonword predicted by subjects. The depicted means are collapsed across Experimental Instruction. Word-Shock denotes the word served as the CS+ and the nonword served as the CS-. Nonword-Shock indicates the word served as the CS- and the nonword served as the CS+. Random Shock means the word and nonword were paired randomly with electric shock. Higher numbers indicate more negative attitudes.

confirm the Experimenter's hypothesis. The description of conditions and rating scales was ordered randomly on a single page. Following the completion of these ratings, subjects were given credit, debriefed, and dismissed.

Results and Discussion

Pleasantness ratings were analyzed using a 2 (Experimental Stimulus) \times 3 (CS-US Contingency) \times 2 (Experimental Instruction) repeated-measures ANOVA using the multivariate approach to correct for violations of sphericity (Vasey & Thayer, 1987). Only the CS-US Contingency \times Experimental Stimulus interaction was significant, $F(2, 42) = 43.60$, $p < .01$. Inspection of Fig. 2 reveals that the form of this interaction matches the coverage of classical conditioning provided in introductory psychology texts (see Rescorla, 1988) but does not match the form of the interaction found in Experiment 1. That is, subjects predicted that: (1) when the word was followed by the electric shock, experimental subjects would develop more pleasant negative attitudes toward the word than the nonword; (2) when the nonword was followed by the electric shock, experimental subjects would develop more pleasant negative attitudes toward the nonword than the word; and (3) when the word and nonword were paired randomly with electric shock, similar attitudes toward the word and the nonword

would result. Importantly, none of the contrasts designed to determine if the conditioning of the nonword was predicted by subjects to be stronger than the conditioning of the word approached statistical significance. Indeed, inspection of Figure 2 reveals that the means were in the opposite direction (i.e., the conditioning of the nonword was predicted by subjects to be weaker than the conditioning of the word).⁷

The failure of subjects to predict the experimental hypothesis argues against a demand characteristics interpretation, but aspects of the results of Experiment 2 call for continued vigilance regarding the possible operation of experimental demands in research on the classical conditioning of attitudes. Respondents in Experiment 2 answered similarly when instructed to predict (a) subjects' attitudes toward the stimuli following the various CS-US contingencies, and (b) the experimenter's expectations regarding the subjects' ratings of the stimuli. In both instructional conditions, individuals predicted (and believed the experimenter predicted) that whatever stimulus was associated with shock would also become disliked. One possible explanation for this parallelism is innocuous: subjects may simply have believed that their understanding of psychology enabled them to predict correctly how people would respond in a simple attitude-conditioning experiment, and that the more knowledgeable experimenter also formulated this prediction. Indeed, Rescorla's (1988) comments regarding the oversimplification of classical conditioning theory in psychology textbooks suggest subjects could have responded in this manner if they had been allowed to consult their textbooks prior to responding. Nevertheless, it seems prudent to continue using procedures such as simulation experiments to assess or control for the possible operation of experimental demands in attitude-conditioning research.

In sum, the results of Experiment 2 indicated that even though the contingencies between the conditioned and unconditioned stimuli were explained and subjects attempted to predict how to confirm the experimenter's hypothesis, subjects were unable to predict accurately the differential attitude change observed in Experiment 1 using a classical conditioning procedure. Together, therefore, these studies are consistent with the hypothesis that human attitudes can be classically conditioned. These studies may also help to clarify the conditions under which classical con-

⁷ Familiarity ratings were also analyzed using a 2 (Experimental Stimulus) \times 3 (CS-US Contingency) \times 2 (Experimental Instruction) repeated-measures ANOVA using the multivariate approach to correct for violations of sphericity. As in Experiment 1, these data provided evidence for the effectiveness of the word/nonword manipulation: words were predicted to be more familiar than nonwords ($M_{\text{words}} = 2.33$; $M_{\text{nonwords}} = 7.36$), $F(1, 21) = 74.37$, $p < .01$. The only other significant result was a CS-US Contingency \times Experimental Stimulus interaction, which indicated that subjects expected the familiarity ratings of words and nonwords to be higher when the electric shock followed the nonword than the word, $F(2, 42) = 6.80$, $p < .01$. This test did not approach significance in Experiment 1 ($F < 1$).

ditioning is likely to be a particularly powerful determinant of attitudes in humans. For instance, due the dearth of attitude relevant information about a novel stimulus and to little or no preexposure, classical conditioning should be a more powerful determinant of attitude formation than attitude change.

GENERAL DISCUSSION

Rudimentary Determinants of Attitudes

Classical Conditioning

Our primary goal in this research was to increase our understanding of the conditions under which the classical conditioning of aversive events influence an individual's attitude toward a collateral stimulus or event. Neutral words and nonwords served as conditioned (attitude) stimuli in this research, and an aversive electric shock served as the unconditioned stimulus. The words and nonwords were matched in terms of their valence and structural features, but differed in terms of the semantic information individuals possessed that was relevant to the evaluation of each (i.e., the availability of attitude-relevant information in memory). We reasoned that when individuals have access to a relatively large body of attitude-relevant information in memory, the aversive experience resulting from CS-shock pairings contributes marginally to the representation of the attitude-object in memory. Even if the experiences from aversive classical conditioning are represented separately from attitude-relevant beliefs in memory (see below), their effects should be attenuated by other, less negative attitude-relevant information (given neutral pre-conditioning attitudes). On the other hand, when relatively little attitude-relevant information is available in memory, the aversive experiences resulting from CS-shock pairings contribute much more thoroughly to the representation of the attitude in memory. Thus, we predicted aversive classical conditioning would be a more powerful determinant of attitudes toward nonwords than words. Consistent with this reasoning, the results of Experiment 1 demonstrated that subjects' attitudes toward the nonwords, in contrast to words, became more negative as a function of their pairing with electric shock.

The CS-US contingency was not masked in this research. One possible consequence is that subjects may have believed the CS+ would continue to be associated with electric shock, or with negative events generally, and they therefore rated the CS+ more negatively than the CS-. Two observations argue against the development of such attitudes and beliefs as being artifactual. First, the shock electrode was removed prior to the administration of the attitude posttest. Hence, subjects knew objectively that the administration of electric shock was completed and they were no longer at risk for electric shock. Second, both words and nonwords served

as the CS+ in Experiment 1. If subjects believed the CS+ was a harbinger of some aversive event in the laboratory, then this belief should be equivalent for words and nonwords as conditioned stimuli unless their feelings and beliefs were the legitimate product of the classical conditioning procedures. Below, we return to the relationship between the classical conditioning of attitudes and the associated beliefs about the attitude object.

A second consequence of contingency awareness, however, is that subjects may have deduced the experimenter's expectations. If subjects were "demand aware," they may have expressed attitudes they felt would please the experimenter rather than attitudes they truly felt toward the stimuli. This line of argument requires that subjects not only knew that stimuli associated with negative events would become disliked, but that they inferred this effect would be stronger for nonwords than for words prior to their attitudes being changed in the classical conditioning procedures. The between-subjects manipulation of CS-US contingency in Experiment 1, coupled with the experimenter being kept blind to this manipulation until the subject had been prepared and the experimenter returned to the control room to initiate the automated experimental procedure, lessened the likelihood that subjects would deduce correctly the experimental hypothesis. In addition, the evidence from Experiment 2 indicated subjects were unable to infer this experimental hypothesis even when they were given information about all of the experimental conditions.

Implications for Multiple Attitude Representations and Behavior

Our second aim in this research was to call attention to the possible effects of rudimentary associative and affective processes on attitude formation and change. Attitude theory and research have focused primarily on self-reports of attitudes, issue-relevant cognitive responses and heuristic information processes, and intentional behaviors (cf. Tesser & Shaffer, 1990). We can now return to a discussion of the multiple representations of, beliefs about and behaviors toward an attitude object that may eventuate from classical conditioning. We begin by reviewing evidence from psychobiology demonstrating that the classical conditioning of affective responses can produce multiple, hierarchically organized representations in the brain.

Classical conditioning has provided a valuable paradigm for studying behavioral preference in nonvertebrates and nonprimates, and it is increasingly being used to examine the mechanisms underlying the learning and memory of affective associations. Research by LeDoux and his colleagues on conditioned fear reactions to acoustic stimuli, for instance, indicates that projections from the auditory processing areas of the thalamus to the amygdala bypass the cortex and constitute a subcortical mechanism for affective learning (e.g., LeDoux, Iwata, Cicchetti, & Reis, 1988; LeDoux, Sakaguchi, Iwata, & Reis, 1986). LeDoux, Romanski, and Xag-

oraris (1989) used visual rather than auditory stimuli to determine whether subcortical affective memory was limited to the auditory modality. In addition, the visual cortex was ablated in half of the rats to determine if classically conditioned affective responses to visual stimuli were dependent on the visual cortex. Animals were given either paired or random presentations of a flashing light (CS) and footshock (US) following lesions of the visual cortex or sham operations. Classically conditioned responses were found following the pairing of the CS and US regardless of the integrity of the visual cortex, although the absence of a visual cortex greatly slowed extinction of the conditioned response. LeDoux and his colleagues have interpreted these data as evidence that the acquisition and representation of affective categorizations, memories, and preferences can operate at multiple, interrelated levels within the brain.⁸

The data from psychobiology, as well as the results of these experiments, are reminiscent of Nisbett and Wilson's (1977) thesis that subjects can come to feel certain ways about stimuli and can even construct rationalizations for their feelings, while not really knowing why they came to feel as they do about people, objects, and events around them. The results of Experiment 2, for instance, revealed that subjects' implicit theories of classical conditioning led them to believe that whatever stimulus was associated with electric shock would also become disliked. The results of Experiment 1, in contrast, demonstrated that subjects felt more negatively about the novel than the familiar CS+. These data suggest a process by which individuals can come to feel differently toward stimuli in their world even though they do not comprehend the true basis for these differential feelings. Whether people spontaneously confabulate to explain their feelings or they require queries from others before they rationalize these feelings is not important here (but see Gazzaniga, 1985).

To illustrate, consider children who are exposed to relatively familiar and unfamiliar races in film, television, and the news media, with each race periodically associated with negative events (e.g., assault, homicide, victimization). The results of the present research suggest that more negative attitudes will develop toward the race about which the children have little knowledge and contact, and that these children will not appreciate the subtle manner in which their social environment has produced their

⁸ Affective processes appear not to be unique in this regard. Rafal, Smith, Krantz, Cohen, and Brennan (1990) recently reported evidence from hemianopic humans that indicated visual information processing could occur in parallel at the cortical and subcortical level. Neurologic patients who have suffered unilateral destruction of the striate cortex or its geniculostriate afferents are blind in the half of the visual field contralateral to the lesion and cannot see stimuli within this blind area. Rafal et al. (1990) demonstrated that these patients nevertheless show evidence of "blindsight" (see, also, Weiskrantz, Warrington, Sanders, & Marshall, 1974). Signals in the blind area activated the oculomotor system and affected orienting behavior in hemianopic humans.

prejudicial attitudes.⁹ Consider, further, that as these children go through socialization, they may initially articulate prejudicial beliefs to justify the differential attitudes they hold toward majority and minority groups, but that these prejudicial beliefs may come under attack and undergo correction during socialization. One possible outcome is that these children become socialized to inhibit expressions of their true beliefs and attitudes. A second possible outcome, however, is that the egalitarian beliefs they are taught also produce corresponding changes in attitudes, especially if these beliefs are accessible.

In either case, it should be the latter beliefs and attitude representation that influence and predict behavioral intentions. However, remnants of a conflicting behavioral organization (attitude representation) may also exist, possibly (although not necessarily) at a lower level of the nervous system (e.g., LeDoux et al. 1989), and influence a variety of affective and "unintentional" behaviors. Indeed, behavior is organized in terms of approach/withdrawal at every level of the nervous system (see review by Cacioppo et al., 1991). Even simple brain stem and spinal reflexes show this behavioral organization and show evidence that this organization can be modified through classical conditioning. This behavioral organization at lower levels of neuraxis can be characterized as being relatively inflexible and stimulus bound. As one moves up the central nervous system, approach/withdrawal tendencies remain but these response tendencies come under greater contextual (relational) control, and responses become more flexible and persistent. This is perhaps exemplified by attitudes derived through issue-relevant thinking, which contributes to a well-articulated set of beliefs or declarative knowledge structure, and to attitude accessibility. These attitudes, in turn, are more persistent, resistant to persuasion, and predictive of intentional behavior than attitudes derived through the operation of heuristics (see Petty & Cacioppo, 1986).

In sum, heuristic information processing is but one of several distinct psychological mechanisms that fall under the rubric of the peripheral route in the elaboration likelihood model. The present research indicates that attitudes toward a stimulus about which subjects possess little or no declarative information are more affected by its contiguity with an irrelevant but emotionally evocative event than are attitudes toward a stimulus whose representation in memory is relatively abundant in accessible associations. It remains for future research to determine whether or not attitudes developed by a contiguity of stimuli with irrelevant but emotionally evocative events are more predictive of a variety of affective and "unintentional"

⁹ This also suggests a possible associative mechanism that contributes to the illusory correlation effect—classical conditioning (cf. Lynch, Granger, Larson, & Baudry, 1989; Rescorla, 1988).

behaviors than are attitudes derived through issue-relevant thinking and heuristic information processing.

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