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# IMPLICIT AND EXPLICIT ATTITUDES TOWARD CIGARETTE SMOKING: THE EFFECTS OF CONTEXT AND MOTIVATION

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Two studies examined the effects of context and motivational state on two implicit measures of attitudes toward smoking (priming [Fazio, Jackson, Dunton, & Williams, 1996] and the Implicit Association Test [IAT; Greenwald, McGhee, & Schwartz, 1998]) as well as on explicit attitudes among nonsmokers and smokers. The priming measure was sensitive to changes in the salience of different aspects of smoking and to changes in motivational state (nicotine deprivation). There were only modest relations between explicit and implicit attitudes, and the two implicit measures were generally uncorrelated. These results have implications for the complexity and ambivalence of attitudes toward smoking held by smokers and for interventions that seek to change their attitudes and smoking behavior.

The attitude construct has arguably been the central construct for social psychologists over the past 50 years. Understanding how and why people evaluate objects and how attitudes relate to behavior have been primary goals. The assumption that attitudes are reliable predictors of behavior was shared by theorists and researchers until questions began

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findings that are relevant to the current study. First, self-reported urges are generally uncorrelated with psychophysiological measures (Drobes & Tiffany, 1997; Niaura et al., 1992). This suggests that explicit (self-reported) and implicit attitude measures might be unrelated. Second, different psychophysiological reactions are observed toward different smoking-related cues, for example to viewing an experimenter handling a cigarette versus viewing an experimenter smoking a cigarette (Niaura et al., 1992). This suggests that smoking is a complex attitude object, and there may be different attitudes to different smoking-related cues. Finally, reactivity to smoking cues may be magnified by nicotine deprivation (Baker et al., 1987). Thus, smokers may have different implicit attitudes toward smoking in nicotine-deprived versus nondeprived states.

In sum, the current research had four major goals. First, we explored whether attitudes (both implicit and explicit measures) vary with changes in situational context and motivational state. Second, we examined the relation between two different implicit measures of attitudes toward smoking—the priming method and the IAT. Third, we examined the relation between these two implicit measures and explicit measures of attitudes. Finally, we examined the relation between attitudes (both implicit and explicit) and smoking status.

## STUDY 1

The goal of this study was to test whether scores on the implicit measures would vary for two different aspects of the smoking experience. To do this, we compared responses to pictures highlighting the sensory aspects of smoking (e.g., pictures of cigarettes burning in an ashtray) with responses to pictures of packages, cartons, and store displays of cigarettes, which highlight the economic aspects (cost) of the cigarettes and the health implications of smoking (because of the salience of the Surgeon General's Warning on the packaging).

We also examined the relations between two different implicit measures—the priming methodology and the IAT procedure. The priming procedure assesses the degree to which evaluative responses that are automatically activated by a priming stimulus affect the speed of categorization of subsequently presented positive and negative adjectives (Fazio et al., 1996). For example, if an individual has a positive attitude toward the prime, this will speed up categorizing positive adjectives as positive and slow down categorizing negative adjectives as negative (relative to baseline response times to categorize adjectives in the absence of a prime). The IAT (Greenwald et al., 1998) employs a dual categorization procedure in which one of the categorizations involves a discrimination

of positive and negative words and the other categorization involves a discrimination of two objects (e.g., white and black faces). In one case, one of the attitude objects (e.g., black faces) shares a response key with positive words, while the other attitude object (e.g., white faces) shares a response key with negative words. In the other case, these pairings are reversed. The difference in latency to respond is used as an indicator of the relative positivity of black versus white faces.

## PARTICIPANTS

Participants were 61 introductory psychology students at Indiana University who participated for course credit. To be eligible, participants had to report smoking at least one cigarette per day (8.9% smoked at least a pack per day). Sixty-two percent of participants were female and the mean age was 19.2 years. Four participants were eliminated due to high (greater than 25%) error rates on the priming task, and three statistical outliers detected by exploratory analyses were deleted, leaving a total of 54 participants for the analyses.<sup>1</sup>

## METHOD

### STIMULUS MATERIALS

Stimuli were 16 evaluative adjectives, and 32 digitized photographs showing either babies, insects, cuddly animals, or a cigarette-related picture. There were two types of cigarette-related pictures. One type involved packaging information (e.g., pictures of a cigarette pack or a carton of cigarettes, of commonly smoked nonmenthol and menthol brands). The other type did not have packaging information but highlighted more sensory aspects of smoking (e.g., a cigarette burning in an ashtray, a cigarette being held in a hand).

### PROCEDURES

The experiment was introduced as a study of the effects of regular exposure to nicotine on memory. Upon arrival, participants were ushered into cubicles and seated in front of a computer. After providing informed consent, participants completed a brief inventory, in which they rated their familiarity with several types of objects, including the four

1. One participant was missing data on the priming method due to a computer failure in writing the data file.

\* types (babies, animals, cigarettes, and insects) that were to be used as primes and as category members in the IAT. Next, participants completed the priming task. This task was always presented first because it is believed to be potentially reactive to participants' knowledge of the true purpose of the experiment (Fazio, 2000, personal communication). According to Greenwald, (2000, personal communication), the IAT should not be sensitive to such knowledge.

Participants were told that they were to complete several computer tasks, and were asked to carefully read instructions on the screen before beginning each task. The first task obtained baseline response times for adjectives, in which participants were shown adjectives on the computer screen. Participants were instructed to press the key labeled "GOOD" on the response box if the word had a positive connotation (e.g., fabulous) or to press the key labeled "BAD" if the word had a negative connotation (e.g., rotten). They were told to respond as quickly as possible without making mistakes. Each adjective remained on the screen for a total of 1.75 seconds or until the participant responded. The inter-trial interval was 1.0-second.

The second and third tasks were fillers to bolster credibility of the study description as a memory experiment. In the second task, participants were shown pictures of babies, bugs, animals, and cigarettes (both packaging and sensory aspects) on the computer screen, each for 325 milliseconds. Participants saw a total of eight pictures. This was described as a memory task, and participants were asked to pay attention to the pictures because they would have to identify them from a larger set of pictures in a later task. There was a 1.0-second inter-trial interval.

In the third task, participants were shown a larger set of pictures and were asked to identify the ones they saw in the second task. Participants were shown the same eight pictures they had seen in phase 2 plus another eight distractor pictures. The pictures were shown on the computer screen for five seconds or until the person responded. Participants were told to respond by pressing the key labeled "YES" on the response box if the picture shown was one they had seen in the previous task or the key labeled "NO" if they had not seen the picture in the previous task.

In the fourth task, which served as the priming task, participants saw a picture followed by a positive or negative adjective to categorize. There were four blocks, each with 16 trials. Each picture remained on the computer screen for 315 milliseconds and was immediately followed by an adjective (135 millisecond prime to stimulus interval). Participants were told that the purpose of this part of the experiment was to combine the two tasks in order to see how quickly they could identify adjectives as positive or negative while at the same time they were trying to memorize

pictures shown prior to each adjective. As in the first task, subjects were asked to indicate, by pressing a key on the response box, whether the adjective had a positive or negative connotation as quickly as possible without making mistakes. As with the first task, each adjective remained on the screen for a total of 1.75 seconds or until the participant responded.

Priming scores involved a comparison of the baseline latency of response to the evaluative words and the latency of response to these same words when preceded by pictures of cigarettes in the sensory mode or in the packaging mode. Relative facilitation of latency to positive words as opposed to negative words (compared to their baselines) implies positive attitudes toward cigarettes. Relative facilitation of latency to negative words as opposed to positive words implies negative attitudes. The implicit measure of attitudes consisted of the difference between the amount of relative facilitation of latency to positive versus negative words.

Following the priming tasks, participants completed the IAT (Greenwald et al., 1998). The IAT uses a dual categorization procedure in which one of the categorizations involves a discrimination of positive and negative words and the other categorization involves a discrimination of two objects (here a smoking-related picture vs. a comparison object). The IAT had five phases. The first phase was an attribute discrimination task, in which subjects were shown positive and negative adjectives. Subjects were instructed to respond to the words as quickly as possible by using their right hand to press the "5" key on the number pad (if the word was good) or by using their left hand to press the "a" key (if the word was bad). The word remained on the screen until the participant responded. There were 32 trials with an inter-trial interval of 250 ms.

The second phase was an initial target discrimination task. Participants were shown two types of pictures (one that was normatively attitudinally positive [i.e., either babies or cuddly animals], and one that was normatively attitudinally negative [i.e., cigarette-related stimuli]). Participants were asked to categorize the picture (e.g., as either a baby or a smoking stimulus) by pressing either the right "5" key or the left "a" key. The picture remained on the screen until the participant responded. There were 32 trials with an inter-trial interval of 250 ms.

The next phase was a combined task in which pictures and words alternated. Participants categorized each picture and responded to each word with the same response keys they had practiced earlier. This task should be performed easily (small response latencies) when the same response key is used to categorize a positive target category (e.g., baby, animal) and a positive word. By contrast, the task should be difficult (longer response latencies) when the same response key is used to categorize

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weakly correlated. This is consistent with the findings of other experimenters (Brauer, Wasel, & Niedenthal, 2000; Fazio, 1999). However, the relation between the two measures remains ambiguous because of their low internal consistency (Cunningham et al., 2001). Correlations between implicit and explicit measures were also generally weak (although the priming measure but not the IAT was significantly related to global attitudes). This might be caused by the fact that all participants were smokers, restricting the range of their explicit attitudes. Swanson et al. (2001) also report weak relations between implicit and explicit attitudes toward smoking by smokers.

## STUDY 2

To further explore whether attitudes toward smoking are context-dependent, we performed a study that varied motivational state as a context. To do this, we varied smoking participants' exposure to nicotine (deprivation vs. exposure). Moreover, to further examine whether smokers' attitudes toward smoking were positive or negative, we included nonsmokers as a comparison group. This allowed us to test whether smokers would be relatively more positive toward smoking than were nonsmokers (even if smokers' attitudes were negative in an absolute sense). We expected results that would parallel those of the first study. That is, the implicit attitudes of smokers measured by priming, but not by the IAT, should be affected by the deprivation/exposure manipulation. In addition, the relations between the implicit measures and between the implicit and explicit measures should be weak.

## PARTICIPANTS

Participants were introductory psychology students at Indiana University who participated for course credit. There were sign-up sheets for nonsmokers (have not smoked a cigarette in the past six months) and daily smokers for a study of the effects of nicotine on memory. Smokers were instructed not to smoke for at least four hours before their appointment.

There was a total pool of 299 participants. Twenty-five were eliminated for failure to meet the eligibility criteria (i.e., neither nonsmokers nor daily smokers). Data from 14 participants were not analyzed due to high error rates (greater than 25%) on the priming and/or IAT tasks. Six smoking subjects were eliminated because a bioassay suggested that they had smoked within four hours of their laboratory session. Four smoking subjects were eliminated because they declined to smoke in the "recently exposed" condition. In addition, 13 ex-smokers were elimi-

nated from the nonsmoker group, and exploratory analyses revealed four statistical outliers. Thus, 66 subjects were eliminated, leaving a sample of 233 (33.8% nonsmokers, 39.2% light smokers [i.e., smoke fewer than 15 cigarettes a day], and 27.0% heavy smokers [smoke at least 15 cigarettes a day]). In the samples, 61.3% percent were female, and the mean age was 19.6 years.<sup>3</sup>

## METHOD

### STIMULUS MATERIALS

Stimuli were 16 evaluative adjectives and 32 digitized photographs, showing either babies, insects, cuddly animals, or a cigarette-related picture. These were the same images used in Study 1, with the exception of the cigarette-related pictures, which included only the "sensory" pictures similar to those in Study 1.

### PROCEDURE

Sessions included either all nonsmokers or all smokers. To manipulate the degree of deprivation, we randomly assigned the sessions with smokers (all of whom had not smoked for the last four hours) to one of two conditions. In one condition ("Deprived"), the smokers were given the implicit attitude procedures in their deprived state. In the other condition ("Recently Exposed"), the smokers were asked to smoke a cigarette just before beginning the implicit attitude measures. Participants in this condition were accompanied outside the building where they smoked a cigarette, after which they returned to the laboratory.

Before randomization of smokers (right after participants signed informed consent), we verified their abstinence from smoking using a bioassay (testing for carbon monoxide in expired air using a MicroCO). Participants who scored 15 parts per million of carbon monoxide or higher were presumed to have smoked within four hours and were eliminated from the study ( $N = 6$ ).

In this study, all subjects completed the priming and the IAT procedures using the identical procedures described in Study 1, with one modification to the IAT procedures. In each IAT procedure, prior to each phase that had the combined picture/word task, we included a block of 16 practice trials on the combined task in order to minimize order effects.

3. Two subjects had missing IAT data due to computer malfunctions.

The measures of participants' global attitudes toward smoking were identical to those described in Study 1.

## RESULTS AND DISCUSSION

The most important goal was to determine whether smokers' implicit and explicit attitudes varied as a function of their motivational state (i.e., as a function of nicotine deprivation). We tested this question in a series of 2 (light vs. heavy smoking)  $\times$  2 (deprivation vs. recent exposure) ANOVAs. Results showed significant interactions between smoking level and the deprivation manipulation for the priming measure,  $F(1,152) = 4.78, p < .05$ . Light smokers were more positive toward smoking when they had just smoked a cigarette than when they were deprived, but heavy smokers were more positive toward smoking when they were deprived and more negative when they had just smoked a cigarette (see Table 2). When heavy smokers had just smoked a cigarette, they were even slightly more negative than were nonsmokers (means of 33.62 for nonsmokers and 54.31 for deprived heavy smokers). Thus, when heavy smokers were deprived, they were somewhat positive toward smoking, but when they were satiated they were negative toward smoking.

For the IAT scores, there were no significant effects of the deprivation manipulation either as a main effect or in interaction with level of smoking. Rather, for the IAT, there was only a main effect of smoking level such that light smokers were more negative than were heavy smokers on the IAT composite,  $F(1,150) = 4.08, p < .05$ .<sup>4</sup>

Finally, for explicit attitudes there were no significant effects of smoking level, deprivation, or their interaction (all  $ps > .14$ ). Interestingly, although the effects of the manipulation were not statistically significant for the explicit measure, the pattern of means for heavy smokers was in the opposite direction for the implicit and explicit measures. For the priming measure, heavy smokers became more negative after they had just smoked (even more negative than nonsmokers), whereas heavy

4. We examined the potential effects of order on the results by including order in the ANOVAs for the IAT measures. There was a significant effect of order ( $F$  values ranged from 12.00 to 57.17). There were no changes in the findings when order was included in the analyses. We also tested whether either comparisons between smoking stimuli and any of the individual contrast categories (babies, animals, insects) would show effects of the deprivation manipulation on IAT scores. However, none of these components of the composite IAT score showed effects of the manipulation.

TABLE 2. Mean Implicit and Explicit Scores among Smokers and Nonsmokers in Study 2

	Deprived		Recently Exposed		
	Light	Heavy	Light	Heavy	
Measure of Attitude	(N = 47)	(N = 36)	(N = 46)	(N = 27)	Nonsmokers (N = 79)
Implicit measures					
Priming measure	25.30	-7.10	5.84	54.31	33.62
IAT composite	45.34	-7.25	54.52	21.53	103.72
Explicit measures					
Attitudes toward the act	2.99	3.02	3.20	2.88	4.52

Note. High scores indicate negative attitudes toward smoking.