

Predictive Validity of the Implicit Association Test in Studies of Brands, Consumer Attitudes, and Behavior

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Three studies investigated implicit brand attitudes and their relation to explicit attitudes, product usage, and product differentiation. Implicit attitudes were measured using the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). Study 1 showed expected differences in implicit attitudes between users of two leading yogurt brands, also revealing significant correlations between IAT-measured implicit attitudes and explicit attitudes. In Study 2, users of two fast food restaurants (McDonald's and Milk Bar) showed implicit attitudinal preference for their favorite restaurant. In Study 3, implicit attitudes of users of two soft drinks (Coca-Cola and Pepsi) predicted brand preference, product usage, and brand recognition in a blind taste test. A meta-analytic combination of the three studies showed that the use of IAT measures increased the prediction of behavior relative to explicit attitude measures alone.

In understanding consumer attitudes and decisions, emotions, unconscious motives, and automatic processes should be considered (Batra, Myers, & Aaker, 1996; Cohen & Areni, 1991; Gorn, 1982; Isen, 1989; McDonald, 1992; Shiv & Fedorkhin, 1999). This conclusion follows from recent work in implicit social cognition showing that attitudes can be automatically activated outside conscious awareness (Bargh, 1997; Johnson & Weisz, 1994).

Two studies illustrate these implicit influences on consumers. In one study (Janiszewski, 1988), participants read a magazine with text on one page and an advertisement on the facing page. Even when their attention was focused on the text (not on the ad), information from the ad nevertheless influenced their attitudes toward both the ad and the brand (Janiszewski, 1988, 1990). This influence occurred although participants showed no explicit memory of the ad. In the second study, incidental ad exposure affected participants' consideration of advertised products even when they were ex-

PLICITLY trying to avoid choosing the products depicted in the ad (Shapiro, 1999).

Still more evidence of implicit processes in consumer behavior comes from research on the influence of brands on consumers' attitudes, judgments, and preferences. Consumers may possess brand images, the consumer behavior equivalent of social psychology's stereotypes (Bargh, 2002; Edell & Moore, 1993; Kirmani & Zeithaml, 1993). The manner in which brand images affect consumer behavior is often automatic (Janiszewski, 1988). Research on responses to products shows that perceptions of product features (even such features as taste of coffee, strength of beer, sweetness of juice, etc.) can depend on whether the product test is blind (Lannon, 1993). This presumably reflects the manner in which brand images can influence perceptions of otherwise near-identical products.

MEASURING IMPLICIT ATTITUDES IN CONSUMER RESEARCH

Research on implicit attitudes is complicated by measurement difficulties. Self-reported measures typically do not

suffice as indicators of brand image or advertising influence (Gordon & Longmaid, 1988; Levy, 1985; Smith, 1954). Therefore, applied researchers as well as their academic counterparts are trying to introduce alternative methods. Applied researchers have attempted to develop qualitative techniques to study the issues that are beyond consumers' consciousness. These include "projective techniques" such as anthropomorphization or animalization (Branthwaite & Lunn, 1985; Greenbaum, 1993; Hussey & Duncombe, 1999), where the task of consumers is to imagine a brand as a person or an animal. Surprisingly, in the case of strong brands, people are able to create consistent images of a brand as if it were a person, including gender, age, education, character, lifestyle, likes and dislikes, leisure time activities, and so forth. Based on such data, marketers can infer potential—both mostly unconscious—barriers to purchase and use of a brand, and can propose marketing communication strategies that might change those barriers (e.g., changing some elements of brand image). Despite their popularity in commercial research, however, projective techniques are not well accepted in academic research because of the subjectivity involved in their construction and interpretation.

MEASURING CONSUMERS' IMPLICIT ATTITUDES WITH THE IMPLICIT ASSOCIATION TEST

Since the 1980s, much attention has been devoted to reaction time as an indication of automatic processes and automatic activation of attitudes. These processes have been mostly studied in the context of stereotypes and prejudices (Bargh, 1989; Bargh, 1997; Bargh, Chaiken, Gøvender, & Pratto, 1992; Brauer, Wasel, & Niedenthal, 2000; Devine, 1989; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Greenwald & Banaji, 1995; Pratto, 1994). One method of researching implicit attitudes that has become very popular in psychology in the last 6 years is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998; Greenwald & Nosek, 2001; Swanson, Rudman, & Greenwald, 2001).

The method involves a computerized task in which participants sort stimuli into four different categories: (a) two contrasted target concept categories pertaining to the attitude objects being evaluated (e.g., flowers and insects or racial Black and White); and (b) two contrasted attribute categories (e.g., pleasant and unpleasant words).¹ On each side (left and right) of the display screen the names of one of the target categories and one of the attribute categories are presented (e.g., "flower" and "unpleasant" on the left and "insect" and "pleasant" on the right). Participants are instructed to re-

spond to exemplars of each category by pressing a key on the same side in which the label appears.

Stimuli (words or pictures) appear in the middle of the computer screen, one at a time. These stimuli are exemplars of the four categories (e.g., tulip, mosquito, love, war). The participants' task is to press either the left- or right-hand key, guided by the side of the screen on which the corresponding category label (e.g., "flower," "insect," "pleasant," "unpleasant") was displayed. For example, suppose the two categories on the left are flowers and unpleasant words and the two on the right are insects and pleasant words. Then, participants should classify "happy" or "rose" by pressing a key on the left. These trials are preceded by practice trials with only one category per key (e.g., flowers to the left and insects to the right). The analysis uses the reaction times from the tasks for which all four categories are presented on the screen. The participant is asked to do this task in two different forms on different blocks of trials, switching the pairings of attribute and concept categories. (That is, in addition to the task combination described in our example, participants would do another version of the task with the labels "insect" and "unpleasant" on the left side and "flower" and "pleasant" on the right side.)

The assumption underlying interpretation of the IAT is that it is easier to give the same response to items in two categories when those categories are associated than when they are not. In the example, suppose flowers and insects have an equally strong association with positive evaluations. Then, there should be no difference in ease of performing the task, regardless of which target category (flowers or insects) is paired with pleasant words. However, suppose instead that the categories have differential evaluative associations (e.g., flowers are more strongly associated with pleasant words than are insects). In this case, it should be easier to perform the task that requires giving the same response to flower names and pleasant words. This would be indicative of a more positive attitude toward flowers than toward insects.

The measure is described as an implicit measure because it does not depend on participants' awareness of the existence or strength of the associations being assessed. The IAT has been useful in investigating relative association strengths in several domains, including racial attitudes (e.g., Dasgupta & Greenwald, 2001), stigmatized behavior such as smoking (e.g., Swanson et al., 2001), gender stereotypes (e.g., Rudman, Greenwald, & McGhee, 2001), and numerous others (see overview by Greenwald & Nosek, 2001).

This article presents applications of the IAT method to the prediction of brand preferences. In research involving social attitudes toward groups such as African Americans and the elderly, and in studies involving associations indicative of gender stereotypes, IAT measures have been only weakly correlated with parallel self-report (explicit) measures of the same associations. It is suspected that these low correlations, or dissociations, are explained either by participants' limited willingness to report socially sensitive attitudes and beliefs, or by limited introspective knowledge of the strengths of the

¹All studies presented in this article used positive and negative words to represent the attribute dimension of evaluation. However, the IAT method is not limited to assessing associations with evaluation (see Greenwald & Nosek, 2001).

associations assessed by the IAT (Greenwald et al., 2002; Greenwald & Nosek, 2001). For these social attitudes and stereotypes, political correctness and other self-presentation considerations may influence explicit but not implicit measures. By contrast, implicit and explicit brand attitudes may be less subject to competing influences and may therefore show higher correlations.

Although consumer attitudes are less subject to self-presentation biases than ethnic or racial attitudes, such dissociations between explicit and implicit attitudes can also be observed in this domain. Maison, Greenwald, and Bruin (2001, Study 2) reported that women who prefer high-calorie products over low-calorie products in terms of taste were nevertheless found to have implicit preferences for low-calorie products. People can also be attracted to a product with a bad brand image. They may like the product, use it privately, but be ashamed of using it publicly. Another example, which bothers many marketers, is the situation where people buy a product, and say that they like it (and believe it), but nevertheless buy a different brand the next time they shop. To understand such cases, the IAT may be a useful tool.

The studies investigated preferences for three different pairs of brands. The first study determined the relation between explicit and implicit measures of preferences for two leading brands of yogurt and was conducted among regular consumers of yogurt. Study 2 investigated the relations among implicit preferences, explicit preferences, and brand choice behavior among consumers who were selected because they just had lunch at one of two fast food restaurants: McDonald's or Milk Bar.² Study 3 examined the relations among implicit and explicit preferences, self-reported behavior, and brand taste recognition among brand-loyal users of Coca-Cola and Pepsi.

STUDY 1

Study 1 investigated the use of the IAT method to study implicit preferences for brands and their relation to explicit preferences. The study investigated two of Poland's leading brands of yogurt: Danone and Bakoma,³ both of which have a positive brand image. Yogurts are products for which con-

sumers are typically both (a) aware of their attitudes and preferences, and (b) lack reasons for suppressing the report of them. Therefore, we predicted that IAT-measured preference would be correlated with self-reported attitudes and preferences and also with product use.

Method

Participants. Twenty-eight female and 12 male undergraduate students of the Department of Psychology at the University of Warsaw (ages 19–25) participated for pay of 5 PLN (about \$1.33). Participants were selected based on one criterion: they ate yogurt at least a few times per week. (Brand preferences were not checked at this point.)

Explicit measures. A questionnaire about yogurt usage and attitude toward the two brands contained the following items: (a) self-reported behavior—frequency of eating of each brand (5-point scale: 1 = *more often Bakoma than Danone*; 5 = *more often Danone than Bakoma*); (b) liking—separate questions for liking of Danone and Bakoma (5-point scale: 1 = *dislike*; 5 = *like very much*); (c) preference—5-point scale with preference for one of two yogurt brands (1 = *definitely prefer to eat Bakoma than Danone*; 5 = *definitely prefer to eat Danone than Bakoma*); (d) evaluation—separate evaluation of Danone and Bakoma on eight different bipolar dimensions (not tasty–tasty, not nice–nice, not natural–natural, unhealthy–healthy, not worth buying–worth buying, for older–for younger, not fashionable–fashionable, not popular–popular), each rated on a 7-point scale.

Implicit measures. The IAT measure of implicit preferences for the two brands included the following pleasant and unpleasant stimuli (English translations of words used in the Polish version): (pleasant words) sun, luck, love, fun, happiness, pleasure, holiday, friendship; (unpleasant words) disease, death, murder, accident, poison, war, tragedy, vomit. These stimuli were used previously by Maison and Bruin (1999) and Maison, Greenwald, and Bruin (2001). Stimuli representing the two target categories (brands) were images taken from actual labels and pictures of packages. The four pictures for each brand were similar in size and form.⁴

The IAT was completed on PC-type desktop computers, using Inquisit laboratory software (Inquisit, 2002). Stimuli were presented in the center of the computer screen. As previously described, participants were instructed to assign each stimulus to one of two categories (in single categorization tasks) or one of four categories (in combined categorization tasks). Participants used either the "A" key with the left index finger or the "5" key on the numeric keypad with the right index finger.

²Milk Bar (Bar Mleczny) is a Polish type of fast food restaurant. It is typically considered to be a place to eat very inexpensively, with a reasonable food quality. (The name is misleading, because the food is not exclusively milk-based.) Milk Bars are not chain restaurants. The name is a generic name rather than a brand name. However, these restaurants are easily identifiable as a category. It was not possible to use another category more similar to McDonald's, because at the time of the experiment, there was no other fast-food restaurant chain as easily recognized and as widely present in Poland.

³Danone is the European spelling of the yogurt brand known in the United States as Dannon. Bakoma is a local Polish brand; however, a majority of Poles perceive this brand as an international one. At the time of conducting these studies, these two brands were the two market leaders in Poland.

⁴These images and those used in Experiments 2 and 3 are available electronically from the first author.

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which are significantly different from one another, $t(32) = 3.65$, $p = .0009$, indicate that Danone users had relatively more favorable implicit attitudes toward Danone than toward Bakoma, whereas the reverse was true for Bakoma users.

Multiple Regression: Predicting Behavior From Explicit and Implicit Measures

For purposes of conducting a multiple regression analysis to predict behavior from explicit and implicit attitudes, the criterion measure was stated favorite brand, for the 32 participants who indicated that either Danone or Bakoma was their favorite brand. Explicit preferences were inferred from the difference in average ratings of the two brands on the eight semantic differential items. Implicit preferences for Danone (vs. Bakoma) were correlated $.47$, $n = 32$, $p = .006$, with this explicit measure. The multiple correlation was significant, $R = .74$, $F(2, 29) = 17.02$, $p = 10^{-5}$. The beta-weight associated with the explicit measure was significant, $\beta = .57$, $t(29) = 4.00$, $p = .0004$, and the weight of the implicit attitude was only marginal $\beta = .26$, $t(29) = 1.84$, $p = .08$. The marginal significance of the latter coefficient can be understood as a consequence of both the high level of prediction of favorite brand directly from the explicit measure ($r = .70$) and the substantial correlation between the two predictors ($r = .47$).

Discussion. Study 1 provides evidence that the IAT can be used successfully to measure implicit brand preferences. First, the IAT revealed significant differences between participants' reactions to different yogurt brands depending on their preferred brand of yogurt. Second, implicit preferences (measured with the IAT) were positively related to participants' explicit ratings of yogurt brands (self-reported behavior, explicit attitude based on liking, preference and brand evaluation). Those who reported using one brand more often than another showed a relatively greater implicit preference for this brand.

STUDY 2

Study 1 showed that the IAT method can be used as a measure of implicit preference for brands. Results also showed a correlation between implicit preferences and both evaluation of brands and declared behavior. However, behavior in the first study was only self-reported. The second study investigated implicit preferences in relation to actual behavior in the form of known usage of a brand.

The brands used for Study 2 were two types of fast food restaurants: McDonald's and Milk Bar (see Footnote 2). Predictions were that (a) participants' explicit ratings of each of the two types of fast food restaurants would be consistent with place of eating (observed behavior), (b) implicit preferences for McDonald's versus Milk Bar would also be consistent with place of eating, and (c) implicit preferences for Mc-

Donald's versus Milk Bar would be positively correlated with explicit preferences.

Method

Participants. Ten women and 10 men (ages 16–25) were recruited from a McDonald's restaurant in the center of Warsaw, directly after finishing a meal. An additional 10 participants of each sex were recruited from Milk Bar. The study was conducted in a research facility of a market research company and participants were told they were participating in marketing research. They were paid 5 PLN (about \$1.33) for their services.

Explicit measures. Participants completed a questionnaire asking about their attitude toward McDonald's restaurants and Milk Bar. This questionnaire contained items pertaining to the frequency of eating at each of the two restaurants (1 = *almost never*; 5 = *almost every day*), and the relative preference for eating at the restaurants (1 = *definitely prefer to eat in Milk Bar*; 5 = *definitely prefer to eat in McDonald's over Milk Bar*). In addition, participants evaluated each restaurant on six 5-point semantic differential scales: not tasty–tasty, not popular among peers–popular among peers; not nice–nice; not healthy–healthy; dirty–clean; slow–fast.

Implicit measures. Participants completed an IAT task measuring implicit attitudes toward the two types of fast food restaurants: McDonald's and Milk Bar. The list of stimuli, based on two groups of typical fast food meals, included the following: (a) McDonald's stimuli—Hamburger, Cheeseburger, Big Mac, McChicken; and (b) Milk Bar stimuli—Pierogi, Nalesniki, Zurek, Barszcz (all four are typical food served in Milk Bar). The list of Polish pleasant and unpleasant words was the same as in Study 1. All stimuli used in this study were words.

The IAT task was completed on PC-type desktop computers, using Inquisit (2002). Stimuli corresponding to the task's categories were presented in the center of the computer screen. Participants responded to the categorization task by pressing either the "A" key with the left-hand finger or the "5" key on the numeric keypad with the right-hand finger.

Procedure. The procedure in this study was similar to that of Study 1, except that the list of stimuli in the IAT was different, as was the questionnaire at the beginning of the study. Participants completed the explicit attitude questionnaire (see description earlier) before doing the IAT.

Results and Discussion

IAT data reduction. The same data reduction procedure was applied as in Study 1. Also in this study, one person was excluded from analysis because of an error rate higher

than 30% (the average error rate of the other participants was 4.7%). All analyses reported here involve the remaining 39 participants.

Explicit preferences. In an analysis of the six semantic differential items, McDonald's was perceived as cleaner, faster, and more popular among peers, but Milk Bar was perceived as a healthier place to eat (significant differences). Separate analyses of users of one or the other restaurant showed strong explicit preference for the place at which they had just eaten. Users of McDonald's evaluated McDonald's more positively than Milk Bar on all dimensions (all differences significant) and users of Milk Bar evaluated Milk Bar more positively than McDonald's (five of six differences significant).

Implicit preferences. The IAT effect was calculated for each participant by computing the latency for the [MB- and McD+] task minus the latency for the [McD- and MB+] task, with further computational details as in Study 1, including use of logarithmic transformations of individual trial latencies for statistical hypothesis testing. Higher positive scores for the IAT effect indicated a more favorable implicit attitude toward Milk Bar. Comparison of the IAT effect between those who use McDonald's and those who use Milk Bar showed significant difference in reaction time: for McDonald's users, the IAT effect was -62 msec; for Milk Bar users, it was 113 msec; $t(37) = 2.29, p = .03$.

Among Milk Bar users, comparison of reaction times for [MB- and McD+] (the task in which names of Milk Bar meals were paired with unpleasant words and McDonald's meals with pleasant words) with the reverse task [McD- and MB+] showed a significant difference: $RT[MB- \text{ and } McD+] = 921 \text{ ms}$; $RT[McD- \text{ and } MB+] = 808 \text{ ms}$; $t(18) = 2.06, p = .05$. Among McDonald's users, comparison of reaction times between these two tasks showed a nonsignificant difference in the expected direction: $RT[MB- \text{ and } McD+] = 863 \text{ msec}$; $RT[McD- \text{ and } MB+] = 925 \text{ msec}$; $t(19) = -1.07, p = .30$.

Multiple regression analysis: Predicting behavior from explicit and implicit measures. For this multiple regression analysis, the criterion was the dichotomous behavioral measure of location at which the participant had just completed a meal. The explicit attitude predictor was computed from evaluations of each brand on the six intercorrelated semantic differential dimensions. All three variables (IAT, explicit attitude, and criterion behavior) were scored so that higher values indicated relatively more favorable attitudes toward Milk Bar. IAT-based preferences were positively correlated with both explicit preferences, $r(39) = .43, p = .006$, and preferred location, $r(39) = .35, p = .03$. Finally, explicit preferences were also correlated positively with preferred location, $r(39) = .59, p = .0001$.

The analysis yielded a significant multiple correlation, $R = .60, F(2, 36) = 10.20, p = .0003$. The analysis resulted in a

significant beta-value for the explicit measure, $\beta = .54, t(36) = 3.66, p = .0008$, and a nonsignificant value for the implicit one $\beta = .12, t(36) = 0.81, p = .42$. Thus, as in Experiment 1, implicit attitudes were positively correlated with behavior and had positive weight in the multiple regression, but their weight in the multiple regression was not statistically significant.

In summary, Study 2 provided further confirmation that the IAT method can be used as a measure of implicit consumer attitudes. Implicit attitudes correlated with explicit attitudes and with choice of place to eat. However, multiple regression analysis indicated that the prediction of choice of place to eat by implicit attitudes involved variance that largely overlapped with that of the explicit attitude predictor.

STUDY 3

Studies 1 and 2 showed that the IAT method can be used as a measure of implicit preferences for brands. Their results also showed significant correlations between implicit preferences as measured by the IAT and explicit preferences, as well as with both self-reported (Study 1) and observed (Study 2) behavior. Study 3 investigated the relation between implicit attitude toward brands and product differentiation. When consumers have a choice between two brands that are difficult to differentiate (e.g., two brands of coffee, beer, or detergents from the same price category), they may base choices on their implicit brand attitudes rather than on product features (Batra et al., 1996). However, some consumers can differentiate even very similar products, and their product choices may be based on more than brand image. Some studies suggest that attitudes are stronger when they are based on direct experience with the attitude object than when they are based on indirect experience (Fazio & Zanna, 1981; Smith & Swinyard, 1983). Consequently, we assumed that people are likely to have more well-developed preferences for brands if they can distinguish between them in form and taste than if they cannot. (The latter individuals might base their judgments on brand image alone.) Therefore, we expected that those who can perceptually differentiate the products should express stronger implicit preferences for their favorite brand than those who cannot. In this research, the ability to differentiate was operationalized as brand recognition in a blind product test.

Study 3 used two competing brands of soft drinks that were difficult to differentiate in terms of taste: Coca-Cola and Pepsi. The study was conducted among regular users of each of the two brands. As in earlier studies, we predicted that participants' explicit and implicit brand preferences would be significantly correlated. However, we also expected that these preferences would be stronger among participants who were able to distinguish the taste of the two brands than among those who could not.

Method

Participants. Participants in the research were students from a Polish high school. Out of 600 students, a total of 103 participants were selected for the main study, in four groups: (a) those who preferred Coca-Cola and were able to identify the product correctly (27 participants); (b) those who preferred Coca-Cola but were unable to identify the product correctly (25 participants); (c) those who preferred Pepsi and were able to identify the product correctly (25 participants); and (d) those who preferred Pepsi but were unable to identify the product correctly (26 participants). A total of 57 women and 46 men participated (ages 16–19).

Procedure. Participants were invited to participate in a consumer study about opinions and attitudes toward soft drinks. The study was in two phases: a preliminary part and a main part. The first part was conducted to select participants who differed in their brand usage and ability to recognize brands in a blind product taste test. This selection consisted of two stages. In the first stage of the selection procedure, 600 high school students were asked if they preferred Coca-Cola or Pepsi, and how frequently during a week they drank their preferred brand. Only those participants who indicated that (a) they had a clear preference for Coca-Cola or Pepsi, and (b) they drank their preferred beverage at least several times per week, were invited to the second stage of the selection process, which was a blind product test. Participants were given two unmarked cups, one of which contained Coca-Cola whereas the other contained Pepsi, and were asked to indicate which cup contained which product.

Based on these responses, participants were divided into groups who (a) preferred Coca-Cola and were able to identify it correctly, (b) preferred Coca-Cola but were unable to identify it correctly, (c) preferred Pepsi and were able to identify it correctly, and (d) preferred Pepsi but were unable to identify it correctly. After completing the questionnaire in which their explicit attitudes toward the two brands were assessed, participants completed the IAT measure of implicit brand attitudes.

Explicit measures. Participants completed a questionnaire about their explicit attitudes toward Coca-Cola and Pepsi. First, they estimated the frequency with which they drank each beverage along scales from 1 (*almost never*) to 5 (*almost every day*). Then, they reported their relative preference for the two beverages along a scale from 1 (*definitely prefer Pepsi over Coca-Cola*) to 5 (*definitely prefer Coca-Cola over Pepsi*). Finally, they evaluated each brand along six semantic differential scales, each scored from 1 to 5: not tasty–tasty; not healthy–healthy; not popular among peers–popular among peers; not fashionable–fashionable; not modern–modern; and for older people–for younger people.

Implicit measures. Participants completed an IAT that measured implicit preferences for the two brands. Four graphic images represented each brand. Stimuli used for each brand had similar form and size and were typical for the two brands. The list of Polish pleasant and unpleasant words and IAT task was the same as in the previous studies.

Results and Discussion

IAT data reduction. The same data reduction procedure was applied as in previous studies. The average error rate for this study was 5%. All analyses reported here include all 103 participants.

Explicit preferences. Coca-Cola was generally perceived as more popular than Pepsi, but Pepsi was perceived as more modern than Coca-Cola. Separate analyses for Coca-Cola and Pepsi users revealed that users of each brand evaluated their preferred brand more positively than the other brand on most of the dimensions. Coca-Cola users perceived their brand significantly more positively than Pepsi users on four of six dimensions (all differences significant except modern and for younger people), and Pepsi users perceived their brand more positively on five of the six dimensions (all differences significant except for popular).

Implicit preferences. A 2×2 (usage \times recognition success) analysis of variance was conducted with the IAT effect as the dependent variable. This analysis showed that Coca-Cola users had stronger implicit preferences for Coca-Cola, $M = 112$ msec, than Pepsi users did Pepsi, $M = -62$ msec, $F(1, 99) = 49.00$, $p = 10^{-10}$. However, although these preferences were stronger when participants could distinguish between the two brands (128 msec vs. -85 msec for Coca-Cola vs. Pepsi users, respectively) than if they could not (95 msec vs. -40 msec, respectively), this difference was not reliable, $F(1, 99) = 1.67$, $p = .20$ (are not significant).

Although we expected that due to the selection procedure, participants would have a strong preference for one over another brand, it turned out during analysis of the data that the selection procedure had not been severe enough because many participants reported drinking both beverages. Therefore, a subanalysis was carried out using stronger selection criteria than in the original selection. A subsample of 54 participants (of the total of 103) was identified whose relative frequency of drinking the two beverages differed by at least 2 points along the 5-point scales on which drinking frequency was assessed. The same 2×2 (usage \times recognition accuracy) analysis was conducted for these participants, with the IAT measure as the dependent variable. In this analysis, however, the interaction was quite significant, $F(1, 50) = 4.71$, $p = .03$, and indicated that as expected, preferences of participants who could accurately distinguish the taste of the two products had more extreme implicit preferences (132 msec vs.

-126 msec for Coca-Cola vs. Pepsi users, respectively) than if they could not (63 msec vs. -63 msec, respectively).

In contrast, these same participants' explicit preferences for the two beverages were virtually identical regardless of whether they could identify them accurately. That is, although Coca-Cola users had stronger preferences for Coca-Cola than for Pepsi, this was true regardless for both users who could distinguish the two products (4.94 vs. 1.22 for Coke vs. Pepsi users, respectively) and those who could not (4.86 vs. 1.23, respectively). Thus, participants' implicit preferences were influenced by their recognition accuracy but their explicit preferences were not.

Multiple regression analysis. Two dependent measures were of interest in multiple regression analyses: participants' preferred beverage and their ability to recognize their preferred brand by taste. Analyses of both of these measures used explicit and implicit attitude measures as the predictors. Multiple regression analysis of usage yielded a multiple correlation of .75, $F(2, 99) = 64.77$, $p = 10^{-18}$, and significant beta-values for both the explicit measure, $\beta = .53$, $t(99) = 7.31$, $p = 10^{-10}$, and the IAT, $\beta = .36$, $t(99) = 5.04$, $p = 10^{-6}$.

To analyze taste recognition, a criterion variable was created with the following values: 1 = *Pepsi drinkers, who correctly recognized their preferred brand by taste*, 2 = *Pepsi drinkers who failed to recognize their preferred brand by taste*, 3 = *Coca-Cola drinkers who failed to recognize the taste difference*, and 4 = *Coca-Cola drinkers who correctly recognized the difference*. This analysis yielded a significant multiple correlation of $R = .70$, $F(2, 99) = 46.43$, $p = 10^{-14}$, associated with significant beta-values for the explicit measure, $\beta = .44$, $t(99) = 5.58$, $p = 10^{-7}$, and for the IAT, $\beta = .39$, $t(99) = 4.94$, $p = 10^{-6}$. Very similar results were obtained when this analysis was limited just to the subset of participants who correctly identified the taste of their preferred brand.

The results of Study 3 again confirmed that the IAT provides a valid measure of implicit brand preferences. Persons who preferred one soft-drink brand over the other and who drank their preferred brand more often also showed implicit preferences for that brand. The hypothesis that implicit preferences would be stronger among persons who could distinguish the taste of the brands was also confirmed, but only for participants who used one brand much more frequently than the other. The first analysis done for all participants of the study showed this pattern, but not in statistically significant fashion. However, when a subsample with more sharply defined brand preference was selected, the expected pattern was statistically significant. Those who could identify the taste of their preferred brand had stronger implicit attitudes favoring the brand. Multiple regression analyses of both brand preference and taste discrimination revealed that explicit and implicit attitudes were statistically significant independent predictors for both preferred brand and taste discrimination success.

GENERAL DISCUSSION

These studies sought to validate the IAT as a measure of consumers' implicit brand preferences. In the three studies, we consistently observed that participants who preferred one brand over another (on explicit measures), and who used it more often than the other brand, also showed implicit preferences for this brand. In interpreting the implicit preference findings provided by IAT measures, it is important to bear in mind that these measures indicate relative preference rather than absolute attitude. For example, the IAT measure used in Study 3 established that Coca-Cola users implicitly prefer Coca-Cola over Pepsi, but not that they dislike Pepsi—they might just like Pepsi less than Coke.

These studies differed from previous research using the IAT in that most past studies were concerned with attitudes toward social groups for which social desirability or impression management are likely to produce biases in explicit measures (e.g., Greenwald et al., 1998; Rudman et al., 2001). Impression management processes, which plausibly contributed to low levels of implicit-explicit correlations in previous studies, are much less likely to intrude into these studies of attitudes toward low-involvement consumer products. Previous research has shown that implicit-explicit correlations can be very high when impression management is not a concern (e.g., Greenwald, Nosek, & Banaji, 2003). Consequently, it is not surprising that substantial correlations of implicit attitudes with both explicit attitudes and behavior were observed in this research.

Results of multiple regression analyses predicting behavioral indicators from implicit (IAT) and explicit (self-report) attitude measures consistently produced strong multiple correlation coefficients. These analyses consistently revealed that independent contributions of explicit attitude measures were significant and were associated with beta-coefficients that were equal to or larger than those for implicit attitude measures.

Importantly however, implicit attitude measures consistently revealed positive evidence of unique contribution to the prediction of behavior. Although this independent contribution was not statistically significant in two of the three studies, the beta-coefficients were consistently positive. To determine a conclusion that could be justified by the parallel design structure of the three studies, the authors conducted two meta-analytic analyses of the series of studies (see Table 1). In each meta-analysis, Fisher's r to z transformation was used in computing average betas or correlations.

The first meta-analysis combined the brand preference analyses of the three studies. For estimates of predictive efficacy of IAT measures independent of self-report measures, this analysis yielded a mean beta-coefficient of .26, $t(2) = 3.40$, $p = .08$. The mean partial correlation for IAT measures predicting behavioral preference was .32, $t(2) = 3.13$, $p = .09$. Using the Stouffer method to combine significance levels for the three partial correlations, $z = 4.14$ (two-tailed $p = .00003$).

TABLE 1
Summary of Regression Statistics Indicating Independent Prediction of Behavioral Criteria by
Implicit Association Test (IAT) Measures (Studies 1–3)

Study	Criterion Measure	N	β	Multiple Regression Statistics			
				Partial <i>r</i>	<i>t</i>	<i>df</i>	<i>p</i>
1	Favorite yogurt brand	32	.263	.323	1.840	29	.038
2	Preferred fast food venue	39	.120	.134	0.660	36	.257
3	Favorite soft-drink brand	102	.364	.452	5.036	99	.10 ⁻⁶
3	Taste discrimination	102	.389	.444	4.935	99	.10 ⁻⁶

Note. Values are statistics describing the performance of each study's IAT measure as a predictor in multiple regression analyses in which IAT and explicit attitude measures (based on semantic differential items) were simultaneous predictors of the criterion shown in the second column. *p* values are two-tailed.

In addition, the second meta-analysis included Study 3's analysis of the taste recognition measure. For this second meta-analysis, the mean beta-coefficient was .30, $t(3) = 4.49$, $p = .02$, and the mean partial correlation was .36, $t(3) = 4.36$, $p = .02$. We used the Stouffer method to combine significance levels for the four partial correlations, $z = 5.91$, $p = 10^{-9}$.

These results imply that even in a domain (consumer behavior) in which there are likely to be moderate or strong positive correlations between IAT and self-report attitude measures, the IAT provides an independent contribution to the prediction of behavior. This conclusion fits with findings of other studies that have indicated independence in predictions of behavior by IAT and explicit measures (e.g., Egloff & Schmukle, 2002; McConnell & Leibold, 2001). The evidence for this conclusion was strongest from Study 3 individually, and it is clear that the strong result of Study 3 contributed substantially to the overall meta-analytic result. Although it is not done in this research, conceivably future research will identify consumer behavior domains in which the IAT may predict behavior more strongly than do explicit measures. Even when the IAT is not a stronger predictor than explicit measures, its use in combination with explicit measures can result in stronger prediction of behavior than can be achieved with self-report measures alone.

In Study 3, participants who correctly recognized their favorite brand in a blind product test had a significantly stronger implicit attitude toward their preferred brand than participants who could not recognize their favorite brand. An important question is why this would be so. One possible answer comes from attitude formation theories, which state that attitudes can be based on cognition (Fishbein & Ajzen, 1974), emotion (Krosnick, Betz, Jussim, & Lynn, 1992; Zajonc, 1980), or behavior (Bem, 1972). In the case of low-involving products such as those investigated in the three studies presented here, it is likely that attitudes are only weakly developed cognitively (i.e., relatively unelaborated), rather being based on thoughts and feelings that are primarily related to brand image and brand personality (e.g., Petty & Cacioppo, 1986). However, those who were able to differentiate the tastes, because their attitude was based not only on emotions (brand image) but also on sensual experiences, may have had more elaborated implicit attitudes than those who

could not differentiate the tastes, therefore producing stronger results with the IAT.

The findings raise the question of how implicit attitudes and explicit attitudes relate to each other in explaining consumer behavior. Unfortunately, these three studies cannot answer this question. The studies were designed primarily to explore the interrelations among the IAT, explicit attitudes, and consumer behavior, without aspiring to test any causal models. The results convincingly demonstrated that the IAT has potential for increasing understanding of consumer behavior, but unraveling the actual process must remain a subject for future investigation.

The results nevertheless bear on the usefulness of implicit attitude measures and the IAT in particular for consumer and marketing research. The IAT was shown to be useful in research on brand attitudes and the role of brands in consumer decisions. The IAT may prove especially useful in research contexts in which brand attitudes are not accessible to self-report and, therefore, explicit measures will prove insufficient. The IAT can also be useful for research in consumer behavior domains in which socially desirable responding can be expected, such that participants may be reluctant to reveal their attitudes. Examples of such attitudes are those toward controversial ads (e.g., containing sex, nudity, or homosexual elements). A recent study by Brunel, Tietje, Collins, and Greenwald (2003) assessed explicit and implicit attitudes (measured using the IAT) toward ads using Black or White models. On explicit measures, all participants were equally positive to ads with White and Black models. Nevertheless, implicit measures showed preference for the ads that depicted White models.

Another possible use of the IAT in consumer context is proposed in Unified Brand Theory (Tietje, Brunel, & Greenwald, 2001). These authors proposed use of the IAT for diagnosing brand identification, which is understood as the association between brand and self. Brand identification should be related to brand attitude, interpreted as association between brand and positive valence. Because both brand identification and brand attitude can be defined as associations between concepts, each can be assessed using the IAT. Tietje et al. suggested that IAT-measured brand identification may often predict brand usage more strongly than does IAT-measured brand attitude.

In addition, the IAT can be used to investigate brand image and brand personality, which are conceived as associations of brands with nonpersonal attributes and personal trait attributes, respectively. Current practice is to study these constructs in focus groups, using various projective techniques (see references in the introduction). Such techniques are problematic because of subjectivity of interpretation and, in most cases, the lack of standardization of procedures and materials used as stimuli. In contrast, the IAT offers a standardized procedure and a quantitative measure.

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