

Implicit Attitudes as Potential Protection From Risky Sex: Predicting Condom Use With the IAT

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The Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998) has become a popular tool for measuring implicit attitudes toward 2 contrasting concepts. In this study, we suggest including a neutral category (trees) to capture implicit evaluations of a single target attitude object. Using such a technique to measure implicit attitudes toward condoms, we predicted and found that explicit attitudes were related to intended condom use in situations that allow for controlled and deliberative processing, but implicit attitudes were related to intended condom use when automatic processing presides. Implications for such implicit and explicit attitude-behavior relations are discussed in the context of sexual risk-taking.

Implicit measurement techniques have become very popular in social psychology over the last few years (for a review, see Fazio & Olson, 2003). One such measure that has garnered considerable attention is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). Its influence on the field of psychology is evidenced by numerous recent publications including special editions of two journals (*Journal of Personality and Social Psychology* and *Zeitschrift fur Experimentelle Psychologie*) and the use of the IAT in areas as diverse as stereotyping and prejudice, smoking cessation, and phobia treatment. Although serious questions have been raised about the nature of the IAT (see Brendl, Markman, & Messner, 2001; Karpinski & Hilton, 2001), some research has suggested that the IAT is a reliable measure of implicit at-

titudes (Cunningham, Preacher, & Banaji, 2001) that correlates with attitude-related behavior (McConnell & Leibold, 2001). The goal of this research was to develop a modified version of the IAT that can measure implicit attitudes toward a single target category. Additionally, we wanted to demonstrate the predictive ability of this modified IAT in the domain of condom use.

THE IMPLICIT ASSOCIATION TEST

According to Greenwald et al. (1998), the IAT is a dual categorization tool for assessing people's implicit (non-conscious) attitudes toward various attitude objects (e.g., flowers and insects, Blacks and Whites). The idea behind the IAT is that individuals will be able to pair two concepts onto a single response more easily when those concepts are similar or associated than when they are dissimilar or unrelated.

When measuring attitudes, the concepts include exemplars of the attitude objects and exemplars of attributes (e.g., pleasant and unpleasant words). For example, one of Greenwald et al.'s investigations examined attitudes toward flowers and insects by having participants use the same response key when either the name of a flower (e.g., tulip) or a pleasant word (e.g., love) was presented and a different response key when either the name of an insect (e.g., spider) or an unpleasant word (e.g., cancer) was presented. The time participants took to respond to each stimulus was measured in milliseconds. Participants were able to respond very rapidly on such compatible trials. In contrast, when participants were instructed to use the same response key when either the name of a flower or an unpleasant word was presented and a different response key when either the name of an insect or a pleasant word was presented, they responded much slower. Such incompatible trials take more time because of the incongruence between the attitude objects and their evaluative implications. The IAT effect is computed as the difference between time to respond on incompatible versus compatible trials and, as one would expect, this difference (i.e., the IAT effect) tends to be large and positive when flowers and insects are contrasted, suggesting implicit attitudes that favor flowers over insects.

Important extensions of IAT research have shown that it can be especially helpful when researchers want to assess attitudes that people are unable or unwilling to consciously report, or when their consciously held attitudes are different from those held at the unconscious level. For example, although Whites may explicitly report attitudes toward Blacks that are just as positive as their attitudes toward Whites, assessments of Whites' implicit attitudes with the IAT point to less positive attitudes toward Blacks than Whites (Greenwald et al., 1998; Monteith, Voils, & Ashburn-Nardo, 2001). Importantly, such implicit attitudes have been found to predict actual behavior in relation to Blacks, whereas explicit attitudes did not (McConnell & Leibold, 2001).

However, as explained earlier, the nature of the IAT is such that implicit attitudes toward one attitude object can only be measured relative to attitudes toward another attitude object (e.g., attitudes toward Blacks relative to attitudes toward Whites). This necessity of a contrasting category can be a limitation of the IAT when one seeks to measure attitudes toward a single attitude object (Greenwald, 2001). As Nosek and Banaji (2002) stated, "The IAT requirement of the presence of a second attitude object directly in the measurement context constrains interpretation of the effect to the particular comparison object present in the context" (p. 6).

MEASURING IMPLICIT ATTITUDES TOWARD SINGLE ATTITUDE OBJECTS

Recently, Nosek and Banaji (2001) developed a categorization task similar to the IAT that purports to measure implicit

attitudes toward a single object independent of any contrasting categories. The Go/No-go Association Task (GNAT) relies on signal detection theory by requiring participants to respond when critical target and attribute exemplars are presented (i.e., a "go" response) and not respond when distracter exemplars are presented (i.e., a "no-go" response). For example, across several trials participants are presented with a variety of stimuli (e.g., pleasant words, unpleasant words, Black faces, and White faces) and instructed to respond (a go response) only when presented with a Black face or an unpleasant word (thus pairing a target concept and an attribute with the same response key) and not respond (a no go response) when White faces or unpleasant words are presented. Nosek and Banaji argued that a computation that incorporates response latencies and error rates provides a measure of implicit attitudes toward the target concept (in this case, negative attitudes toward Blacks). Additional GNAT administrations with varied instructions can provide independent measures of implicit attitudes toward other contrasting target concepts (e.g., positive attitudes toward Whites). Indeed, across several studies the GNAT was successfully able to differentiate favorable attitudes toward a positive target and unfavorable attitudes toward a negative target. Interestingly, however, measures of implicit attitudes as captured by the GNAT correlated only weakly with implicit attitudes measured via the IAT. Although the authors suggested that these weak associations may be partly due to the generally poor reliability of individual measures, they further speculated that the two measures may be tapping into substantively different features of implicit cognition.

Other lines of research have likewise attempted to assess implicit attitudes toward a single attitude object by using variations on the IAT that preserve the dual-categorization nature of the task. Brendl et al. (2001) developed an IAT that used an attitude object of interest (e.g., insects) as one target concept and nonwords (e.g., gize) as the contrasting category. When participants were performing the categorization task, they were instructed to categorize the individual exemplars as either pleasant or unpleasant and as either insects or nonwords. However, one problem with this strategy is that less familiar stimuli are often associated with less favorable evaluations (Zajonc, 1980). Therefore, to the extent that differences in familiarity (and thus valence) exist between insect names and nonwords, any attempt to measure attitudes toward only one target concept is likely to be compromised. That is, a traditional IAT score using this paradigm would reflect not only attitudes toward the attitude object of interest (i.e., insects) but also (negative) attitudes toward the less familiar nonsense category. Indeed, contrary to previous research that suggests people have negative implicit attitudes toward insects (Greenwald et al., 1998; Nosek & Banaji, 2001), Brendl et al. (2001) found that implicit attitudes were more positive toward insects than toward nonwords. A better approach to using the IAT to measure attitudes toward a single object might be to in-

clude the target category of interest and a valence-neutral, yet meaningful contrasting category.

Marsh, Johnson, and Scott-Sheldon (2001) attempted to use such an approach. These researchers examined implicit attitudes toward condoms using an IAT that required participants to categorize condom stimuli and neutral objects. More specifically, the target concepts used in the categorization task were condoms or noncondoms, and the individual exemplars were pictures of condoms or pictures of neutral objects (e.g., markers, an antacid package). A problem with this method for assessing implicit attitudes toward a single attitude object is that the target concept that forms the contrasting category (noncondoms) is actually an ill-defined "other" category and does not represent a distinct target concept. That is, although a variety of neutral exemplars were used for the contrasting category of noncondoms, they do not constitute a meaningful and independent target concept beyond not being condoms. This distinction is important given recent research demonstrating that IAT effects emerge based on the evaluative implications of the target concept and not of the individual exemplars (De Houwer, 2001). This research suggests that because IAT performance reflects attitudes toward the target category rather than attitudes toward individual exemplars, use of an ambiguous and heterogeneous target concept (e.g., noncondom) makes interpretation of such measures difficult.

The alternative approach used herein involved an IAT that included the target concept (i.e., condoms) and a distinct neutral contrasting target category (i.e., trees). Using a conceptually distinct valence-neutral contrasting category, a traditionally computed IAT score should reflect implicit attitudes toward only the target concept of interest (i.e., condoms). For example, if people's evaluations of trees are in fact neutral, then we should expect no differences in response latencies for trials when tree exemplars are paired with positive or negative words. That is, although there will likely be some individual variability in response tendencies, overall, people should not be any faster (or slower) to pair *oak* with *happiness* than to pair *maple* with *death*. Because people's attitudes toward the neutral concept are constant, any fluctuations in response latencies should be indicative of differential evaluations of the target concept. Therefore, the systematic differences between positive associations and negative associations reflected in the traditionally computed IAT difference score should provide a measure of implicit attitudes toward condoms only. This can be seen by examining the formula traditionally used for computing IAT scores (Greenwald et al., 1998): $[RT(\text{Condoms/Unpleasant}) + RT(\text{Trees/Pleasant})] - [RT(\text{Condoms/Pleasant}) + RT(\text{Trees/Unpleasant})]$. Rearrangement of this formula demonstrates how, in the case of a neutral category, the IAT effect reduces to differential evaluations of the target concept: $[RT(\text{Condoms/Unpleasant}) - RT(\text{Condoms/Pleasant})] + [RT(\text{Trees/Pleasant}) - RT(\text{Trees/Unpleasant})]$. To the ex-

tent that the neutral category is truly neutral, the latter part of this new equation should be zero.

Although such a computational strategy can be applied to traditional IATs (e.g., Black-White), when the target concepts are similar (racial groups) or the underlying theoretical processes are related (e.g., ingroup favoritism vs. outgroup derogation), it becomes difficult to separate (conceptually and statistically) the various aspects of this IAT formula. Therefore it will be important to demonstrate in this study that there are no differences between participants' positive and negative evaluations of trees.¹ Then, comparisons can be made between the two blocks in which condom-related stimuli are paired with pleasant or unpleasant words. To the extent that participants are faster for one block than the other, the computed IAT difference score should reflect implicit attitudes toward the single target concept condoms.

PREDICTIVE VALIDITY

The predictive validity of our modified IAT was examined in relation to condom use. Given the notorious difficulty associated with using measures of explicit attitudes to predict behaviors related to condom use and HIV prevention (Albarracín, Johnson, Fishbein, & Muellerleile, 2001), developing an effective measure was an important research goal. Previous research on condoms has shown that although people are aware of the health-related advantages of using condoms and often report positive attitudes toward condom use (Fisher, Fisher, & Rye, 1995; Gibbons, Gerrard, Blanton, & Russell, 1998), people nevertheless frequently fail to use them (Keller, 1993). We theorized that this discrepancy may be due to the fact that extant research related to condom use has relied heavily on explicit measures of attitudes. Indeed several researchers have suggested that general models of health-related behavior and, more specifically, research on sexual risk-taking overemphasize the role of the deliberative thinking associated with explicit attitudes (Loewenstein & Furstenberg, 1991; Zimmerman & Vernberg, 1994). The dis-

¹Although important for our purposes, establishing nonsignificant differences between participants' mean latencies for trees + pleasant and trees + unpleasant is a necessary but not sufficient condition for demonstrating true neutrality. Minimal variability around zero for the tree IAT difference score would also suggest similar pleasant and unpleasant evaluations. As might be expected with measurements using response latency, we found considerable variability among participants' implicit associations with trees. However, this does not compromise our argument for computing and conducting analyses with a separate IAT difference score based exclusively on trials with condoms. Such individual difference variability in participants' associations with trees will likely introduce some error variance in any analyses using the condom IAT. However, by establishing no overall mean differences in pleasant and unpleasant evaluations of trees, we can be confident that no systematic variance associated with participants' overall evaluations of trees will influence condom IAT scores. Thus, the condom IAT difference score should provide an accurate representation of participants' implicit evaluations of condoms.

inction between implicit and explicit attitudes is important given recent research suggesting that implicit and explicit attitudes may have different behavioral consequences.

Several social psychological theories maintain that responses (e.g., judgments and behaviors) result from automatically activated attitudes or biases unless one has the motivation and opportunity to override such responses based on one's consciously held attitudes. For example, Fazio's (1990) Motivation and Opportunity as Determinants (MODE) model of attitude-behavior processes makes this argument, which is also inherent in Devine's (1989) conceptualization of the automatic and controlled components of prejudice. Several studies imply that explicit attitudes are most likely to be aligned with responses that involve deliberative processing, whereas behavior will be aligned with automatically activated attitudes or biases under conditions that do not prompt controlled processing (Devine, 1989, Studies 1 and 2; Dovidio, Kawakami, & Gaertner, 2002, Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997²). In other words, automatic processing is the default mode, acting as an "autopilot" of sorts and guiding behavior in accordance with one's implicit attitudes unless an individual is otherwise induced to think more carefully. Previous research has indicated that a shift from automatic to controlled processing can be instigated through the presence of environmental cues that signal the possibility of negative outcomes (e.g., Gray, 1982; Monteith, 1993; Monteith, Ashburn-Nardo, Voils, & Czopp, 2002). For example, one's behavior while driving a car on a nice day may be initiated through mostly automatic processing, but controlled processes are likely to be used while driving during a rainstorm given the increased possibility of accidents.

In the domain of health risks and condom use, we expected a similar relation between explicit and implicit attitudes and subsequent behavior. Explicit attitudes toward condoms were expected to predict intentions to use condoms in situations that elicited controlled processing, but in a situation that involved more automatic processing, we expected implicit attitudes toward condoms to predict condom use. To manipulate whether controlled or automatic processing was more likely in this research, we varied the nature of cues present in a vignette describing a sexual encounter. In the context of sexual scripts and safe-sex behavior, environmental cues associated with an increased risk for contracting HIV such as a less familiar sexual partner and casualness of relationship (Malloy, Fisher, Albright, Misovich, & Fisher, 1997) should instigate controlled processing. As a result, explicit attitudes toward condoms should be activated, and because of their accessibility, they should influence related intentions (i.e., to use condoms). However, in the absence of such environmental cues, explicit attitudes are unlikely to be activated, and one's implicit attitudes are likely to subtly and

perhaps unconsciously influence behavioral intentions. Therefore, we hypothesized that in a "high-cue" sexual situation (i.e., casual sex), explicit attitudes toward condoms will predict intentions to use condoms, but in a "low-cue" situation (i.e., sex with a steady partner), implicit attitudes will predict intentions.

METHOD

Overview

Participants chose one of four dating partners and listened to an audio description of an evening spent with that person. After this description, participants completed measures of implicit and explicit attitudes toward condoms and questions regarding previous condom use. Then, participants chose another dating partner and listened to an audio description of a different evening spent with that person. The audio files described a casual evening with a coworker or a romantic evening with a steady partner, and their order of presentation (first or second) was counterbalanced. After the second social situation, participants completed a second condom IAT.

Participants

One hundred and thirty-two heterosexual students (64 men, 68 women; 64 White, 68 Black) from the University of Kentucky were paid \$25 each for their participation. Potential participants were prescreened to include only those students who were not married or engaged, between 18 and 26 years of age, who had previously engaged in sexual intercourse. Participants were recruited by phone using lists of undergraduate students obtained from the registrar's office. All participants completed the experiment individually.

Materials and Procedure

Participants completed the entire experimental session over the computer using Medialab software (Jarvis, 2000b). As part of a study on social decision making, participants were presented with digital photographs of four attractive same-race members of the opposite sex and asked to choose the one person with whom they would most like to spend an evening. These full-body digital photographs were taken of models identified at a local talent agency. On selection, an enlarged photograph of the selected individual was presented on screen as participants listened to a detailed audio narrative of an evening with that person. The audio file was professionally recorded and saved as a WAV file to accommodate MediaLab. The voice of the narrative, which matched participants' gender and race, described both social situations.

Social situations. Participants were instructed to make a sincere attempt to imagine themselves in the situations de-

²Not all of Dovidio et al.'s (1997) findings were consistent, but the bulk of the findings were consistent with what is being suggested here.

scribed to them. The high-cue scenario ("Happy Hour"; HH) described flirting with a coworker at a bar for several hours after work. The coworker then invites the participant back to his or her apartment for a drink, where they both willingly become more intimate, and eventually have sex. In the low-cue scenario ("Dinner and a Movie"; DM), the participant and his or her girlfriend or boyfriend of 8 months enjoy a meal at a nice restaurant and a movie together. After the movie, the couple goes back to the girlfriend or boyfriend's apartment for a drink, where they both willingly become more intimate, and eventually have sex.

All participants listened to both scenarios, although the order of presentation was counterbalanced. That is, for half of all participants HH was presented first and DM was presented second, and the reverse was true for the remaining half. After each scenario, participants first reported the likelihood that they would have used a condom in the scenario on a 4-point scale ranging from 1 (*very unlikely*) to 4 (*very likely*) and then reported the likelihood that they would have actually had sex on a 101-point scale ranging from 0 (*definitely would not*) to 100 (*definitely would*). As participants were instructed to imagine that they actually had sex in each social situation (as stated by the narrative), participants rated their likelihood of using a condom assuming that they had had sex. The likelihood of having sex measure was included to examine responses from any participants who, despite being told to imagine they had sex in the scenario, still reported they would definitely not have had sex.³

Piloting of scenarios. A pilot study was conducted to aid in the choice of scenarios that varied in their risk (and thus would elicit more or less cues for safe sex). Eighteen participants listened to two of four scenarios. Consequently, some participants heard HH and another scenario that was not chosen for use in the experiment proper; some participants heard DM and another scenario that was not chosen; and some participants heard both HH and DM. Thus, analyses could be done in two ways: as independent groups *t* tests and as paired samples *t* tests. After listening to a given scenario, participants were asked "On a scale ranging from 0 to 100 with 0 being the safest situation you can imagine and 100 being the riskiest, how risky do you think it would have been to have sex without a condom in the scenario?" The between-subject analysis revealed that participants perceived the HH scenario to be more risky ($M = 84.28$, $SD = 26.45$) than the DM scenario, ($M = 43.33$, $SD = 24.60$), $t(17) = 3.96$,

$p = .001$, $d = 1.92$. The same was true in the within-subjects analysis ($M_{HH} = 72.22$, $SD_{HH} = 31.53$; $M_{DM} = 43.30$, $SD_{HH} = 28.72$), $t(8) = 3.44$, $p = .009$, $d = 1.23$.

Condom IAT After listening to a social situation and providing their scenario-related responses, participants completed a condom IAT programmed using DirectRT software (Jarvis, 2000a). Given recent research demonstrating contextual influences on implicit attitudes (Dasgupta & Greenwald, 2001), participants completed the IAT twice (once after each scenario) to test for any potential influencing factors of the two social situations.

In the IAT, participants first categorized 28 adjectives as either pleasant or unpleasant (Block 1),⁴ then categorized 13 condom-related words (e.g., condom, trojan, latex) and 13 types of trees (e.g., oak, maple, pine) as either condoms or trees (Block 2). In Blocks 3 and 4, these tasks were combined, requiring participants to use one response key (e.g., the Z key) to categorize pleasant words and condoms on one side of the screen (e.g., the left side) and another response key (e.g., the number pad 2 key) to categorize unpleasant words and trees on the other side of the screen (e.g., the right side). Block 3 was a practice block, and Block 4 was a critical block for which participants' responses and reaction times were recorded. In Block 5, the response keys previously assigned to trees and condoms in Block 2 were reversed (i.e., if condoms were categorized on the left and trees on the right side in Block 2, condoms were categorized on the right and trees on the left in Block 5). Blocks 6 and 7 combined the tasks of Block 1 and Block 5 such that, for example, participants used one response key to categorize pleasant words and trees and another response key to categorize unpleasant words and condoms. Block 6 was a practice block, and Block 7 was a critical block. The two critical blocks (5 and 7) consisted of 40 trials each, and all other blocks consisted of 20 trials. Within each block, the order of stimuli presentation was randomly determined, but an equal number of exemplars from each category was presented. If an incorrect response was given, an error message of a red X briefly appeared on the screen before continuing to the next trial. There were four IAT order conditions to counterbalance any effects of block sequence (i.e., condoms + pleasant and trees + unpleasant first vs. condoms + unpleasant and trees + pleasant first) and whether pleasant or unpleasant were categorized on the left or the right.

Explicit attitudes and previous behavior. After the first IAT, participants completed a 15-item measure assessing explicit attitudes toward condoms using a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). These items measured participants' perceived difficulty in obtaining condoms (e.g., "It's very embarrassing to buy condoms"), perceived dif-

³Fifteen participants (13 women, 2 men) indicated they definitely would not have had sex in the HH scenario and 1 male participant indicated he would not have had sex in the DM scenario. Analyses comparing these participants with remaining participants indicated no significant differences in IAT score, explicit attitudes toward condoms, or previous condom use. Additionally, as shown in Table 1, there were no significant correlations between likelihood of having sex in a scenario and likelihood of using a condom in the scenario, supporting the notion that participants assumed they would actually have sex when making the likelihood of using a condom rating.

⁴The pleasant and unpleasant exemplars were taken from Greenwald et al.'s (1998) lists.

ficulty in talking about condoms (e.g., "When I suggest using a condom, I am almost always embarrassed"), and beliefs that condoms ruin sex (e.g., "Condoms are uncomfortable for both partners"). These 15 items demonstrated satisfactory reliability ($\alpha = .76$) and were combined to form an overall index. Participants also responded to two questions regarding previous condom use (e.g., "In the last 3 months, how many times have you used condoms when having sex?" and "In the last 3 months, how many times did you have sex without a condom?") that were significantly correlated, $r(113) = -.30, p = .002$. The second question was reverse scored and the two were combined to form an index of previous condom use.⁵

RESULTS

Order and Scenario Analyses

Several analyses were conducted to examine possible order effects of the IAT counterbalancing conditions on IAT performance, social situation order on IAT performance, and social situation order on reported explicit attitudes. As is common with the IAT, there was a significant counterbalancing order effect such that the IAT effect was significantly stronger when participants completed the condoms + pleasant/trees + unpleasant block before the condoms + unpleasant/trees + pleasant block than in the reverse order (see Greenwald et al., 1998). Importantly, there were no significant effects of social situation order on IAT scores, $t(130) = 0.76, p = .45, d = 0.13$. Additionally, situation order did not affect participants' reported explicit attitudes about condoms, $t(130) = 0.21, p = .83, d = 0.04$, or their reports of previous condom use, $t(130) = 0.02, p = .98, d = 0.01$.

Supporting our prediction that the HH scenario would be perceived as riskier than the DM scenario, participants reported that they would be more likely to use a condom during the HH scenario ($M = 3.28, SD = 1.07$) than during the DM scenario ($M = 2.88, SD = 1.14$), $t(131) = 3.12, p = .002, d = 0.27$. Similarly, participants reported that they would be less likely to have sex in the HH scenario ($M = 46.9, SD = 35.7$) than in the DM scenario ($M = 87.1, SD = 19.8$), $t(131) = 13.88, p < .001, d = 1.21$.

There was a main effect of race on explicit attitudes such that White participants ($M = 2.53, SD = 0.58$) had more negative attitudes toward condoms than Black participants ($M = 2.15, SD = 0.56$), $t(130) = 3.80, p < .001, d = 0.66$. Black participants ($M = 7.49, SD = 2.45$) also reported higher rates of previous condom use than White participants ($M = 6.15, SD = 2.91$), $t(130) = 2.65, p = .009, d = 0.50$. There were also main effects of gender such that male participants ($M_{HH} = 71.55, SD_{HH} = 28.02$; $M_{DM} = 91.89, SD_{DM} = 15.66$) were more likely than female participants ($M_{HH} = 23.72, SD_{HH} =$

25.14; $M_{DM} = 82.53, SD_{DM} = 22.30$) to report that they would have had sex in both the HH scenario, $t(130) = 10.33, p < .001, d = 1.81$, and DM scenario, $t(130) = 2.77, p = .009, d = 0.49$. As these were the only significant effects of race or gender, and they did not interact with any other variables, they are not discussed further.

IAT Data Reduction

Following Greenwald et al. (1998) the first two trials in each block were dropped, and all response latencies greater than 3,000 msec or less than 300 msec were replaced by 3,000 msec and 300 msec, respectively. Latencies were log-transformed, and logged latencies were used in all subsequent analyses. For ease of interpretation, however, results are presented in milliseconds.

To obtain an IAT score indicative solely of participants' implicit attitudes toward condoms, four trial indexes were computed. One index combined latencies for trials in which condoms and pleasant words were paired together (i.e., the same key was used to categorize them). A second index combined trials when condoms and unpleasant words were paired together. A third index combined trials for pairing of trees and pleasant words, and a fourth index combined pairings of trees and unpleasant words. As there were strong correlations between the first and second IAT administration for all four trial types (average $r = .59$, all $ps < .001$), latencies for the four types of trials were averaged across both IAT administrations.

Implicit Attitudes

To examine participants' implicit attitudes toward trees and condoms, all four indexes were tested using a 2 (target: condoms or trees) \times 2 (evaluation: pleasant or unpleasant) within-participants analysis of variance. As expected, the Target \times Evaluation interaction was significant, $F(1, 131) = 6.09, p = .015$. To test participants' evaluative tendencies for trees, the trees + pleasant index was compared to the trees + unpleasant index. Consistent with the idea that people do not have strong favorable or unfavorable attitudes toward trees, within-participants analyses revealed no effect of trial type,

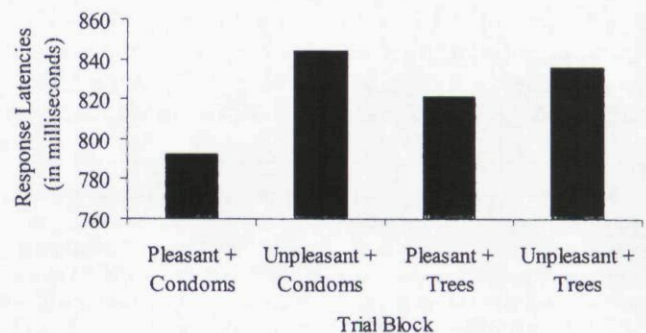


FIGURE 1 Reaction times (in milliseconds) to the four IAT blocks of trials.

⁵Several other questions that were not of interest to this study were also included in this questionnaire (e.g., "In the last 3 months how often did you use marijuana before you had vaginal intercourse?").

$t(131) = 0.59, p = .558, d = 0.05$ (see Figure 1). This indicates that participants responded similarly when exemplars of trees were paired with pleasant and unpleasant words, suggesting that, as expected, the target concept of trees is a neutral category.

In contrast to their evaluations of the category trees, participants' implicit attitudes toward condoms were decidedly not neutral. As shown in Figure 1, participants responded significantly faster when exemplars of condoms were paired with pleasant words than when they were paired with unpleasant words, indicating an overall tendency to have positive implicit attitudes toward condoms, $t(131) = 4.23, p < .001, d = 0.37$. To obtain an individual difference measure of participants' implicit attitudes toward condoms, an IAT difference score was calculated based exclusively on reaction times to these two critical trials (i.e., those involving condom-related words and pleasant or unpleasant words). Latencies from the condoms + unpleasant index were subtracted from the condoms + pleasant index to form an overall IAT score, so that larger IAT scores correspond to more negative implicit attitudes toward condoms.

IAT Scores, Explicit Attitudes, and Condom Use

Means, standard deviations, and intercorrelations of all measured variables are presented in Table 1. As evidence of the construct validity of our alternative IAT, there was a small

correlation between participants' implicit and explicit attitudes, $r(132) = .25, p < .01$. This is consistent with much research demonstrating small yet significant positive correlations between implicit attitudes and self-reported explicit attitudes (see Greenwald & Nosek, 2001). We next examined the relation between implicit and explicit attitudes and participants' reports of previous condom use. Recall our hypotheses that explicit attitudes would be related to condom use in situations that prompt more deliberative thinking (i.e., controlled processing), but implicit attitudes would be related to condom use in situations where automatic processing dominates. Because participants' previous sexual encounters likely included a wide range of situations that involved both controlled and automatic processing, we would expect their ratings of previous condom use to be related to both implicit and explicit attitudes. Supporting this notion, those with negative attitudes toward condoms at both the implicit and explicit level were less likely to report using condoms in previous sexual encounters. Table 2 displays zero-order and partial correlations of participants' implicit and explicit attitudes toward condoms and their responses to the measure of past condom use.

Importantly, implicit and explicit attitudes did diverge somewhat in their relations to condom use in the different social situations provided. Consistent with the idea that explicit attitudes guide behavior when environmental cues prompt more deliberate and controlled processing to avoid negative

TABLE 1
Means, Standard Deviations, and Intercorrelations of Variables

	HH: Use Condom	HH: Have Sex	DM: Use Condom	DM: Have Sex	Previous Condom Use	Explicit Attitudes
HH: Use condom ^a M = 3.28 SD = 1.07						
HH: Have sex ^a M = 46.9 SD = 35.7	-.07					
DM: Use condom ^a M = 2.89 SD = 1.14	.14	-.08				
DM: Have sex ^a M = 87.1 SD = 19.9	-.15	.40*	-.14			
Previous condom use ^a M = 6.83 SD = 2.76	.20*	.03	.43*	-.05		
Explicit attitudes ^b M = 2.33 SD = .60	-.21*	.13	-.13	.11	-.31*	
Implicit Attitudes ^b M = 51.9 SD = 147.4	-.06	.02	-.19*	-.06	-.23*	.25*

Note. HH = happy hour scenario; DM = dinner and movie scenario.

^aHigher ratings indicate that participants were more likely to use condoms/have sex/have used condoms previously. ^bIAT scores and explicit attitudes were calculated such that positive scores correspond to more negative attitudes toward condoms.

* $p < .05$.

TABLE 2
Zero-Order Correlations and Standardized Betas
of Implicit and Explicit Attitudes and Condom Use

	Zero-Order		Beta	
	IAT	Explicit	IAT	Explicit
Previous condom use	-.23**	-.31**	-.17*	-.27**
Condom use: High cue scenario (happy hour)	-.06	-.21**	-.01	-.21**
Condom use: Low cue scenario (dinner & movie)	-.19**	-.13	-.17*	-.09

Note IAT scores and explicit attitudes were calculated such that positive scores correspond to more negative attitudes toward condoms.

* $p < .07$. ** $p < .05$.

outcomes, only participants' self-reported attitudes were significantly correlated with condom use in the Happy Hour scenario, $r(132) = -.21, p = .02$. Participants with more favorable explicit attitudes toward condoms were more likely to report condom use in a situation with strong cues for safe-sex behavior. Further analyses were conducted to test the difference in the strength of the correlations between condom use and implicit and explicit attitudes. Using tests advocated by Cohen and Cohen (1983) that address the within-participants nature of the design, the difference in correlations between condom use and explicit attitudes ($r = -.21$) and implicit attitudes ($r = .06$) was marginally significant, $t(131) = 1.42, p < .10$, suggesting that explicit attitudes were somewhat better predictors of condom use than implicit attitudes in this scenario.

In contrast with high-cue situations, implicit attitudes were expected to be related to condom use in situations in which strong situational cues for risky sex are absent and automatic processing dominates cognition. Supporting this hypothesis, only implicit attitudes toward condoms were significantly correlated with condom use in the DM scenario, $r(130) = -.19, p = .03$. Participants with more favorable attitudes were more likely to report condom use with a familiar dating partner, when cues for safe sex are substantially lower. A follow-up analysis revealed that, although only the correlation between IAT scores and condom use was significantly different from zero, this correlation was not significantly greater than the correlation between explicit attitudes and condom use in the DM scenario, $t(131) = 0.66, ns$.

To examine the unique effects of implicit and explicit attitudes, condom use in the high-cue scenario was regressed on both implicit and explicit attitudes ($R^2 = .05$). The results indicated that explicit attitudes remained significant, $F(1, 131) = 5.60, p = .02, \beta = -.21$, and the effect of explicit attitudes remained nonsignificant, $F(1, 131) = 0.01, p = .94, \beta = -.01$. The interaction between implicit and explicit attitudes was not significant. A follow-up analysis examined the difference between the standardized regression coefficients and indicated that the unique effects of explicit attitudes on high-cue con-

dom use ($\beta = -.21$) were marginally greater than the unique effects of implicit attitudes ($\beta = .01$), $t(131) = 1.51, p < .10$.

Similar analyses conducted examining condom use in the low-cue scenario ($R^2 = .04$) indicated that IAT scores remained marginally significant, $F(1, 131) = 3.50, p = .06, \beta = -.17$, and the effect of explicit attitudes remained nonsignificant, $F(1, 131) = 1.02, p = .31, \beta = -.09$. The difference between these betas was not significant, $t(131) = 0.57, ns$. Again, the interaction between implicit and explicit attitudes was not significant. Collectively, these analyses suggest that research relying solely on explicit attitudes may be only partially explaining the attitude-behavior link for safe sex. Indeed, our research suggests that in sexual situations where the need for condom use is less salient (but potentially just as important), people's implicit attitudes toward condoms may have implications for condom use and HIV prevention.

DISCUSSION

There were two primary goals of this study. First, given the restraints of current applications of the IAT in measuring implicit attitudes toward a single attitude object, we sought to develop a modified version that could accomplish such a task while retaining the conceptual and computational parallels of the IAT. The finding that participants did not differentially associate trees with positive and negative evaluations suggests that trees are perceived as valence-neutral objects. Thus, by including this neutral contrasting category in the traditional dual-categorization IAT, the computed IAT score more accurately reflects one's implicit attitudes toward the target concept of interest.

The second major goal of this research was to demonstrate the effectiveness of such an IAT in a realm with important practical implications by measuring people's implicit attitudes toward condoms and the correlates for healthy, risk-reducing behaviors. Using an experimental procedure that encouraged realistic re-creation of actual social situations, participants imagined an evening in which they had sex with either a steady partner or a casual partner. As expected, explicit attitudes were significantly correlated with participants' reported likelihood of using a condom with a casual partner, a situation where external cues for safe sex should be high. That is, the presence of environmental cues associated with an increased risk of contracting HIV (e.g., a casual first-time sexual partner) should have triggered a shift from automatic to controlled processing. Although our data cannot offer direct evidence of more careful thinking in the high-cue condition, certain findings suggest that this likely was the case. Specifically, our pilot data indicated that participants perceived sex to be riskier in the HH scenario than in the DM scenario, which presumably is why participants reported that they would be less likely to have sex in the former scenario. Previous research has demonstrated that the presence of dan-

ger cues does in fact lead to more careful thinking (Monteith et al., 2002), suggesting that participants in our study likewise recognized such cues and more controlled processing ensued.

In contrast, a sexual situation with a steady partner has relatively weaker cues for condom use. That is, a regular sexual partner (especially within a sustained romantic relationship) is more familiar and thus less likely to be associated with high risk (Malloy et al., 1997). In the absence of any environmental cues associated with the need for safe sex, controlled processing is unlikely to be instigated, and the default mode of automatic processing is likely to persist. As a result, one's implicit attitudes should largely determine behavior. Consistent with this reasoning, when participants imagined themselves in a sexual situation with a romantic dating partner, participants' implicit attitudes were significantly related to their likelihood of using a condom.

This research provides an important extension of previous work attempting to predict safe sex behaviors. Although the majority of research has relied on behavior models that emphasize more deliberate processing and one's self-reported explicit attitudes (Loewenstein & Furstenberg, 1991; Zimmerman & Vernberg, 1994), the research reported here suggests that such reliance may exclude important alternative behavioral antecedents. In particular, one's implicit attitudes toward condoms are related to safe sex behavior in situations where external cues for condom use are less obvious and automatic processing dominates.

One important issue that needs to be addressed is the apparent discrepancy between these findings and those reported by Marsh et al. (2001). In addition to using a modified IAT (recall that their IAT used contrasting noncondom exemplars, but no contrasting category), Marsh et al. hypothesized and demonstrated that participants' explicit attitudes toward condoms predicted steady partner condom use but implicit attitudes predicted condom use among casual partners (although this effect was only significant in analyses when IAT scores were computed based on the first half of trials for all blocks). Although these results may appear dissonant with the findings of the research reported here, an important difference is that participants in the Marsh et al. study reported their past condom use with casual and steady partners rather than imagining themselves in a casual or steady partner situation in the laboratory. Thus, our research and that of Marsh et al. involved very different contexts. Whereas cues signaling possible negative outcomes no doubt were very salient to our participants in the HH casual sex situation, real-world situations in which casual sex occurs (e.g., when one has actually been drinking alcohol) are likely to attenuate attention to cues (Gray, 1982). In other words, our laboratory context afforded a great deal of processing capacity for thinking about the situation that may not be available in actual casual partner situations. Furthermore, when our participants imagined the relatively safe sex situation, there was little reason (even beyond the absence of danger cues) for explicit attitudes to

come to mind. In contrast, people in actual steady relationships (as in the Marsh et al. research) frequently know if and when they will have sex with their partner. Such information allows people to more carefully consider whether they will use condoms with their partners well in advance of the actual sexual interaction. In such premeditated instances, explicit attitudes toward condoms will likely direct behavior. In sum, our social situation manipulation allowed us to examine the effects of the strength of cues for possible negative outcomes, but we are not suggesting that sex with casual and steady partners is typically influenced by the activation of explicit and implicit attitudes, respectively.

Although our investigation was successful in demonstrating the different relations between implicit and explicit attitudes and condom use, there are limitations that need to be addressed in future research. First, our data do not provide direct support for the idea that explicit attitudes are more related to behavior under deliberative processing, whereas implicit attitudes are more related to behavior under more automatic processing. Although our findings are consistent with this possibility, we did not directly manipulate opportunity for controlled processing while keeping scenario constant. Future research should employ a more rigorous experimental design that manipulates such opportunity for controlled processing (cf. Fazio, 1990). Second, the strength of our findings associated with condom use in the social situations were likely attenuated by the inclusion of a single 4-point dependent measure of condom use. With such a restricted range, that we were able to demonstrate a significant relation with the attitude measures is impressive. However, future research should use a more sensitive measure of behavioral intention. With an improved measure, researchers will be better able to evaluate the significance of the differences between correlations of condom use and implicit and explicit attitudes, which did not prove to be significant in our research. Third, as with much research investigating issues as delicate and personal as sexual behavior, we have relied on imagined reactions to hypothetical situations. Research that is able to transcend such analogue procedures and examine actual condom-related behaviors will undoubtedly provide a more accurate reflection of the various cognitive and behavioral relations involved in practicing safe sex. Finally, now that we have suggested that trees may operate as a neutral contrasting IAT category, future research employing this procedure may be able to expand on these findings and further test the conditions under which implicit attitudes may be related to condom use. Continued research on this and other modifications of the IAT will be necessary to compare and contrast their value and pinpoint exactly how and why they may differ in their relations with various criterion variables. Through continued research on the relation between implicit attitudes and behaviors, we may be able to understand more about when such attitudes are likely to offer another (implicit) line of protection from the negative consequences of risky sexual behavior.

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