

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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to arise about the true relation between attitudes and behaviors (LaPiere, 1934; Minard, 1952; Wicker, 1969).

This challenge to the centrality of the attitude construct stimulated many researchers to study why attitudes do not always predict behavior. The answers were many and diverse. Many variables moderate the attitude-behavior relation, including the strength of normative beliefs (Ajzen & Fishbein, 1973), the accessibility of the attitude (Snyder & Kendzierski, 1982), the match of specificity in the measures of the attitude and the behavior (Ajzen & Fishbein, 1977), the extent to which the attitude is based on indirect versus direct experiences with the object (Fazio & Zanna, 1981), the consistency of the affective and cognitive components of the attitude (Norman, 1975), the degree to which the attitude is clearly defined (Fazio & Zanna, 1978), and the level of dispositional self-monitoring (Snyder & Swann, 1976).

Another factor that affects our ability to predict behavior from attitudes is the extent to which we can adequately measure attitudes. It has been recognized for many years that paper and pencil measures of attitudes have problems of validity (Rosenberg, 1969; Webb, Campbell, Schwartz, & Sechrest, 1966). Evaluation apprehension and social desirability can lead to reports of attitudes that do not represent true underlying feelings. Thus, for many years, social psychologists have been calling for more unobtrusive measures of attitudes. Suggestions have been made for the use of physiological measures of attitudes (Cacioppo & Petty, 1987) or for the use of a bogus pipeline procedure where participants are deterred from acting on concerns about social desirability (Jones & Sigall, 1971). The underlying idea behind these methods is that there is a true attitude, and if we could only assess this core attitude without the biasing effects of measurement or motivational factors, we would be able to predict behavior toward the attitude object with great accuracy.

This focus on more unobtrusive measures of attitudes has increased in recent years based on the distinction between explicit and implicit measures of attitudes (Banaji & Greenwald, 1994; Greenwald & Banaji, 1995). Explicit or conscious measures are direct and depend on both the ability of a person to accurately assess his/her attitude and the willingness to report this attitude to an experimenter. It is clear that people can be unaware of their true attitudes (Greenwald & Banaji, 1995) and also that they may be hesitant to reveal certain attitudes, especially attitudes involving sensitive social issues. Implicit measures, on the other hand, involve judgments that are under the control of automatic activation of the attitude (Fazio, Jackson, Dunton, & Williams, 1996), where there is no awareness that the attitude is being expressed. One often-expressed presumption underlying implicit measures of attitudes is that introspection

and motivational concerns will not influence the measures. This presumption suggests that measurement of implicit attitudes will tap into some core attitude that will be manifest in the same way across different motivational states and contextual stimuli.

It is well-known that explicit measures of attitudes are responsive to changes in context and motivation (Bem, 1967; Salancik & Conway, 1975). However, parallel information about the context-dependence of implicit measures is just beginning to emerge. Based on the conceptualizations of implicit attitudes, it might be hypothesized that they are not affected by changes in context. However, the idea that implicit attitudes are unaffected by contextual changes has been challenged recently (Banaji, 2001; Mitchell, Nosek, & Banaji, 2001). The responsiveness of implicit attitudes to changes in context and motivational state is a main focus of the current research.

Implicit measures have proven to be very useful in assessing attitudes toward a variety of social objects including racial groups, gender, and the self. Importantly, studies that employ both implicit and explicit measures of attitudes often report disjunctures between them (Banaji & Greenwald, 1994; Banaji & Hardin, 1996; Brauer & Wasel, 1998; Greenwald, McGhee, & Schwartz, 1998; Rudman, Greenwald, Mellott, & Schwartz, 1999) and find that the implicit measures are far better predictors of subsequent behavior (Fazio et al., 1996). However, other recent work suggests that the relationship between implicit and explicit measures can be quite strong (Cunningham, Nezlek, & Banaji, 2001; Lepore & Brown, 1997; Lemm & Banaji, 1999; Nosek, Banaji, & Greenwald, 2002a, 2002b; Wittenbrink, Judd, & Park, 1997). Cunningham, Preacher, and Banaji (2001) have shown that, once corrections for internal consistency are made, implicit and explicit measures are significantly correlated, although they do not form a single factor. A goal of the present studies is to address further this issue of the relation between implicit and explicit measures of attitudes. Moreover, we examine the relation between two methods of assessing implicit attitudes that have been particularly important in recent years, a priming procedure (Fazio et al., 1996) and the Implicit Association Test (IAT; Greenwald et al., 1998).

The current studies address these questions as they apply to cigarette smoking, which is a particularly interesting application for several reasons. First, cigarette smoking is of public health importance because it is the single, largest preventable cause of mortality and morbidity in the U.S. (USDHHS, 1994). Attitudes toward smoking have been an important area of research because many antismoking campaigns (both prevention and cessation programs) include attitude change interventions. Second, because smoking has become a socially sensitive behavior, the measurement of attitudes toward smoking by explicit scales presents

problems. In recent years, surveys of adults (USDHHS, 1994) and young adults (Johnston, O'Malley, & Bachman, 1997) indicate that the majority of individuals disapprove of smoking behavior. Because of its stigma, the measurement of traditional explicit attitudes toward smoking is threatened by social desirability response biases. Individuals may under-report their "true" positive feelings about smoking because of evaluation apprehension, or alternatively, the need to bolster and justify their behavior may lead smokers to over-exaggerate positive feelings about smoking.

Given its social stigma, implicit measures may be a particularly useful way to assess attitudes toward smoking. This has been shown for other forms of substance use. Stacy (1997) found that an implicit (but not an explicit) measure of marijuana expectancies prospectively predicted college students' marijuana use. In contrast, for alcohol use (a less stigmatized behavior), both implicit and explicit measures were predictive (Stacy, 1997). Swanson, Rudman, and Greenwald (2001) suggest that stigmatized behaviors such as smoking may be unique in terms of implicit attitudes. They report that smokers bolster their explicit attitudes toward smoking so that these explicit attitudes are consistent with their smoking behavior. However, smokers are not able to bolster their implicit attitudes, and these implicit attitudes are more negative toward smoking and are not consistent with their smoking behavior or with attitudes measured explicitly. Thus, stigmatized behaviors may not show the same relations between implicit and explicit attitude measures or between implicit measures as do nonstigmatized behaviors. The current study used both implicit and explicit measures of attitudes toward smoking and tested whether the same differences between smokers and nonsmokers that have been observed for explicit measures (on which smokers are significantly more positive) would also be seen for implicit measures. We also examined the within-participant correlations between implicit and explicit measures.

In addition to social desirability concerns, smoking is a behavior for which attitudes may be extremely complex, and smokers may hold ambivalent attitudes about smoking behavior. Smokers must perceive themselves as enjoying some benefits from smoking (if only the benefits of reduced craving) because they continue to engage in this behavior. However, the majority of smokers also have negative feelings about smoking and wish they could quit (Institute of Medicine, 1994; USDHHS, 1994).

If smokers have complex, ambivalent attitudes toward smoking, this has important implications for clinical treatment (i.e., smoking cessation interventions). First, clinicians could not rely on traditional paper and pencil measures to provide an assessment of smokers' attitudes toward

smoking. Second, clinicians could not assume that smokers who seek treatment or who express negative attitudes have a commitment to stop smoking. More thorough assessment and more therapeutic emphasis on attitudinal ambivalence might be required. As described in "stages of change" models (e.g., Prochaska, DiClemente, & Norcross, 1992), clinicians might have to engage in attitude change interventions to help smokers resolve their ambivalence.

Fortunately, both social psychological research with general population samples and treatment experience with clinical populations (particularly substance abusers and those with eating disorders) suggest that ambivalent attitudes do not necessarily produce failure in attitude change interventions. In fact, ambivalent attitudes may produce a state of discomfort that motivates individuals to seek information to resolve their ambivalence (Hodson, Maio, & Esses, 2001). To be effective, clinical interventions would have to work with these ambivalent attitudes. For example, Shaffer and Simoneau (2001) criticize existing substance use treatments for too often ignoring clients' ambivalence because of their commitment to a "bottom line" of rapid behavior change. They propose a "resistance reduction" model in which clinicians help clients exercise their ambivalence without holding an investment in client change, and they suggest that the focus should be on exploring the decision making process. Similarly, Vitousek, Watson, and Wilson (1998) suggest that ambivalence plays a pivotal role in the treatment of eating disorders, and that clinicians should follow a similar process of exploring the pros and cons of the status quo as well as the pros and cons of behavior change with their clients. Thus, as these examples suggest, a better understanding of smokers' attitudes toward smoking can provide important directions for smoking cessation treatments.

Smoking is also a potentially useful behavior in which to observe variations in attitudes across situational contexts. Smoking involves sensory experience, monetary costs, health risks, social responses to one's smoking, etc. Presentations of different stimuli that make salient different aspects of smoking might produce different explicit and/or implicit attitudes.

Smoking also allows for the examination of variability in attitudes as a function of motivational state. Because smoking is an addictive behavior that involves dependency and craving (USDHHS, 1994), varying the state of nicotine deprivation may produce motivational changes that lead to variations in implicit or explicit attitudes toward smoking. There is a growing literature that measures reactivity to smoking-related cues among smokers who are in varying states of deprivation (Baker, Morse, & Sherman, 1987; Drobles & Tiffany, 1997; Niaura, Abrams, Pedraza, Monti, & Rosenhow, 1992). Studies in this area have produced several

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.¹

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

a positive target category (e.g., baby, animal) and a negative word. The stimuli remained on the screen until the participant responded. There were 33 trials with an inter-trial interval of 250 ms.

The fourth phase repeated phase 2 (just categorizing pictures), but the right- and left-hand responses were reversed. Except for the reversal of the response key, all methods were identical to phase 2. The fifth phase was another combination task. It was identical in procedure to phase 3, except that the right and left responses were reversed for categorizing the pictures. This reversed the pairings of pictures and adjectives.

Each participant went through these five phases twice—once comparing smoking with either cuddly animals or babies (half of the participants saw cuddly animals and half saw babies) and once comparing smoking with insects. The comparison of smoking to insects always followed the comparison of smoking to a positive object.

Across participants, half had the initial combined Picture/Word task with compatible responses (i.e., with a shared response key for positive words and the normatively positive category, which was either babies or cuddly animals) and then the second combined task using incompatible responses. The other half had the reversed order of response pairings.²

Greenwald et al. (1998) calculate IAT scores by using the difference in latency between one dual categorization pairing and another dual categorization pairing. For example, consider an IAT task in which the two types of pictorial stimuli to be responded to on different response keys are pictures of cigarettes and babies. The other categorization for this task would be the use of these response keys for distinguishing between good and bad words. In this IAT task, the important difference in latency would be between times to respond when cigarette and “bad” share a response key and baby and “good” share a response key (presumably a compatible categorization task) compared to when cigarette and “good” share a response key and baby and “bad” share a response key (presumably an incompatible categorization task). Averaging these scores across all target and comparison stimuli produces an overall implicit attitude score. We used this composite score to derive an overall attitude score toward smoking. However, in order to investigate differences in response to sensory vs. packaging stimuli, we also computed latency dif-

2. To examine potential order effects, we performed a 2 (order) \times 2 (packaging vs. sensory stimuli) ANOVA on the IAT score. As is often found for the IAT (Greenwald, personal communication), there was a significant main effect of order ($F(1,52) = 11.17, p < .01$). However, there was no interaction ($F < 1.0$) between order and type of stimulus, suggesting that order effects did not influence the test of implicit attitudes toward packaging versus sensory stimuli.

ference scores based only on the sensory and packaging stimuli. As recommended by Greenwald et al. (1998), for each task the first two trials were eliminated to allow for adaptation to the task; latencies under 300 milliseconds were re-coded to be equal to 300 milliseconds and latencies over 3,000 milliseconds were re-coded to equal 3,000 milliseconds.

After the IAT, participants completed self-report questionnaires about their smoking behavior and explicit attitudes. These items were from our ongoing longitudinal study of cigarette smoking (Chassin, Presson, Sherman, Carty, & Olshavsky, 1984; Chassin, Presson, Rose, & Sherman, 1996). Explicit attitudes toward smoking were measured with a three-item semantic differential instrument in which participants indicated whether smoking was nice versus awful, pleasant versus unpleasant, and good versus bad. Responses were on five-point Likert scales. Internal consistency (coefficient α) was .69 and .89 in Studies 1 and 2 respectively.

RESULTS AND DISCUSSION

The first goal of this study was to determine whether implicit attitudes would vary as a function of highlighting the sensory experience of smoking versus packaging information. Results of a 2 (type of implicit measure—priming vs. IAT) \times 2 (type of stimulus—sensory vs. packaging) ANOVA using standardized scores showed a significant interaction between the type of implicit measure (priming vs. IAT) and type of stimulus (packaging vs. sensory, $F(1,52) = 7.11, p < .01$). For the priming method, there were significant differences between attitudes toward the sensory stimuli and the packaging stimuli, $F(1,52) = 6.70, p < .02$, such that attitudes were positive to the sensory stimuli (mean = -27.01) and negative to the packaging stimuli (mean = 43.27). For the IAT method, there were no significant differences in attitudes toward the two types of stimuli (means of -13.00 and 10.91 for sensory and packaging conditions respectively, $F < 1$). (Note that negative scores represent positive attitudes.)

Next, we examined relations between the two implicit measures (see Table 1). In general, the priming and IAT measures were only weakly correlated (correlations ranged from -.11 to .11). Finally, we examined the relations between the implicit and explicit measures (see Table 1). For the priming method, there was a modest but significant relation of sensory stimuli with global attitudes toward the act of smoking ($r = .27, p < .05$). Those with the most negative implicit attitudes also held the most negative attitudes toward the act of smoking. There were no significant correlations between implicit and explicit attitudes for the IAT.

TABLE 1. Correlations among Implicit and Explicit Measures of Attitude toward Smoking for Study 1

Measure of Attitude	1	2	3	4	5	6	7
Implicit							
1. Priming/Packaging Stimuli	—						
2. Priming/Sensory Stimuli	-.13	—					
3. Priming (total)	.59**	.72**	—				
4. IAT/Packaging ^a	.11	-.02	.07	—			
5. IAT/Sensory	-.04	-.11	-.11	.36**	—		
6. IAT (total)	.11	.02	.11	.51**	.61**	—	
Explicit							
7. Attitudes toward the act	.08	.27*	.27 ⁺	.18	-.08	.12	—

Note. Higher scores indicate negative attitude toward smoking. *Ns* = 53–54 for correlations with priming measure and IAT composite. ^aIAT data are collapsed over packaging and sensory stimuli because they did not significantly differ. ⁺ $p < .10$. * $p < .05$. ** $p < .01$.

These brand versus packaging results suggest that the implicit attitudes of smokers toward smoking as measured by a priming technique are context-dependent. Although their attitudes toward smoking stimuli were rather positive when those stimuli represented sensory aspects of smoking, these attitudes were negative when the smoking stimuli depicted brands and packaging. Such a result might indicate that smokers have different attitudes toward different aspects of smoking. "Smoking" is a complex, general attitude object, and attitudes toward different aspects of this complex object might well differ. Perhaps the sensory pictures might represent the taste and stimulation that a smoker gets from inhaling a cigarette. On the other hand, the packaging pictures may represent the economic costs of smoking or the health consequences, given that the Surgeon General's Warning appears on packaging. These different attitudes toward different aspects of smoking are likely to lead to an overall ambivalent attitude of smokers toward smoking such that smokers hold both positive and negative attitudes toward smoking at the same time.

Why did the salience of the sensory versus the packaging aspects of smoking affect only the priming implicit measure but not the IAT implicit measure? This may be related to the different response requirements of the two methods. Although these two methods are similar conceptually, there are also some important differences. The priming procedure depends on the automatic accessibility of attitude valence. Responses are automatic and not subject to conscious control. If the activated attitude is positive (as in the case of sensory aspects of smoking for smokers), there will be facilitation for the categorizing of positive words and inhibition for the categorizing of negative words. If the automatically activated attitude is negative (as in the case of packaging information for smokers), there will be inhibition for the categorizing of positive words and facilitation for the categorizing of negative words.

The IAT procedure, on the other hand, has a conscious, controlled component. The participant consciously tries to arrive at a strategy for the dual categorization task. "How can I represent cigarettes and good adjectives together?" "How can I represent cigarettes and bad adjectives together?" Because of the ambivalent attitudes of smokers toward cigarettes, they can arrive at a strategy to do either. This would be true regardless of the salience of the specific aspect of smoking. Perhaps it is this conscious categorization aspect of the IAT that renders it unaffected by changes in context. Also, smoking is a stigmatized behavior. As our theorizing and the results of Swanson et al. (2001) suggest, implicit attitudes toward stigmatized objects may be unique. Contextual effects may be more observable in IAT responses for objects that are not stigmatized.

The priming and IAT measures of smoking attitudes were only

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.³

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, $F(1,150) = 4.08, p < .05$.⁴

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 17.00 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

Measure of Attitude	Deprived		Recently Exposed		Nonsmokers (N = 79)
	Light (N = 47)	Heavy (N = 36)	Light (N = 46)	Heavy (N = 27)	
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.

smokers became (nonsignificantly) more positive after exposure on the explicit measure.

We then examined the correlations between the two implicit measures, and between implicit and explicit measures across the total sample. As in Study 1, the two implicit measures were not significantly correlated ($r = .04$). We also correlated the two implicit measures separately for each condition and smoking status (i.e., separately among nonsmokers and among heavy smokers and light smokers in the deprived and exposed conditions). There was only one significant correlation. Priming and IAT scores were positively correlated among heavy smokers in the exposed condition ($r = .44, p < .05$; the other correlations ranged from $-.18$ to $.06$).

Next, we examined the correlations between the explicit and implicit measures. The priming score was uncorrelated with explicit global attitudes ($r = .01$), but the IAT was significantly related to global attitudes ($r = .30, p < .01$). Those with more positive attitudes on the IAT had more positive explicit attitudes toward smoking. We examined these correlations separately for nonsmokers and for heavy and light smokers in the exposed and deprived conditions. The only significant correlation was between the IAT and explicit attitudes among nonsmokers, who should experience no ambivalence ($r = .23, p < .05$; the other correlations ranged from $-.16$ to $.19$).

Finally, we compared smokers and nonsmokers in their implicit and explicit attitudes. Smokers and nonsmokers did not significantly differ on the priming measure (means of 33.62 for nonsmokers and 17.11 for smokers, $t(228) = 1.09$). Because the priming score varied for deprived and exposed conditions, we also compared the nonsmokers' priming score to each of the four smoking groups (heavy and light smokers under exposed and deprived conditions). None of these four comparisons revealed any significant differences between nonsmokers and smokers on their priming scores (t values from $-.66$ to 1.75 , all $ps > .10$).

However, smokers and nonsmokers did significantly differ on their IAT scores. Smokers (mean = 31.49) were significantly less negative toward smoking than were nonsmokers (mean = 103.72) on the IAT score ($t[228] = 4.18, p < .001$; note that higher scores indicate more negative attitudes). This was also true comparing nonsmokers to heavy and light smokers in the exposed and deprived conditions separately (t values from 1.96 to 4.35, p values from $.06$ to $.01$).

Smokers were also significantly more positive than were nonsmokers in their explicit attitudes toward smoking (means of 4.52 for nonsmokers and 3.04 for smokers, $t(228) = 16.02, p < .001$). This was also true when nonsmokers were compared to the heavy and light smokers in the de-

prived and exposed conditions separately (t values from 9.25 to 12.14, all $ps < .01$).

Results of Study 2 thus indicated that implicit attitudes toward smoking when assessed using priming, but not IAT, were sensitive to motivational context (i.e., sensitive to the manipulation of nicotine deprivation). These results are parallel to those of Study 1. Again, it may be the conscious categorization component of the IAT procedure that causes it to be unaffected by changes in motivational state. Smokers can find the same mnemonic strategies to pair smoking with good or bad adjectives regardless of their state of deprivation because of the ambivalent nature of their attitudes. The two implicit measures were uncorrelated, and the IAT was more correlated with explicit attitudes and with smoking behavior than was the priming measure.

GENERAL DISCUSSION

The current research had four major goals. First, we asked whether attitudes (both implicit and explicit) varied with changes in situational context and motivational state. Second, we examined the relations between the priming and IAT measures. Third, we examined the relation between implicit and explicit measures. Finally, we examined the relation between smoking status and attitudes toward smoking (both implicit and explicit measures). We will discuss each question in turn.

CONTEXT DEPENDENCE OF IMPLICIT ATTITUDES

The major question of the current research concerned the stability of implicit attitudes over situational contexts (i.e., stimuli highlighting different aspects of smoking) and motivational state. It has been empirically demonstrated that explicit measures of attitudes are subject to contextual and motivational factors (Bem, 1967; McConnell, Liebold, & Sherman, 1997; Salancik & Conway, 1975). This, in fact, has been one argument for the development of implicit measures. The assumption is that implicit measures will be more robust across contextual and motivational factors and will reveal some core, "real" underlying attitude. More recently, however, it has been argued and demonstrated that implicit measures are, in fact, responsive to context (Banaji, 2001; Mitchell et al., 2001).

Our results showed sensitivity to context and motivational factors, although this was confined to the priming method. In Study 1, smokers had more positive implicit attitudes toward stimuli depicting the sensory aspects of smoking than to stimuli depicting packaging information. In Study 2, heavy smokers who had just smoked a cigarette had sig-

nificantly more negative implicit attitudes than did those who were nicotine deprived. In Study 1, this might reflect the fact that the different stimuli made salient different aspects of smoking—either the positive sensory experience or the negative aspects of economic cost and health warnings. In Study 2, the increased negativity among heavy smokers who had just smoked might reflect their negative feelings about engaging in a socially undesirable behavior or negative feelings about their dependence on cigarettes. Such negative feelings have been reported after a “slip” or relapse among those who are attempting to quit smoking or to stop engaging in other addictive behaviors (Marlatt & Gordon, 1985). It is also possible that, for heavy smokers, one cigarette was not enough to satisfy their craving, and this led to an especially negative implicit attitude. In addition, deprivation may make salient the sensory aspects of smoking, whereas satiation makes salient the health consequences of smoking.

These findings are inconsistent with the notion that there is a single core implicit attitude toward an object and that only explicit attitudes are context-dependent. Fazio (1989) has conceived of attitudes as associations between an object and an evaluation. He has recognized, however, that any attitude object can be categorized in multiple ways. Each categorization can bring with it its own implicit affective association. In any specific situation, cues may prompt identification of the object in one or another category, and only the affect associated with that category will be activated. These alternative attitudes toward the same object can be activated spontaneously as the object is categorized in one way or another, depending on the contextual cues available. Indeed, recent work by Smith, Fazio, and Cejka (1996) and by Mitchell et al. (2001) supports the prediction that different categorizations of the same object can lead to very different attitudinal responses.

Why is the priming method responsive to changes in context and motivation whereas the IAT measure is stable over these manipulations? One possibility, raised earlier, is that, whereas the priming procedure involves the automatic accessibility of attitudes and is not subject to conscious control, the IAT has a conscious strategic component. That is, participants try to arrive at a strategy or mnemonic device that will allow the same response to two different stimuli.

In the case of cigarettes as an object, smokers can associate cigarettes with positive words based on their own attachment to cigarettes and the pleasure that they get from smoking. They can also associate cigarettes with negative words based on their knowledge of the generally negative societal feelings about smoking and based on the health risks and costs of smoking. Changes in context or motivational state may not interfere with the use of these conscious strategies, and thus neither context nor

motivational state will affect attitudes toward smoking measured by the IAT. It is possible, however, that if the conscious strategic component of responding to the IAT was eliminated, contextual and motivational effects on smoking attitudes might be observed. For example, performing the IAT while under cognitive load might eliminate conscious considerations, bringing the responses under automatic control.

A second consideration is that attitudes of smokers, but not nonsmokers, toward smoking are ambivalent. Smokers have positive associations with smoking, but also negative associations. The ambivalence is based, in part, on the stigmatized nature of smoking. As Swanson et al. (2001) have discussed, stigmatized objects may be unique in their associated implicit attitudes. The mix of positive and negative evaluations may render changes in context and motivation less effective. People do not easily bolster implicit attitudes toward stigmatized objects or behaviors (Swanson et al., 2001), and this prevents the representation of a simple positive or negative attitude.

RELATIONS BETWEEN PRIMING AND IAT

Consistent with previous literature (Brauer et al., 2000; Fazio, 1999), our data showed only modest relations between the two implicit measures. The two measures may actually assess somewhat different aspects of underlying attitudes. Fazio's (1989) approach has always emphasized the importance of the accessibility of attitudes, whereas the IAT may reflect attitude extremity. However, the low internal consistency (particularly of the priming measure) precludes definitive interpretation of the relation between the two measures.

THE RELATION BETWEEN ATTITUDES AND SMOKING BEHAVIOR

The present findings are consistent with a large literature that shows nonsmokers to be more negative toward smoking than are smokers when assessed with traditional paper and pencil explicit measures (USDHHS, 1994). In the current studies, nonsmokers demonstrated this negativity on implicit measures as well. Parallel to the findings for explicit measures, the IAT significantly distinguished between nonsmokers and smokers, such that smokers always had more positive attitudes on the IAT than did nonsmokers. Interestingly, Swanson et al. (2001) reported significant differences between smokers and nonsmokers on the IAT, but only when pictorial stimuli were used (as in the present studies) rather than when verbal stimuli were employed. However, it is also noteworthy that smokers' implicit attitudes toward smoking were gen-

erally negative in the absolute sense (i.e., scores above zero). This was true in all cases except when heavy smokers were deprived or when smokers were responding to pictures representing the sensory aspects of smoking. This might suggest that the positive aspect of smokers' attitudes involve the sensory features of smoking.

The implicit attitudes of smokers measured by the priming method appear to be particularly complex and ambivalent. These attitudes varied from quite negative to positive. In particular, negative attitudes of smokers emerged with the priming methodology in Study 1 when the priming stimuli involved packaging information, and in Study 2 when heavy smokers had recently smoked a cigarette. These cases may highlight negative aspects of cigarette smoking. Taken together, these findings reveal that smokers have negative and/or ambivalent attitudes toward smoking that cannot be detected with traditional paper and pencil measures.

The complexity of smokers' implicit attitudes has important implications for smoking cessation interventions. First, clinicians may be less able to rely on simple paper and pencil measures for understanding clients' attitudes toward cessation. Second, interventions that fail to address this attitudinal ambivalence may fail because movement toward behavior change will activate the other side of the ambivalent attitude. Recent stages of change models (e.g., Prochaska et al., 1992) as well as recommendations stemming from clinical experience in the treatment of addictive behaviors (Shaffer & Simoneau, 2001) and eating disorders (Vitousek et al., 1998) suggest that clinicians must help their clients resolve attitudinal ambivalence in order to accomplish successful behavior change. Tourangeau, Rasinski, Bradburn, and D'Andrade (1989) suggest that making salient one particular side of an ambivalent attitude is an effective way to achieve attitude change. Others (Shaffer & Simoneau, 2001; Vitousek et al., 1998) suggest that clinicians must help clients exercise both sides of the ambivalence in order to achieve resolution. Thus, clinicians are already acquainted with the complexities of ambivalent attitudes within the larger domain of psychotherapy and behavior change. The current findings place cigarette smoking attitudes and behavior change within this same context.

Recent social psychological evidence is also consistent with the importance of attitudinal ambivalence in the process of attitude change. Maio, Bell, and Esses (1996) demonstrated that people with ambivalent attitudes exhibited more systematic processing of persuasive messages pertaining to the attitude object. With regard to the importance of attitudinal ambivalence specific to smoking, Lipkus, Green, Feaganes, and Sedikides (2001) found that smokers who felt more ambivalent about their smoking (compared to those who were positive about their smok-

ing) reported a greater desire to quit and were more motivated to take steps to quit. Thus, the ambivalence that we observed in our implicit measures is likely to be important in many aspects of smoking, including reactions to persuasive messages and smoking cessation.

THE RELATIONS BETWEEN IMPLICIT AND EXPLICIT ATTITUDES

As in previous studies of implicit attitudes (Brauer & Wasel, 1998; Fazio et al., 1996; Rudman et al., 1999), the overall correlations between implicit and explicit measures were generally weak. However, other research has reported stronger relations between implicit and explicit measures (Nosek et al., 2002b; Wittenbrink et al., 1997). The clearest conclusion that can be drawn is that relations between implicit and explicit attitudes are systematic but weak, supporting the notion that these different kinds of measures tap different aspects of attitudes. With explicit measures, people may not be aware of their true attitudes, and these measures also contain problems of evaluation apprehension and social anxiety.

One reason that we observed weak correlations between our implicit and explicit measures might have to do with the stigmatized nature of smoking. Swanson et al. (2001) suggested that the relation between implicit and explicit measures is moderated by the stigmatization of the target behavior. In their research, smokers bolstered their explicit attitudes, rendering these attitudes consistent with their smoking behavior. However, they were not able to bolster their implicit attitudes, and thus there was a disjuncture between the implicit attitudes on the one hand and the smoking behavior and the explicit attitudes on the other hand. In Study 2, we found evidence of similar bolstering in that, for heavy smokers, recent smoking was associated with increases in positive explicit attitudes. After smoking, bolstering might be needed because of the guilt of having engaged in a stigmatized behavior. However, the implicit attitudes of heavy smokers became very negative after smoking, indicating an inability to bolster these implicit attitudes. Thus, implicit and explicit attitudes moved in opposite directions after the exposure manipulation. In conclusion, our findings demonstrate that implicit attitudes, measured by the priming method, are responsive to changes in context and motivational state. Implicit measures of attitudes may be particularly useful in understanding attitudes and the attitude-behavior relationship when the target object is stigmatized and attitudes are ambivalent. Clinically, smoking cessation interventions may need to recognize the client's attitudinal ambivalence and focus on resolving this ambivalence rather than simply assuming a shared goal and working on behavior

change. If the implicit attitudes of smokers can be changed, this is likely to have effects on their smoking behavior. Recent studies (Chassin, Presson, Prost, Rose, & Sherman, 2001; Fazio et al., 1996) indicate that implicit attitudes can effectively predict behavior. With regard to the IAT, future studies should investigate procedures that might demonstrate the responsiveness of IAT-measured attitudes to contextual and motivational changes. These might include the use of a cognitive load manipulation to prevent the use of conscious strategies.

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