Research Article

IMPLICIT ATTITUDE FORMATION THROUGH CLASSICAL CONDITIONING

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Abstract—*We sought to demonstrate that attitudes can develop through implicit covariation detection in a new classical conditioning paradigm. In two experiments purportedly about surveillance and vigilance, participants viewed several hundred randomly presented words and images interspersed with critical pairings of valenced unconditioned stimuli (USs) with novel conditioned stimuli (CSs). Attitudes toward the novel objects were influenced by the paired USs: In a surprise evaluation task, the CS paired with positive items was evaluated more positively than the CS paired with negative items. This attitudinal conditioning effect was found using both an explicit measure (Experiments 1 and 2) and an implicit measure (Experiment 2). In a covariation estimation task involving the stimuli presented in the conditioning procedure, participants displayed no explicit memory for the pairings.*

Attitude formation, how people come to evaluate objects in the environment positively and negatively, is a long-standing issue in social psychology. A fundamental form of attitude acquisition, classical conditioning, has struck the curiosities of not only social psychologists (e.g., Cacioppo, Marshall-Goodell, Tassinary, & Petty, 1992; Krosnick, Betz, Jussim, Lynn, & Stephens, 1992; Zanna, Kiesler, & Pilkonis, 1970), but marketing and advertising researchers (e.g., Allen & Janiszewski, 1989; Kim, Allen, & Kardes, 1996; Shimp, Stuart, & Engle, 1991), human learning theorists (e.g., Baeyens, Eelen, & Van den Bergh, 1990; Hammerl & Grabitz, 1996a, 1996b; Levey & Martin, 1975), and cognitive psychologists (e.g., Lewicki, 1986) as well.

Attitudes are thought to develop via classical conditioning through repeated pairings of potential attitude objects (conditioned stimuli, CSs) with positively and negatively valenced stimuli (unconditioned stimuli, USs), and intuitively, one would expect this to be a ubiquitous means of attitude formation. From the development of racial prejudice through repeated media portrayals of minority-group members in a negative fashion, to the creation of brand preferences via pairings of a target product with supermodels, the case might appear closed based on intuition alone. Yet, although early research seemed to support the contention that classical conditioning is a primary origin of attitudes (e.g., Razran, 1938; Staats & Staats, 1958), research on the classical conditioning of attitudes has since suffered a sporadic and troubled history.

Through the present research, we hoped to provide more solid evidence that attitudes can develop implicitly via classical conditioning. First, we touch on some of the problems of past research, and mention some noteworthy attempts at solving them. The present research developed a new paradigm to help answer the question of whether attitudes can develop implicitly via classical conditioning.

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PRIOR RESEARCH ON THE CLASSICAL CONDITIONING OF ATTITUDES

Razran (1938) read various political slogans to people while providing some of them with a free meal, and found that agreement with the slogans was greater when people received the free meal than when they did not. Though myriad alternative explanations have been proposed to account for Razran's findings, this was probably the first experimental attempt to affect attitudes toward various objects via pairing an attitude object (CS, a political slogan) with other valenced objects (US, a free lunch). Staats and Staats (1958), in a more tightly controlled experiment, paired each of two national names ("Swedish" and "Dutch") with either 18 positive or 18 negative words by having subjects read the CS terms as they appeared on a screen (along with four filler national names) while the experimenter read aloud the US terms. The nation paired with positively valenced terms was later evaluated more favorably than the one paired with negatively valenced terms.

The attitudinal conditioning effect reported by Staats and Staats (1958) was presumed to occur without awareness of the CS-US pairings on the part of participants. This is a critical point, because if participants had noticed that, say, "Sweden" was always followed by "good," then the attitudinal conditioning effect might be explained as a demand artifact (i.e., participants may have been simply reporting what they assumed the experimenter wanted them to report). An alternative explanation, had subjects noticed the CS-US pairings, is that they may have formed attitudes on the basis of deliberate, expectancy-value reasoning. As Fishbein and his colleagues have argued, the pairings may have induced participants to consciously infer correspondent beliefs about the attitude object (Fishbein & Ajzen, 1975; Fishbein & Middlestadt, 1995).

Although Staats and Staats (1958) argued that an associative bond was created between the US and CS through the conditioning procedure without awareness on the part of participants, Page (1969) contended that conditioning effects were simply demand artifacts based on participants' deliberate guesswork regarding the experimenter's hypothesis. He used a more sensitive, funneled debriefing measure of awareness (in which participants respond to progressively revealing questions about the nature of the experiment), and found that conditioning effects occurred only when participants were aware of the experimenter's hypothesis. Page conducted several subsequent studies (e.g., Page, 1974) that repeatedly reinforced his view that attitudinal conditioning was the result of demand awareness; these studies surely contributed to the current neglect of conditioning processes in social psychology.

Concerns about the possible role of demand characteristics were abated by research that separated collection of the final dependent measure from the conditioning phase of the experiment, for example, by having the attitude measure administered by a different experimenter in the context of an ostensibly unrelated experiment (e.g., Zanna et al., 1970). However, the role of awareness of the CS-US contingencies remains a highly contentious issue (e.g., Field, 2000). In

fact, several earlier studies (e.g., Cohen, 1964; Insko & Oakes, 1966), as well as more recent ones (e.g., Allen & Janiszewski, 1989; Shimp et al., 1991), have found conditioning effects only among participants who report awareness of the contingencies.

Some researchers, particularly Baeyens and his colleagues (e.g., Baeyens et al., 1990; Baeyens, Eelen, Crombez, & Van den Bergh, 1992), remain confident that attitudinal conditioning can occur without awareness. In their typical research paradigm, originally developed by Levey and Martin (1975), pictures that each participant earlier rated as neutral are paired repeatedly with pictures that they earlier indicated liking or disliking strongly, all under the guise of an experiment concerned with physiological responses. The neutral stimulus is typically presented for 1 s, and 3 s later, the US is presented for 1 s. The stimulus pairs are separated by 8 s. The initially neutral stimuli have been shown to acquire the valence of the repeatedly associated US. Awareness is measured concurrently (by asking participants to predict whether a neutral, liked, or disliked stimulus will follow the CS) or postconditioning (by a recognition test in which participants indicate which particular US followed each CS). Baeyens et al. (1990) observed that, even though some participants report awareness of some contingencies, contingency awareness is unrelated to the conditioning effect—aware and unaware participants both show it.

Although the studies by Baeyens and his colleagues are encouraging, their conclusions remain contested. Other researchers (e.g., Field, 2000; Field & Davey, 1998; Shanks & St. John, 1994) have expressed concern about the high levels of contingency awareness displayed on the concurrent measure, and about the validity and sensitivity of the postconditioning recognition measure. In short, considerable disagreement remains as to whether the available evidence has established that attitudes can be conditioned in the absence of contingency awareness (also see Eagly & Chaiken, 1993; Hammerl, 2000; Shanks & Dickinson, 1990).

The studies discussed up to this point have approached the problem of eliminating contingency awareness by relying on misleading cover stories and participants' limited memories. Other research has taken a subliminal route—instead of hoping participants will not notice CS-US contingencies, these researchers simply present the USs for subthreshold durations. Krosnick et al. (1992) presented subliminal images of positive or negative objects (USs), followed immediately by supraliminal images of a woman going about various mundane activities (CSs). This backward conditioning procedure, in which the CS follows the US, yielded a significant conditioning effect. However, a posttest indicated that participants could detect the presence of the USs, even though they could not identify their content. Using a shorter presentation time in a second experiment, Krosnick et al. obtained a marginal conditioning effect. Unfortunately, the backward pairing procedure leaves open the possibility of an alternative explanation in terms of affective priming, as Eagly and Chaiken (1993) have noted. Participants may have responded more positively (or negatively) to the target only because the affective primes increased the accessibility of positivity (or negativity), and not because of conditioned changes in their evaluative reactions to the target itself (see Niedenthal, 1990). Subliminal presentation experiments utilizing the more typical forward conditioning procedure have also been conducted (De Houwer, Baeyens, & Eelen, 1994; De Houwer, Hendrickx, & Baeyens, 1997). A meta-analysis of five such experiments revealed a statistically reliable conditioning effect, but the research clearly yielded somewhat inconsistent results involving small effect sizes (De Houwer et al., 1997).

THE IMPLICIT LEARNING PARADIGM

Some reason for optimism about the validity of attitudinal conditioning is provided by the literature on implicit learning. Individuals sometimes show evidence of having learned a rule or association implicitly, even though they are unable to articulate any explicit, conscious knowledge of the relevant information (for reviews, see Berry, 1994; Seger, 1994). Such implicit learning has been demonstrated in a variety of domains, such as learning an artificial grammar (Reber, 1967), learning covariations between facial features and trait ascriptions (Lewicki, 1986; Lewicki, Hill, & Czyzewska, 1992), and learning such visual covariation as regularities between target objects and their location in a spatial layout (Chun & Jiang, 1999). For this reason, we sought to develop an experimental paradigm more similar to the procedures typically employed to study implicit learning. We wanted the paradigm to (a) have minimal likelihood of promoting either demand characteristics or contingency awareness on the part of participants and (b) capture the real world's tendency to present natural covariations between objects and valenced outcomes that may affect people's attitudes, despite their attention being directed elsewhere.

With these aims in mind, we chose to employ supraliminal exposures to the CS and US and to present the CS-US pairs simultaneously, but interspersed in the context of a rapid, nonrhythmic stream of perceptual events. The paradigm involves leading participants to believe that the experiment is about "attention and rapid responding" to particular events. We present to them a wide assortment of images and words, including various neutral items (e.g., an umbrella, a glass of milk, the word "concrete"), that can appear anywhere on the screen, either alone or in pairs. At least one third of all trials are blank screens. Thus, participants see an unrelated assortment of words and images, sometimes appearing alone and sometimes in pairs, and in varying locations on the screen. The trials involving a blank screen ensure that the stimuli are presented at a seemingly nonsystematic, irregular pace. Participants are asked to be vigilant for a particular item, and are instructed to hit a response key as quickly as possible whenever the target item appears on the screen. Critical CS-US pairs are presented simultaneously throughout the presentation.

Our paradigm departs from most other attitudinal conditioning paradigms in several ways. First, there is no prerating phase in which participants evaluate the items to be used in the conditioning procedure; we derive our positively and negatively valenced USs normatively from pretests using different participants. Second, instead of exposing participants to the same CS-US pairs repeatedly, each CS is paired with several nonrepeating, same-valenced USs—all in the interest of diminishing the likelihood of participants consciously noting the pairings. Third, instead of presenting the CS and US sequentially, and segmented from other stimuli by a relatively lengthy intertrial interval, we present each CS-US pair simultaneously, and embedded within a stream of similar perceptual events. Finally, the cover story and experimental task ensure that participants attend to the stimulus items, but engage them in a task that is entirely independent of covariation detection.

EXPERIMENT 1

Experiment 1 was an initial demonstration of the procedure's effectiveness in classically conditioning attitudes toward novel objects.

Method

Participants (45 undergraduate females) were told that the experiment was about "video surveillance," and that several hundred images

would be presented randomly on a computer screen over the course of five blocks. Their task was to hit a response key as quickly as possible when a target image appeared. Eight CS-US pairs were presented in each of the five blocks. These pairs consisted of one Pokemon cartoon character (a color image with the character's name below it) with one of a number of positively valenced words (e.g., "excellent," "awesome") and images (e.g., puppies, a hot fudge sundae) and another Pokemon cartoon character paired with negative words (e.g., "terrible," "awful") and images (e.g., a cockroach, a man wielding a knife).[1] Across the five blocks, 20 CS-US pairs were presented for each of the two Pokemon. Which CS Pokemon was paired with positive USs (i.e., the CS+) and which was paired with negative USs (i.e., the CS−) constituted one independent variable (for which no effects emerged). The target image for each block was also a Pokemon character, and a different target was used for each block. The filler images consisted of other Pokemon, blank screens, and neutrally valenced words and images presented individually and in pairs. Each block consisted of 86 trials presented for 1.5 s each.

After the conditioning procedure, participants were told that we were concerned that their affective reactions to some of the filler items might have interfered with their ability to respond rapidly to the target items. Hence, we asked them to evaluate several of the images (including the two CS Pokemon) on a scale from −4 (*unpleasant*) to +4 (*pleasant*).

Participants were also told that some of the images they saw may have been presented together with some degree of regularity, and were asked to provide covariation estimates for several pairs of images. Through the course of this covariation estimation task, each CS was presented nine times, each time followed by a different item selected from three positive USs, three negative USs, and three neutral filler items. For each pair, participants responded on a scale from −2 ("I'm confident that the two items never appeared together") to 0 ("don't know") to +2 ("I'm confident that the two items appeared together at least once"). Several pairs of filler items, some of which actually appeared together during the conditioning phase, also were included in the covariation estimation task. The order in which participants completed the evaluation and explicit memory tasks was counterbalanced across participants; no effects emerged for this variable.

Results and Discussion

Conditioning effect

Conditioning was examined by collapsing across the variable designating which Pokemon was paired with positive versus negative USs and computing a difference score (rating of the positive CS − rating of the negative CS), for which higher numbers indicate a greater conditioning effect. The mean difference score was 0.64 ($SD = 2.05$), which differed significantly from zero, $t(44) = 2.11$, $p < .05$. Thus, a reliable conditioning effect was obtained; participants evaluated the Pokemon paired with positive USs more positively than the Pokemon paired with negative USs.

Awareness test

The covariation estimation data were analyzed by first calculating the mean of participants' responses to the three USs of a given valence. A 2 (CS counterbalancing condition) × 2 (Pokemon target) × 2 (US valence) analysis of variance (ANOVA), with repeated measures on the last two variables, was performed on these scores. If participants were able to consciously detect and recall the covariations between the CSs and USs, we would expect a three-way interaction. That is, the covariation responses involving Pokemon A and the positive USs and those involving Pokemon B and the negative USs would be higher than the other combinations for the condition in which A was the CS+ and B the CS−, whereas the reverse would be true for the other condition. The ANOVA revealed that participants exhibited no explicit awareness of the pairings ($F < 1$). Participants were no more confident that a given Pokemon had been paired with a US of a given valence than they were that the Pokemon had appeared with a US of the opposite valence.

In order to create a summary measure of awareness, we computed the difference between the mean of participants' covariation estimates for the CS-US pairs that were actually presented and the mean for the CS-US pairs with the opposite-valenced USs. Again, no awareness was apparent, $M = -0.007$, $SD = 0.84$; $t < 1$. Nor was this summary index of awareness related to the magnitude of the conditioning effect, $r = .03$, n.s.

As an additional test of participants' ability to notice covariations during the conditioning procedure, two pairs of filler items had appeared together 15 times through the course of the 430 trials (e.g., the Pokemon Primape and the word "outlet"). Participants' mean covariation estimates for a given filler image and the item actually paired with it were slightly lower, but not significantly so, than their covariation estimates for that same filler image and two fillers with which it had not been paired, mean difference score = −0.30, $SD = 1.34$; $t(44) = 1.47$, n.s. This measure also was unrelated to the magnitude of the conditioning effect, $r = .13$, n.s. Thus, our cover story, along with the vigilance task, was effective in precluding participants' explicit memory for the pairings.

EXPERIMENT 2

Experiment 2 was designed to replicate and extend the first experiment by using an additional dependent measure. A recently developed measure of attitudes, the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998), was included as an additional measure of the conditioning effect. The IAT is a response-mapping task in which participants are required to categorize four types of objects as they are presented on a screen using only two response keys. Two of the four types of objects are clearly pleasant and clearly unpleasant items (e.g., "love," "murder"), and the other two represent the two attitude objects the experimenter is interested in assessing (in our case, the CS+ and the CS−). The meaning of the categorization keys changes throughout the course of the IAT, so that during some blocks, participants map compatible items to the same key (pleasant items and the CS+, unpleasant items and the CS−). In the incompatible blocks, participants map incompatible items to the same key (unpleasant items and the CS+, pleasant items and the CS−). Partic-

1. The Pokemon cartoon characters Shelder and Metapod were chosen as CSs because we found that although college students were willing to evaluate them, they were generally ignorant of Pokemon characters (with the exception of Pikachu, who was not employed in the experiments reported here). US images were selected based on normative data provided by Ito, Cacioppo, and Lang (1998); US words were selected based on pretesting in our lab. In all cases, positive USs were clearly evaluated more positively than negative USs by pretest participants.

ipants should find the compatible task easier than the incompatible task, which should be reflected in their response latencies. For example, if our conditioning procedure is effective, then participants should find it relatively easy to map pleasant items and the CS+ to one response key, and unpleasant items and the CS− to another (compatible task). In contrast, they should find the incompatible task more challenging.

Because implicit measures like the IAT are less susceptible to demand artifacts than explicit measures, and do not require introspective access to any unconsciously formed attitudes, implicit measures of attitudes may be especially well suited for detecting attitude development via a classical conditioning procedure that does not require awareness.

Method

Fifty-six undergraduate women participated in the experiment. The conditioning procedure was identical to that used in Experiment 1. After the procedure, participants rated several of the items (including the two CSs) as in Experiment 1, and completed an IAT designed to assess attitude development for the two CSs. The order in which participants completed these two evaluation tasks was counterbalanced (no effects emerged for this variable). The IAT included two different practice blocks; participants first categorized pleasant and unpleasant items in one of these blocks, and then categorized various combinations of images and names of the two CS Pokemon in the second block. They then completed incompatible and compatible blocks consisting of 50 trials each.[2] After the evaluation tasks, participants completed a funneled questionnaire measure of awareness involving a series of increasingly direct questions. It began with the question, "Did you notice anything out of the ordinary in the way the words and pictures were presented?" and ended with the question, "Did you notice anything unusual about the words and images that were presented with the [CS+ and CS−]?"

Results

On the final item of the postexperimental questionnaire, 6 of the 56 participants mentioned noticing at least one of the CS-US contingencies. It is important to keep in mind that these reports occurred only after the questionnaire informed participants that there was more to the experiment than they had initially been led to believe, and only after it was suggested that there was something unusual in the way the CSs were presented. To be conservative, we excluded the data from these 6 participants from all analyses, although this omission had no effect on the statistical significance of the results.

The latencies from the IAT were first log-transformed. Differences were computed between (a) each participant's mean latency on trials for which Pokemon A and pleasant were represented by the same response key (and Pokemon B and unpleasant were represented by the other key) and (b) the participant's mean latency on trials for which Pokemon A and unpleasant were mapped onto the same key (and, hence, B and pleasant were mapped onto the other). The difference in the explicit scale rating for A minus B also was computed for each participant. In order to place these two measures on a common metric, each was *z*-transformed. The means are presented in Figure 1. A 2 (A = CS+, B = CS− vs. A = CS−, B = CS+) × 2 (evaluation-task order) × 2 (implicit vs. explicit measure) ANOVA, with the last variable as a within-subjects factor, was conducted on these data. The analysis revealed a significant conditioning effect, $F(1, 46) = 6.45$, $p = .015$, unmoderated by either task order or type of measure, both Fs < 1.[3] Subsequent t tests indicated that the CS+ was evaluated more positively than the CS− on both the implicit measure (IAT), $t(48) = 2.59$, $p = .007$, and the explicit (paper-and-pencil) measure, $t(48) = 1.92$, $p = .03$. The two measures were correlated significantly, $r(48) = .39$, $p < .01$.

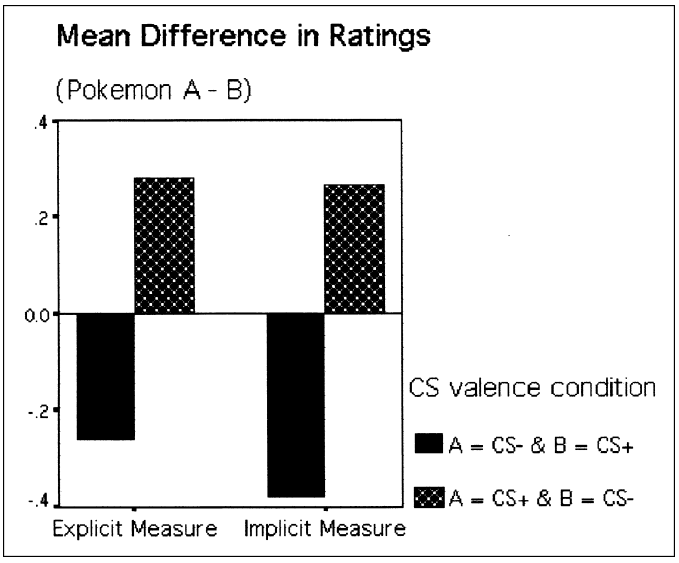

Fig. 1. Mean differences (Pokemon A − Pokemon B) in standardized scores on the implicit and explicit attitude measures by valence of the conditioned stimuli (CSs; A = CS+, B = CS− vs. A = CS−, B = CS+), Experiment 2.

GENERAL DISCUSSION

In Experiment 1, attitudes were conditioned toward novel objects using our newly developed conditioning paradigm. Experiment 2 replicated this finding using an implicit measure of attitude development in addition to the traditional explicit measure. In both experiments, participants remained unaware of CS-US contingencies. These results, along with the subliminal conditioning findings of De Houwer et al. (1997), strongly suggest that attitudes can be conditioned in the absence of contingency awareness.

It is our hope that our successful development of a paradigm in which attitudes are formed implicitly, with no accompanying explicit memory for the CS-US pairings, will invigorate research on classical conditioning as an attitude-formation process. As a whole, the field of social psychology has attended more to questions regarding attitude change, attitude structure and function, and influences of attitudes on judgments and behavior than it has to attitude formation. In fact, in discussing future directions in the study of attitudes, Eagly and Chaiken (1993) referred to the field's current "lack of attention to the developmental issue of how attitudes form and become strong" as a "serious omission and limitation" (p. 681). The implicit learning para-

2. No word that appeared in the conditioning procedure appeared in the IAT.

3. As in Experiment 1, additional analyses revealed no effects for the counterbalancing variable designating which Pokemon was paired with positive versus negative USs.

digm should prove useful in redressing this imbalance, illuminating and testing some fundamental principles regarding the development of evaluative associations.

If classical conditioning is the pervasive source of attitudes that we believe it is, then psychologists' understanding of attitude formation and change stands to gain much from further work on the implicit formation of attitudes. Instead of concerning itself with the question of whether attitudes can be classically conditioned, research can turn to questions regarding the conditions that moderate such implicit attitude formation. Some work has already been done on this front (see Baeyens et al., 1992; Hammerl & Grabitz, 1996a, 1996b; Kim et al., 1996). For example, one such question centers on CS-US relationships: What makes the most effective US for a given CS? Seligman's (Seligman & Hagar, 1972) preparedness theory suggests that humans may more easily detect some environmental covariations than others (e.g., Öhman & Dimberg, 1978). Work by Hammerl and Grabitz has begun addressing other relevant issues, such as the effects of sensory preconditioning on evaluative conditioning (1996b) and the possibility of evaluative conditioning using haptic stimuli (1996a).

The field has seen more than 40 years of debate regarding whether attitudes can form via classical conditioning without awareness. With an affirmative answer, much needed progress now can be made toward understanding the processes underlying attitudinal conditioning, as well as toward designing more effective marketing, health-promotion, and prejudice-reduction campaigns that utilize some form of classical conditioning.

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