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IMPLICIT ACQUISITION AND MANIFESTATION OF CLASSICALLY CONDITIONED ATTITUDES

Michael A. Olson and Russell H. Fazio
Ohio State University

Evidence for the implicit formation of attitudes via classical conditioning was sought using a recently developed conditioning procedure (Olson & Fazio, 2001) and a subliminal priming technique as the dependent measure. Under the guise of an experiment purportedly about attention and vigilance for target events, participants viewed a series of random images and words interspersed with pairings of novel objects (CSs) and valenced words or images (USs). They were then submitted to an evaluative priming procedure in which the CSs were presented as primes for sub–threshold durations. Conditioning was evident in that participants responded more quickly to target words whose valence matched that of the USs that had been earlier paired with the now subliminally–primed CS.

The attitude construct has probably received more attention than any other in the field, so it is surprising that one of the most important questions that surrounds it—its origins—has been relatively neglected (Eagly & Chaiken, 1993). One oft–mentioned means of attitude formation is classical conditioning—the repeated pairing of a novel object (conditioned stimulus, CS) with negatively or positively evaluated items in one's environment (unconditioned stimuli, US) (see De Houwer, Thomas, & Baeyens, in press, for a review). Through simple

Michael A. Olson, Department of Psychology, Indiana University and Ohio State University, and Russell H. Fazio, Department of Psychology, Ohio State University.

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Correspondence concerning this article should be addressed to Michael A. Olson or Russell H. Fazio, Department of Psychology, 1885 Neil Avenue, Ohio State University, Columbus, Ohio, 43210–1222. E-mail may be sent to either (olson@psy.ohio–state.edu or fazio@psy.ohio–state.edu).

conditioning, novel objects are thought to acquire the valence of objects with which they are repeatedly paired. Lay–persons and scientists alike believe that attitudinal conditioning is ubiquitous in the real world, and that our evaluations of objects ranging from members of various racial and ethnic groups to consumer products may often be the result of classical conditioning. Many current theories of racial prejudice, for example, argue that most white Americans consciously hold egalitarian values, but continue to harbor ill–feelings toward non–whites, partially as a function of these groups' consistent negative portrayal by the media and much of the greater society (e.g., Dovidio & Gaertner, 1998). Intuition alone may be acceptable evidence among many laypeople, but does the empirical evidence required for social scientists to feel the same confidence in conditioned attitudes exist?

Early work was encouraging. Staats and Staats (1958) are credited with ushering in attitudinal conditioning work in social psychology, as were Levey and Martin (1975) in human learning. Both paradigms made use of repeated pairings of attitude objects with positively or negatively evaluated word (Staats & Staats) or image CSs and USs (Levey & Martin). Staats and Staats presented national names (e.g., "Swedish") on a screen while reading aloud words, and found that the national name paired with positive words was subsequently evaluated more positively than the national name paired with negative terms. Levey and Martin presented participants with pairs of paintings, some of which participants had previously evaluated neutrally (which served as CSs), and some of which had been evaluated positively or negatively (which served as USs), and found further evidence for conditioning in the evaluations that participants provided, after the conditioning procedure, of the originally neutral paintings.

Unfortunately, later work was more discouraging. Soon after attitudinal conditioning research began attracting attention (e.g., Page, 1969, 1974) and continuing to the present (e.g., Field, 2000; Field & Davey, 1998; Shanks & St. John, 1994), critics have questioned both the validity and the generality of attitudinal conditioning findings. Page (1969, 1974) raised the possibility that attitudinal conditioning effects might be the result of a demand artifact, and provided a convincing demonstration of this argument by asking some participants in a typical conditioning experiment to report an evaluation of the CS that was opposite from the experimenter's expectations. Participants who were asked to do so actually reported a more negative evaluation of CSs paired with positive

items, and more positive evaluations of CSs paired with negative items, showing that they were aware both of the CS–US contingencies and the experimenter's goals.

More recent work has successfully reduced the transparency of the conditioning procedures, and, hence, the likelihood that demand artifacts can account for attitudinal conditioning effects (e.g., Baeyens, Eelen, & Van den Bergh, 1990; De Houwer, Hendrickx, & Baeyens, 1997; Krosnick, Betz, Jussim, Lynn, & Stephens, 1992; Stuart, Shimp, & Engle, 1987). But the role of awareness in attitudinal conditioning is still a contentious issue in that there is heated debate about what participants need to attend to for conditioning effects to obtain (Field, 2000; Field & Davey, 1998; Hammerl, 2000; Shanks & St. John, 1994). Some researchers argue that awareness of CS–US contingencies is a minimal necessity, and, in fact, several studies have shown successful conditioning only among participants who were aware of these contingencies (Allen & Janiszewski, 1989; Cohen, 1964; Insko & Oakes,1966; Shimp, Stuart, & Engle, 1991).

The awareness issue, whether it be an awareness of the experimenter's motives or the contingencies that one observes, has critical implications for the prevalence of attitudinal conditioning as a means of attitude development. An apparent attitude brought about through a demand artifact would not be considered a genuine attitude at all, and any experiment characterized by a potential demand artifact would be less than convincing evidence that attitudes can be classically conditioned. And, if attitude development through classical conditioning occurred only when participants were aware of CS–US contingencies, then the role for conditioning as a means of attitude development would be severely limited; only when one happened to consciously notice a given object's repeated pairings with some other valenced objects would attitudes toward the object be affected.

The strongest case for the existence of attitude development through classical conditioning would entail change in evaluations of the CS in the complete absence of awareness of the CS–US pairings. Olson and Fazio (2001), capitalizing on recent advances in implicit learning in the cognitive literature (e.g., Chun & Jiang, 1999; Lewicki, Hill, & Czyzewska, 1992; Reber, 1967; see Seger, 1994, for a review), recently developed a paradigm that sought to provide just this evidence. Participants were led to believe that the experiment was about "attention and rapid responding" to target events in the environment, and were asked to play

the role of a security guard engaged in surveillance. In five separate blocks, they were shown a stream of unrelated words and images on a computer screen, sometimes presented alone and sometimes in pairs, interspersed with several blank trials that served to reduce the appearance of any rhythmic pattern to the presentation. The participant's task was to be vigilant for a target item that was presented randomly several times throughout the course of each block, and press a response key as quickly as possible whenever it appeared. CS–US pairs were systematically interspersed throughout each block, where one CS was paired with positive items, and another with negative items. To reduce the likelihood that participants would become aware of the pairings, several positive and negative USs were employed, and each appeared only once throughout the procedure. All targets and CSs were various, lesser-known Pokémon™ cartoon creatures.

In Experiment 1 of the Olson and Fazio research, the conditioning procedure was followed by a test of explicit memory for the CS–US pairs. Participants were told that several of the items they saw may have appeared together more than once. They were shown a variety of item pairs, including some actual CS–US pairs and some filler items that had appeared together as many as 15 times, and made estimates as to whether the items appeared together. No evidence of awareness was found for either the CS–US pairs or for the filler items; recognition performance did not exceed chance levels. Participants also were presented with and evaluated several of the images they had seen earlier, including the two CSs, on a rating scale. A clear conditioning effect was found: participants evaluated the CS paired with positive items more favorably than the CS paired with negative items.

Olson and Fazio reasoned that if conditioned attitudes are acquired through an implicit learning mechanism, then participants should show evidence of such conditioning even when their attitudes are measured implicitly. Hence, in a second experiment, they employed a recently developed implicit measure of attitudes, the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998), as an additional dependent measure. The IAT measures the associative strength between constructs by mapping four categories of objects onto two response keys. Stronger associations are reflected in participants more easily (and hence more quickly) assigning two of the four categories to the same response key compared to when the two categories are assigned to a different response key. In our case, two of the categories were the positive CS

and the negative CS (the Pokémon™ Shelder and Metapod, counterbalanced) and the other two were clearly pleasant and unpleasant words (e.g., "love" and "bombs"). Participants categorized exemplars of the four categories as they were presented sequentially on the screen. In some blocks, the positive CS and "pleasant" were assigned to the same response key (and the negative CS and "unpleasant" were assigned to the same response key), and in other blocks the mappings were reversed. Conditioning was evident in that participants were quicker to categorize the exemplars when the positive CS and pleasant items were assigned to one key, and the negative CS and unpleasant items were assigned to another key than when the positive CS and unpleasant items were assigned to the same key (and hence when the negative CS and pleasant items were assigned to the same key). That is, participants responded more quickly when the recently acquired valence of the CS matched the valence of the pleasant and unpleasant keys.

These experiments, then, offer evidence that attitudes can form implicitly via classical conditioning—awareness of the CS–US pairings does not appear to be necessary for the effect to emerge. However, while the measure of awareness of the conditioning process used in Olson and Fazio's research instills confidence that the *learning* was implicit, we are less certain of the implications of the dependent measures used. Each dependent measure involved at least some awareness of the attitude, which leaves an important issue to be addressed.

The nature of the dependent measures used in Olson and Fazio's research leaves open the possibility that conscious consideration of one's evaluation of the CSs was required for the evaluative associations learned during the conditioning phase to consolidate into a detectable attitude. Consider the case of a participant being presented with the explicit measure of his or her attitude toward a CS. The person was faced with the question, "Do I like or dislike this Pokémon™?" Presumably, affective associations toward the CS acquired during the conditioning phase would have been activated in response. Upon the participant's becoming aware of these affective reactions, the feelings may have had a direct effect on the participant's explicit ratings. Alternatively, or in addition, the affective responses may have influenced the overt ratings indirectly. The source of these affective associations was unknown to the participant, so he or she may have experienced only some vague "hunch" about the Pokémon™, with no real "reason" for liking or disliking it. It may be that the image of the Pokémon™ was studied in search of

some justification for the affective responses it activated (Croizet & Fiske, 2000), and an evaluation consistent with the affective responses was arrived at through a cognitization of the attitude object. In either case, the requirement to evaluate the CS would have prompted the participant to consolidate affective information about it, leaving the possibility that the he or she never would have gone from "vague affective responses" to a reportable evaluation without the consolidation process prompted by the attitudinal inquiry.

Indeed, previous research (Fazio, Lenn, & Effrein, 1984) has found attitudes toward novel objects to develop in response to direct queries about one's attitude. The question itself appears to prompt individuals to consider any evaluation–relevant information they have in memory regarding the object (e.g., affective reactions) and then to consolidate that information into an attitude. Participants who were forced to consolidate their attitudes by virtue of the need to complete an evaluative questionnaire were later faster at indicating their attitudes than were participants in a no–consolidation control condition (see Carlston & Skowronski, 1986, for similar evidence in the domain of impression formation). So when asked to consider their evaluations of novel objects, people do the necessary cognitive work in order to arrive at summary evaluations. In Olson and Fazio's first experiment, attitudes toward the CSs may never have consolidated without the prompt provided by the explicit measure. This possibility seems especially likely given the fact that whatever evaluation–relevant information participants had was unconsciously acquired—to participants, the object was still relatively novel, and there was no reason to form an evaluation of it one way or another until they were explicitly asked to do so. Thus, the explicit measure could have actually affected the representation of the attitude, prompting it to develop when it might not have otherwise.

The IAT findings, on the other hand, indicate that evaluative associations acquired through implicit classical conditioning can be detected on an implicit measure, that is, they affect the latencies with which categorization judgments can be made. As we will argue next, however, these findings may not rule out the possibility that a similar consolidation process was prompted through the course of performing the IAT, thus affecting the representation of the attitude.

The research mentioned earlier on attitude formation (Fazio et al., 1984) also investigated the conditions under which individuals spontaneously form attitudes even when not explicitly required to do so. The

findings indicate that individuals consolidate relevant information into an attitude when they perceive some functional value to having available a summary evaluation of the object. After brief experiences with novel objects, individuals developed attitudes in response to such cues as an expectation of future questioning about the attitude objects or an expectation of future interaction with the objects. When later participating in a speeded evaluative judgment task, individuals who had received either of these cues were just as fast at indicating their attitudes as individuals who had been earlier forced to consolidate their thoughts and feelings about the object by the need to a complete an evaluative questionnaire about the object. Moreover, participants who believed that they would either be interacting with the attitude object or would be asked about their opinions of it were significantly faster at making evaluative responses than those in a no consolidation condition in which neither a cue nor a questionnaire had been presented. Thus, relevant contextual cues can prompt individuals to engage in much the same attitude formation process as when they are directly instructed to do so. Without a cue to form an evaluation of a novel object, it appears that a summary evaluation may not develop, despite the fact that one might have evaluation–relevant information about the object available in memory.

The IAT context may have provided just such a cue, prompting participants to actively consider their evaluations of the Pokémon™ CSs. The IAT forces one to categorize target objects (in our case, the CSs) in a context involving the classification of other clearly valenced objects into "pleasant" and "unpleasant" categories. Assigning the CSs to the same response key as positively and negatively valenced items may have served as a contextual cue that encouraged individuals to consider how they might evaluate the Pokémon™ characters, even though the task itself does not require such evaluative expressions. In effect, seeing a particular Pokémon™ assigned to the same response key as the category "pleasant" or "unpleasant" may prompt the question, "Do I like or dislike this Pokémon™?" It is possible that any valenced associations involving the CSs would not have affected performance on the IAT if it had not been for this contextual promotion of active evaluation. Merely seeing, prior to the onset of the combined task, that the same response key signified one of the Pokémon™ characters and "pleasant" or "unpleasant" may have prompted participants to consider their attitudes toward the Pokémon™. Thus, the IAT instructions and context may have in-

duced an attitudinal consolidation process that would not have otherwise occurred.

We have argued that attitude consolidation can occur not only when people are directly asked about their attitudes, but also when they are provided with much subtler cues to consolidate. If prompting people to consider their evaluations of the CSs causes attitudes that might not have otherwise developed to consolidate, then how might we avoid these prompts? One way to ensure that such cues are not available is to obscure the very presence of the attitude object at the time of attitude measurement. Subliminal priming measures of attitudes do just this, and are ideally suited to show implicit development of attitudes through classical conditioning while ruling out the possibility that consideration of one's attitude toward the object is a requirement for the attitude to manifest itself.

A subliminal priming measure suits this purpose because participants are not only unaware that their evaluations of the CSs are under scrutiny, but in fact they are completely unaware of the presence of the CSs in any form during the evaluation procedure. As a result, the possibility that the process of attitude assessment itself affects the formation of attitudes toward the CS can be effectively ruled out. Indeed, sensitivity to attitudes formed via implicit classical conditioning on a subliminal priming measure would provide the strongest evidence to date that a given attitude can develop and operate entirely unconsciously, with no intervening conscious consideration of the evaluative associations to the attitude object.

Priming measures of attitudes (including subliminal priming) operate under the assumption that participants will be relatively faster to identify a positive adjective as such when it follows a positively evaluated prime, and relatively faster to identify a negative adjective as such when it follows a negatively evaluated prime (Greenwald, Draine, & Abrams, 1996; Greenwald, Klinger, & Liu, 1989; see Fazio, 2001, for a review). In the experiment reported here, we predicted that, following the implicit classical conditioning procedure, participants would be relatively faster at identifying the connotation of adjectives preceded by evaluatively congruent subliminal primes (CSs). That is, the subliminally presented CSs should facilitate responding to adjective that match the valence of the USs with which they had been earlier paired.

METHOD

PARTICIPANTS

Fifty–seven undergraduate females at a large midwestern state university participated for course credit. Of these, two were omitted from analyses for failing to follow instructions.

PROCEDURE

For the conditioning phase, participants were assigned to individual cubicles, within which were computer monitors and response boxes. They were told that the experiment was about "attention and rapid responding," and were asked to "play the role of a security guard, watching for deviant activity at a place of business." Participants were shown five blocks of 86 trials each of a series of randomized images (e.g., an image of an airplane, umbrella, and glass of milk) and words (e.g., "soft", "concrete," and "book"). Some of the items were presented alone, and some were presented in pairs. Trial length was set at 1.5 seconds (with a 0 second intertrial interval), producing a block length of a little over 2 minutes. In a given block, 16 of the "items" were blank screens, leading to a less rhythmic appearance of the items. The participant's task was to press a response button whenever a target item appeared. Within any given block, targets appeared 10 times (5 images and 5 words), sometimes alone and sometimes with other filler images. Targets consisted of Pokémon™ cartoon creatures (both images and words), and each block was assigned a different target (none of the targets served as CSs). Participants were provided with the target images and names of targets on paper, and were instructed to pay attention at all times and to focus on the screen in order to quickly and accurately identify the targets when they appeared.

Systematically interspersed in each block were eight CS–US pairs,

1. US items were preselected based on norms provided by Ito, Cacioppo, and Lang (1998) in the case of images, and pre-testing in our lab in the case of words.

2. Target adjectives consisted of clearly valenced positive and negative adjectives (e.g., "wonderful," "horrible") selected from pilot tests from our lab. None of the targets presented in the priming phase had been presented during the conditioning phase.

four containing the CS paired with positive USs, and four containing the CS paired with negative USs. These pairs consisted of simultaneous presentations of one of the two CS Pokémon™ (the names "Metapod," or "Shelder," or a color image of the Pokémon™ with its name printed below), and a number of either positively or negatively valenced words (e.g., "awful, "exciting") and images (e.g., a cockroach, a hot fudge sundae).[1] A total 20 CS–US pairs were presented through the course of the conditioning procedure for each CS Pokémon™. Whether Metapod or Shelder had been assigned to positive versus negative USs constituted one independent variable.

After the conditioning procedure, participants were escorted to another area of the lab where they were to take part in a second, unrelated study on word meaning identification, which was, in fact, the subliminal priming measure of attitudes. Participants were seated in individual cubicles containing PC work stations and response boxes, and were told that they would be identifying the connotation of words presented on the screen. The video cards and monitors were set at a screen refresh rate of 72 Hz (resulting in a single screen refresh cycle of 14 ms). Each trial began with a pre–mask consisting of a string of alphanumeric characters, that appeared on the screen for 4 refreshment cycles (56 ms), followed immediately by the prime–the name of one of the two CS Pokémon™ ("Shelder" or "Metapod"). The prime appeared for 2 screen refreshment cycles (28 ms), and was followed by the same alphanumeric string, which served as a post–mask, for three refreshment cycles (42 ms). Ninety–eight milliseconds later, a target adjective appeared, to which participants responded by pressing a key labeled "good" if the word had a positive connotation, and a key labeled "bad" if the word had a negative connotation.[2] They were instructed to respond as quickly and accurately as possible. The presence of the pre– and post–mask alphanumeric string was justified by telling participants that the string

3. A pilot study that mirrored the present one, with the exception that instead of the names of Pokémon™, the names of 16 objects (e.g., "puppies, "snakes") were presented as primes, indicated no awareness of the presence of primes on the part of participants. In the pilot study, participants were told that a prime had been presented for a very short duration on each trial, and were asked to select from a list of words (half of which were actually presented) which had appeared as primes. An index of hits (correctly selecting a prime) – false alarms (incorrectly selecting a foil) was computed for each participant, which, across all 54 participants, did not differ from zero, t (53) < 1; (M = .35, SD = 2.67).

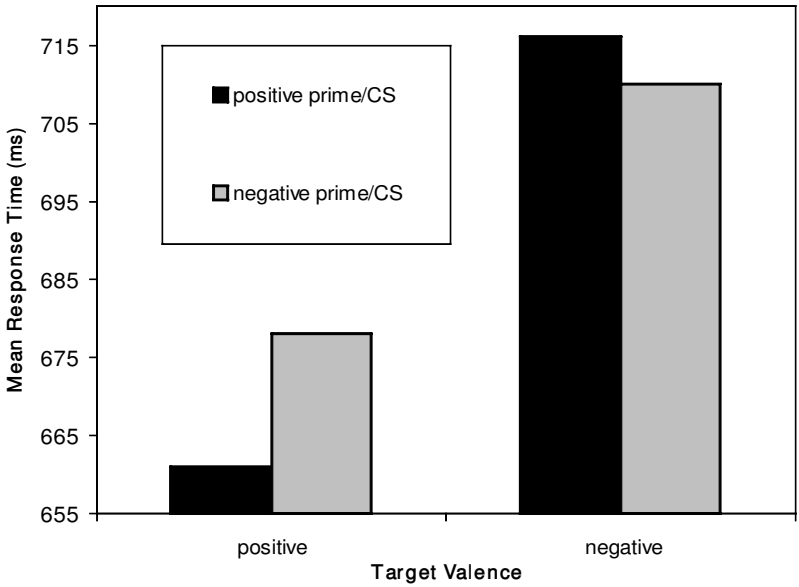

FIGURE 1. Response latencies to target adjectives as a function of CS valence and target valence.

of characters was intended to be a warning signal that a target word was about to be presented.[3]

Participants first completed a practice block of 16 trials with no primes. They then completed two blocks of 32 trials each. Within each block, the 2 CSs were presented 16 times each, followed by one of 16 positively and 16 negatively valenced target adjectives. The presentation of all items was randomized for each participant.

After the priming phase, participants completed a post–experimental questionnaire designed to assess their awareness of both the systematic CS–US pairings in the conditioning phase, and the presence of the primes in the priming phase. Participants were then debriefed, thanked, and dismissed.

RESULTS

Response latencies to the priming task were aggregated across the CS

prime (Metapod and Shelder) and the valence of the target for each participant. Because these values exhibited a normal distribution, all analyses were conducted on the raw latencies. These latencies were then submitted to a 2 (Pokémon™ US assignment: Metapod–positive & Shelder–negative vs. Metapod–negative & Shelder–positive) × 2 (Prime: Metapod v. Shelder) × 2 (Target valence: positive v. negative) ANOVA, with repeated measures on the latter two factors. This analysis revealed a main effect of target valence (F (1,54) = 30.56, $p < .001$), where positive target adjectives were responded to more quickly than negative target adjectives. More important was the emergence of the 3–way interaction, F (1, 54) = 4.62, $p = .04$, indicating that response latencies to positive versus negative targets varied as a function of which prime had been presented and whether that Pokémon™ had earlier been paired with positive or negative USs. Collapsing across the Pokémon™ US assignment variable, the 2–way, Prime (positive vs. negative CS) × target valence interaction confirming a conditioning effect was observed, F (1, 55) = 4.76, $p = .03$ (the relevant means are displayed in Figure 1). Participants were relatively faster to respond to positive targets following the CS prime that had been paired with positive items in the conditioning phase (M = 661 ms, SD = 124) compared to the CS prime that had been paired with negative items (M = 678 ms, SD = 142), and they were relatively faster to respond to negative targets following the CS prime that had been paired with negative items during the conditioning phase (M = 710 ms, SD = 134) compared to the CS prime that had been paired with positive items (M = 716 ms, SD = 129). In short, participants responded more quickly when the target valence matched the valence of the USs with which the CSs had been paired.

On the post–experimental questionnaire, no participant indicated awareness of the primes. Specifically, and corroborating results from the pilot study (see footnote 3), no one reported that they noticed the presence of a word between the pre– and post–masks. There also was evidence of only minimal awareness of the systematic CS–US pairings during the conditioning phase. Participants were explicitly informed that there was more to the experiment than "attention and rapid responding," and were then asked to respond to progressively more direct questions pertaining to the CS–US pairs. To the first question, "Did you notice anything unusual about the items that were presented [during the conditioning phase]?" no participant showed any awareness. Participants were then asked, "Did you notice anything unusual about the

items that were presented with the Pokémon™ Shelder and Metapod?" When provided with this more specific prompt, six participants reported accurately that they had noticed that either Shelder or Metapod had been presented with items with either a positive or a negative valence. It is important to note that this awareness only came after it was suggested that there was more to the experiment than they were told, and that there was something unusual about the items presented with the CSs in particular. Thus, the six participants who accurately mentioned the CS–US pairs did so only after they were encouraged both to recall the specific items presented with the CSs, and to make inferences about what might be "unusual" about these items. In any case, omitting these participants had no impact on the pattern or the significance of the conditioning effect for the 3–way interaction, F (1, 47) = 5.06, p = .03, or the 2–way, Prime × Target valence interaction, collapsed across the Pokémon™ assignment condition, F (1, 48) = 5.24, p = .03. Hence, evidence for conditioned attitudes was found without participants' awareness that these attitudes had been either acquired or measured.

DISCUSSION

Participants viewed a random series of images interspersed with CS–US pairs of which they were unaware, and showed evidence of implicit attitude formation using a subliminal priming measure. That they were unaware of both attitude acquisition and measurement provides perhaps the strongest evidence to date that attitudes can form unconsciously through classical conditioning.

It is important to note that the subliminal priming measure used in the experiment reported here did not require any conscious construal of the attitude object on the part of participants. Previous research has typically enlisted either traditional explicit measures of attitudes, or (in the case of Olson & Fazio, 2001), the IAT. The former require that participants consciously consider their evaluation of the attitude object, and the latter, as we argued earlier, has the potential to cue such active consideration. Hence, the past work is open to the possibility that active construal of the object along an evaluative dimension is a prerequisite for implicitly formed attitudes to manifest themselves. Our subliminal priming measure did not require any construal of the attitude object–indeed, it did not even require that one be consciously aware of the pres-

ence of the attitude object–and therefore provides a more stringent demonstration of implicit attitude development.

Not only does the subliminal priming measure suggest that participants need not engage in any conscious construal of the attitude object in order for attitudes to form, it also suggests that these unconsciously formed attitudes can operate unconsciously. Research by Bargh and colleagues (1996) provides potent evidence or the unconscious operation of goals and motives. For example, they subliminally primed participants with stereotypes of the elderly, and later recorded the time they took to walk down the hall to the elevator, ostensibly after the session's completion. Participants primed with the elderly stereotype walked more slowly, even though they were not primed with anything directly implying slowness or weakness (see also Dijksterhuis, Aarts, Bargh, & van Knippenberg, 2000; Dijksterhuis & van Knippenberg, 1998). Similarly, in the present case, subliminal presentation of the CSs revealed evidence of the CSs' earlier associational history.

Future research should investigate the question of implicit attitude formation and potential change in such important social domains as those involving attitudes toward African–Americans, the elderly, and other historically disadvantaged groups. For now, we can conclude that attitudes toward novel objects can form through classical conditioning in the absence of consciousness, and that the entire process–from acquisition to manifestation–can occur without ever consciously considering the attitude object, or the attitude toward it.

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