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Attitudes and the Implicit Association Test

[Special Section: Implicit Prejudice and Stereotyping: How Automatic Are They?]

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Results

Analysis of the Error Rate

Recall that our participants did not receive an error message when they gave an incorrect response. Despite this fact, across both studies the error rate was nearly identical to the error rate of Greenwald et al. (1998)—about 4%. For Study 1a, the data from 1 participant were excluded from all analyses because the participant had an error rate of 26%. With this participant removed, the error rate averaged 4% and ranged from 0% to 11%. For Study 1b, all data were used in the analyses because no participant showed an excessively high error rate. In this study, the error rate on the IAT averaged 4% and ranged from 0% to 10%.

The IAT Measure

In each stage, the relevant target words were each presented four times. However, two of these presentations were practice. Using the nonpractice responses, we computed an IAT score for each participant. To compute this score, we examined the 10 target words for each category within each stage (5 words, each presented twice) and took the median of the response times of those 10 words. We then averaged the median reaction time responses within each stage and subtracted the Stage 3 times from the Stage 5 times.

Alternative methods of calculating IAT scores include the use of truncated means and log-transformed means (see Greenwald et al., 1998). However, a median-based approach has several advantages. First, median-based measures are not sensitive to the skewness of a participant's time distribution at each stage, and they are robust to outliers. As a result, it is not necessary to create arbitrary cut-off points for the exclusion of outlying observations. When medians are used, all original data points may be included in the analysis. Second, because transforming means is a relatively extreme data-analytical technique, it should only be used when alternative methods of data analysis break down. Although the Stage 3 and Stage 5 response times in our studies were skewed, the IAT scores (the difference in the response times at Stage 3 and Stage 5) were not skewed, indicating that a transformation was not necessary. Median-based measures also have the virtue of being easy to interpret. In contrast to transformed means, which must be retransformed for interpretation, median-based scores can be interpreted in their raw form. For all of these reasons, all of the IAT results that are reported in this article were based on medians. However, we also analyzed the data using both log-transformed and truncated means (Greenwald et al., 1998). Except where noted, all three types of analyses yielded similarly significant results.

The IAT scores for each stage are listed in Table 1. In both Studies 1a and 1b, participants' IAT scores exhibited a bias in favor of flowers, all F s > 124.00, p s < .001, d s > 1.72 (see Table 2). These findings replicate those of Greenwald et al. (1998). Participants were faster when responding to the congruent pairings (flower + pleasant and insect + unpleasant) than when responding to the incongruent pairings (insect + pleasant and flower + unpleasant).

Table 1
Study 1: Measures of Central Tendency for Each Stage of the Implicit Association Test

Stage	Study 1a		Study 1b	
	M	SD	M	SD
1	266.21	53.54	556.88	72.88
2	345.52	88.87	616.98	117.79
3	516.58	63.72	604.09	75.64
4	539.77	56.39	630.21	88.54
5	719.70	119.34	771.32	111.63

Note. All times are reported in milliseconds.

Table 1 Study 1: Measures of Central Tendency for Each Stage of the Implicit Association Test

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50% of the scale (IAT_{illy}) and 35% for the insect item-based ratings (IAT_{maggot}). Similarly, the category-based feeling thermometer covered 65% and 41% of the rating scale for flowers and insects, respectively.

These analyses reveal a significant amount of variability in the IAT scores and the explicit attitude ratings at both the item and the category level. Despite this variability, correlations between the IAT and the explicit measures failed to emerge.

Discussion

The results from Studies 1a and 1b suggest that explicit attitudes and the IAT are independent, and they highlight a problem with relying on means to infer relationships among variables. Looking only at the means for the IAT and explicit attitudes, it would be easy to conclude that they are related. After all, both measures appear to reveal the same evaluative tendencies. Participants indicated that they like flowers more than they like insects on both the IAT and the explicit measures. However, when we examined the correlations we found that the IAT did not correlate with the participants' explicit attitudes.

It is important to note that these correlations failed to emerge under fairly ideal conditions. First, the study was conducted in a domain in which there is little reason to believe that participants would have been concerned with controlling their explicit attitudes. Unlike studies involving prejudice, in which it would be easy to imagine the correlations failing to emerge because participants monitored the expressions of their explicit attitudes, this study involved attitudes toward flowers and insects. Second, the correlations failed to emerge despite the fact that we calculated them at multiple levels of specificity (i.e., at the level of the category, averaged across items, and at the level of the individual item). It is unlikely that the correlations failed to emerge because of a mismatch between the level of responding tapped by the IAT and the level of responding tapped by the explicit measures. Third, the correlations failed to emerge despite ample variability in the participants' responses. Finally, we replicated the results in two independent samples.

Although the correlational data from the first pair of studies suggest that explicitly measured attitudes and the IAT are independent, two findings would make this case stronger. First, despite the considerable variability that emerged in the IAT and explicit ratings of flowers and insects, it is still true that a majority of our participants in the first studies preferred flowers over insects. This general preference for flowers over insects still leaves nonsignificant correlational findings open to interpretations on the basis of range restrictions. A greater range of attitude scores would eliminate this alternative interpretation. Second, the case for independence would be stronger if it could be shown that explicit attitudes and the IAT differ in their ability to predict behavior.

Study 2

10
32
With these concerns in mind, the goals of Study 2 were twofold. The first goal was to replicate the correlational findings of the first study in an attitude domain in which we expected to find a greater range of attitudes. The second goal was to examine the relationships among the IAT, explicit attitude measures, and behavior. To accomplish these goals, we moved away from the domains of flowers and insects and into the domain of consumer choice behavior. Specifically, we were interested in how well the IAT and explicit attitude measures would predict participants' behavior when they were given a choice between two foods: an apple and a candy bar. To these ends, participants in Study 2 took an apple/candy bar IAT, completed a set of explicit attitude

measures concerning apples and candy bars, and then chose either an apple or a candy bar to eat.

There are three important aspects of this design. First, our goal was to examine a consequential behavior that would be amenable to implicit influence. In line with this goal, Dovidio and colleagues (Dovidio et al., 1997) found that attitudes that are measured implicitly tend to predict spontaneous or nonverbal behaviors, whereas those measured explicitly tend to predict deliberative behaviors. In the realm of consumer behaviors, researchers have found that people only engage in a thoughtful, deliberative consideration of their attitudes for high-involvement purchases (Herr, 1995). Because the choice of apple versus candy bar is a relatively spontaneous choice that does not involve a great deal of personal involvement, it seems reasonable to assume that it could be influenced by implicit attitudes.

Second, an interesting aspect of this study is that both attitude objects (i.e., apples and candy bars) are likely to be positively valenced for most participants. With oppositely valenced attitude objects, there is a clear consistent pairing (e.g., flower + pleasant and insect + unpleasant) and a clear inconsistent pairing (e.g., insect + pleasant and flower + unpleasant) that the IAT measures. With an IAT designed to measure associations toward apples and candy bars, there is no obvious consistent or inconsistent pairing. As a result, the second study provides a test of whether the IAT can be used in situations in which both of the attitude objects are similarly valenced.

Third, there is a potential problem with having too simple a design. If participants complete the explicit attitude measures before they make their choice, they may feel that because they just reported their attitudes toward apples and candy bars, they should behave in a manner consistent with those attitudes. If the IAT were to fail to predict behavior in this situation, it could be due to the fact that the participants first reported their attitudes explicitly. To investigate this possibility, we included two conditions. In one condition (i.e., IAT + explicit measures), participants completed an apple/candy bar IAT and explicit attitude measures before choosing between the apple and candy bar. In the other condition (i.e., IAT only), participants only completed the IAT before choosing between the apple and candy bar. The design allowed us to conduct separate analyses for each condition to examine whether implicit and explicit attitudes predicted choice behavior.

Method

Participants

Eighty-five students enrolled in an introductory psychology course at the University of Michigan participated in this experiment. All participants received course credit for their participation.

Procedure

Participants were run in groups of up to 6 at a time. Each group was randomly assigned to be in either the IAT + explicit measures condition or the IAT-only condition. The participants first completed an apple/candy bar IAT. The categories *pleasant* and *unpleasant* and their associated target words were the same as those used in Studies 1a and 1b. Five target words were selected to be representative of the concept *apple*: *red*, *cider*, *pie*, *Red Delicious*, and *Macintosh*. Five target words were also selected to be representative of the concept *candy bar*: *chocolate*, *peanuts*, *wrapper*, *Snickers*, and *Hershey's*. Otherwise, the procedure of the IAT was identical to that of Studies 1a and 1b.

An independent sample of 30 individuals rated how well each of these target words was representative of the concepts of apples and candy bars. Participants rated each target word on a scale ranging from -3 (*strongly associated with apples*) to 3 (*strongly associated with candy bars*). The neutral point was labeled *associated with neither apples nor candy bars*. The results of the pretest indicate that all five apple target words were strongly associated with apples ($M_{\text{apple}} = -2.57$), $F(1, 29) = 883.00$, $p < .001$, and all five candy bar words were strongly associated with candy bars ($M_{\text{candy bar}} = 2.47$), $F(1, 29) = 740.00$, $p < .001$.

After completing the IAT, those participants in the IAT + explicit measures condition completed the explicit measures. Participants completed a semantic differential and a feeling thermometer measure for both apples and candy bars. The feeling thermometer measure was identical to the one described in Study 1b, with the substitution of the categories *apple* and *candy bar*. Participants only rated the category words, not each of the individual target words. For the semantic differential, participants rated *apple* and *candy bar* on five bipolar dimensions: *ugly-beautiful*, *bad-good*, *unpleasant-pleasant*, *foolish-wise*, and *awful-nice*. Each dimension was rated on a 7-point scale ranging from -3 (the negative pole) to 3 (the positive pole), and participants were instructed to circle zero if the anchoring adjectives were irrelevant to the concept. Afterward, participants completed questions concerning how much they liked eating apples and candy bars, how often they ate apples and candy bars, and, if given a choice between an apple and a candy bar, which they would choose. Each of these questions was answered on an 8-point scale ranging from 1 (*strongly disagree*) to 8 (*strongly agree*).

All participants were then presented with a "fun-size" Snickers candy bar and a Red Delicious apple. They were informed that they could choose only one of these objects to eat or to take home with them. The participants were then thoroughly debriefed about the experiment and thanked for their participation.

Results

Analysis of the Error Rate

The data from 4 participants who had an IAT error rate of 18% or greater were removed from all of the analyses. Once these participants were removed, the average error rate was 3% and ranged from 0% to 10%.

Did Completing Explicit Attitude Measures Change Behavior?

Participants in the IAT + explicit measures condition completed the explicit attitude measures before choosing their apple or candy bar. As noted above, a potential problem with the design is that the act of explicitly reporting one's attitudes toward apples and candy bars may change one's behavior. If it does, then the study would provide a very weak test of the relationship between the IAT and behavior. To examine this possibility, we analyzed the participants' choices of apples versus candy bars in the two conditions. Their choices suggest that they were not affected by the manipulation, $[\chi^2(1, N = 81) = 0.02, p = .92]$. Participants who completed the explicit measures selected an apple 47.5% of the time, and participants in the IAT-only condition selected an apple 46.3% of the time. However, because the relationship between attitudes and behavior is complex, we examined whether the IAT predicted behavior separately for each condition.

The IAT Measure