

Implicit Environmental Attitudes: Critique and Technique to Promote Awareness

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Abstract

Attitudes toward the environment are understood in psychological science as the result of separate mental systems, one conscious and the other unconscious, and capable of affecting behavior outside of awareness. For example, the common incongruity between what people say about global sustainability and what they do about the environment has been explicated by the influence of implicit environmental attitudes. This study examined the operational adequacy of the commonly used Implicit Association Test (IAT) by directly asking participants to report their recognition of behavioral influences whilst performing an IAT. An analytic technique of awareness assessment was introduced to improve on traditional post-experimental questioning, by requiring a constrained report that provided introspective access to task-related knowledge in awareness. Results revealed participants were very aware of their IAT response latencies, they accurately recognized IAT features that produced those latencies, and the validity of this awareness predicted their test scores, challenging the claim to attitude effects of which individuals are unaware. Thus, the critical evaluation showed the IAT method to be inadequate as a measure of environmental attitudes that are implicit. Applications of the awareness assessment technique are discussed for evaluating tests of implicit cognition, and for promoting individual mindfulness of one's own environmental attitude.

Keywords: implicit attitudes, environment, IAT, consciousness

In the face of overwhelming evidence for global climate change, many individuals remain unconcerned in their consumer choice behavior (e.g., Brooks, Oxley, Vedlitz, Zahran, & Lindsey, 2014) and their product choices are slow to change (e.g. Weber, 2006). To be sure, individuals often express their willingness to make more environmentally sustainable choices (e.g. Spence, Poortinga, Butler, & Pidgeon, 2011) and their agreement with pro-environmental attitudes. Beattie and Sale (2009) reported about 70 percent of surveyed individuals expressed a preference for low carbon products recognized by carbon footprint information on product labels. In addition, the resistance to more sustainable behavior is not attributable to insufficient knowledge about climate change (Pidgeon, 2012). The goal of such investigations within environmental psychology is to discover the factors that underlie individual resistance to sustainable behavior, ultimately to enhance sustainable development and its education.

One account of the incongruity between what some people say and what they do regarding the environment is provided by cognitive psychology's dual-processing metatheory that hypothesizes two kinds of social cognitions: explicit conscious attitudes that individuals report and implicit attitudes that influence social behavior unconsciously (Greenwald & Banaji, 1995; Wilson, Lindsey, & Schooler, 2000). This traditional view postulates that explicit and implicit mental representations are processed in separate mental systems, the former conscious and deliberative and the latter automatic and outside of awareness (Bargh & Chartrand, 1999; Evans, 2008; Kihlstrom, 1987; 1999; Sherman, Gawronski, & Trope, 2014). Accordingly, resistance to environmentally sustainable behavior might be explained by the unconscious attitudes that individuals harbor towards the environment that both contradict their consciously expressed desires toward sustainable development and influence their behavior "invisibly" as cognitions outside of awareness.

The question of what cognitions are conscious (explicit) and what are not (implicit) is central to all areas of modern psychology. Developments in the area of implicit social cognition (Bargh & Chartrand, 1999; Wilson, et al., 2000) have brought about increasing interest in forms of self-knowledge that are inaccessible to consciousness, including our implicit social attitudes and the automatic effects they have on our thoughts and behaviors (Greenwald & Banaji, 1995; Greenwald & Nosek, 2008). Many attitudes have been shown to exert influence outside of awareness, including unconscious biases toward racial groups (Berdik, Wax, & Tetlock, 2007; Sargent, Kahan, & Mitchell, 2007), political parties (Hawkins & Nosek, 2012), and implicit attitudes toward behaviors such as alcohol consumption (e.g., Palfai & Ostafin, 2003). Implicit attitudes have been recently suggested as the underlying cause of unconscious pro-environmental behavior as well (Beattie & McGuire, 2012; 2015). For example, to test the effectiveness of product carbon labelling on consumer cognitions, Beattie and McGuire (2015) measured eye movements over images of consumer items containing carbon footprint information and participants' explicit attitudes toward environmentally-friendly products. Implicit environmental attitudes were also assessed with a version of the ubiquitous implicit association test (IAT; Greenwald, McGhee, & Schwartz, 1998). On each trial of the basic IAT paradigm, respondents quickly match evaluative attributes (e.g., pleasant, unpleasant) to target items (e.g., spider and flower) under the assumption that response times to match will be fast when a target is associated with an attribute relative to trials when the target is not as strongly associated (De Houwer, 2002; Greenwald, et al., 1998). Using these measures, Beattie and McGuire (2015) reported the characteristic dissociation between implicit and explicit measures of attitude toward the environment. Participants' implicit environmental attitudes, operationalized as difference scores on the IAT, were unrelated to self-reported preferences for environmentally sustainable products.

With respect to the unconscious behavioral impact of implicit attitudes, Beattie and McGuire (2015) reported one finding, that participants with positive difference scores on the IAT (pro-environment implicit attitudes) were more likely to fix their eyes first on the carbon label information than other spaces on the product images. The conclusion drawn from this apparent pre-conscious motor effect was that carbon labelling may be effective for those consumers “with the right implicit attitude” (p. 253). We questioned this interpretation on two methodological grounds. First, by presenting product images as the stimulus targets for environmental IAT categorizations, the finding may signify the operation of implicit attitudes but it remains possible the object of those attitudes so measured was not the global environment but rather the particular product images repeated in the stimulus set (Beattie & McGuire, 2015, p. 272), or product labelling itself. Second, beyond the null relationship obtained with explicit attitudes, no systematic analysis was reported to confirm that the attitudes measured by IAT response times were indeed unconscious, making it uncertain whether the IAT measured anything fully implicit *or* truly environmental. Furthermore, no evidence was given for the IAT’s suitability to measure implicit cognitions of non-social categories such as consumer product sustainability or what pre-conscious eye movements could mean for our understanding of environmental psychology beyond the limited test of product label effectiveness. To address these concerns severely and shed light on the level of awareness individuals might achieve regarding the influence of their own environment-related associative cognitions, we set out to examine the operational adequacy of the IAT as a measure of environmental attitudes that are implicit.

Researchers of implicit social cognitions and the behaviors they predict often use performance-based measures (a) to observe the attitudes indirectly by their behavioral influence and (b) to avoid the confounding influence of deliberative conscious mental processing (Greenwald & Banaji, 1995; Greenwald, McGhee, & Schwartz, 1998). The implicit status of the predictive attitudes is typically confirmed by responses to post-experimental questions that indicate participants had no awareness of the experimental manipulation or its influence on their behavior (Chartrand & Bargh, 2002; see Dulany, 2002 for a critical summary). It is noteworthy that such open-ended non-analytic approaches to awareness assessment appear to be driven by the theory they are intended to confirm (Dulany, 2003). These assessments often fall short of telling what we can know about ourselves (Nisbett & Wilson, 1977) because they require as evidence a report from awareness that is nothing less than some knowledge of the experimental hypothesis, as though participants could guess the researcher’s notions of the criterion of awareness of the effects of manipulations. To address these concerns in the implicit cognition literature, the present evaluation of the environmental IAT contributed an analytic approach to awareness assessment. Our technique collected self-reports of conscious contents during test that were constrained to simple judgments rather than open-ended propositional expressions, and with varying validity of report, for the detection of participants’ awareness of IAT trial features and behavioral influences of different trial types if they exist.

Scores from the IAT typically correlate poorly with explicitly reported attitude scales as theory would predict (see Garwonski & Bodehausen, 2006), although the measure’s reliability limitations have been shown (e.g. Sargent, et al., 2007). Additional research has brought into doubt the automatic and unconscious status of attitudes measured as associations by the IAT (Hahn, Judd, Hirsh, & Blair, 2014; Nosek & Smyth, 2007), providing further motivation to critically examine the IAT as a measure of implicit environmental attitudes. Hahn, et al. (2014), for example, investigated the assumption that implicit and explicit social attitudes explain unique aspects of behavior (Angerström & Rooth, 2011; Dempsey & Mitchell, 2010) by demonstrating that individuals are very accurate in predicting, consciously and explicitly, their

IAT results. Furthermore, it appears IAT measurements can be deliberately reduced and reversed (Blair, 2002; Blair, Ma, & Lenton, 2001). These findings would appear troubling for the IAT's continued use as a measure of any implicit cognitions.

The following investigation of whether IAT scores operationalize positive (or negative) environmental attitudes that are hypothetically implicit was accomplished by collecting directed self-reports that were constrained or focused toward the detection of recognizable behavioral influences intended by the theory of the test (Dulany, 2003). We first anticipated replication of the statistical dissociation between implicit environmental attitudes measured by IAT and participants' statements of explicit attitude (Beattie & McGuire, 2015). Regarding the present study's salient contribution, the critique of IAT for environmental attitudes, we used an analytic conscious report technique to address two empirical questions: (1) Are participants aware of their attitude toward the environment as it is evoked on test trials? And, if so, (2) does the level of this awareness, indexed by the validity of conscious reports, predict individual environmental IAT scores? Valid conscious reports of the impact of IAT trial manipulations, their attribution to IAT attitudinal categories, and their reliable prediction of IAT performance would contribute serious challenges to the operational value of the IAT as a measure of attitudes outside of awareness.

Methodology

Participants

Volunteers were 34 undergraduate students (24 women) attending a private four-year university in the US state of Kentucky who received academic credit in their general psychology class for participating. Participants ranged in age from 18 to 23.5 years ($M = 19.2$), all were English-speaking and only one self-identified as not White. The data collected from all participants were included in the analysis. Prior to the study participants gave their written consent to participate, informed by statements of minimal risk, confidentiality, means of data protection, and their right to revoke the agreement for any reason, in accordance with the university's human research protections committee and the ethical standards of the American Psychological Association.

Measures of Environmental Attitude

Adapted from Greenwald et al. (1998) and similar to Beattie and McGuire's (2012) measure, the IAT for environmental attitudes was a computerized indirect measure of the relative strengths of positive and negative environment-related associations. On each trial the test presented one member from one of 10 pairs of exemplar images matched for function and pictorial orientation but clearly opposed in their environmental sustainability (e.g. a line of coal rail cars and a row of windmills; plastic bag and recycle bin; traditional light bulb and high-efficiency light bulb). By pressing the "E" or "I" keys on the keyboard, participants categorized the images as either environmentally-friendly or environmentally-unfriendly and individual evaluative words as either pleasant or unpleasant in meaning. The evaluative words presented for categorization in the IAT were:

- (1) Pleasant: Joy, Love, Peace, Wonderful, Pleasure, Glorious, Laughter, Happy
- (2) Unpleasant: Agony, Terrible, Horrible, Nasty, Evil, Awful, Failure, Hurt

Each IAT consisted of 5 blocks of categorization trials, with 20 trials in blocks 1, 2, and 4 and 30 trials in blocks 3 and 5. The first block presented simple categorizations of the exemplar images as "Eco-friendly" or "Not eco-friendly." The second block collected response times for

simple categorizations of the words as either “Pleasant” or “Unpleasant.” Starting with the third block, a mixture of image and word trials were presented in which both the eco-friendly and pleasantness categories remained on the computer screen and were congruently presented together, from a pro-environment perspective, on the left or right for response (e.g. Eco-friendly with Pleasant). A reversal of response sides was presented for only image categorizations in the fourth block. In the final fifth block there was again a mixture of image and word trials for which the eco-friendliness and pleasantness category labels were incongruently presented to the left or right (e.g. Eco-friendly with Unpleasant). Under these common IAT arrangements participants who associate environmentally-friendly exemplars with “pleasant” and environmentally-unfriendly images with “unpleasant” should respond faster on trials in block 3 where the category pairings are Pleasant/Eco-friendly and Unpleasant/Not eco-friendly and more slowly on trials in block 5 where the category pairings are Pleasant/Not eco-friendly and Unpleasant/Eco-friendly. A score is computed (D-score, Greenwald et al., 1998) from block mean reaction times that serves as a measure of the individual’s level of positive or negative environmental attitude.

To assess participants’ explicit attitude for this correlational study, participants answered two questions on the back of the awareness assessment response sheet. First they wrote a rating value on a Likert scale that assessed explicit liking of an environmentally-friendly lifestyle from 1 (“I strongly prefer non-sustainable and eco-unfriendly living”) to 5 (“I strongly prefer sustainable and eco-friendly living”). The second question was an open-ended statement: “Please write about your feelings on climate change and making environmentally sustainable choices.”

Procedures

Participants were invited to complete a “sustainable products test” in groups of five or less on desk-top computers in an interactive computer lab on campus. After brief instructions on the IAT categorization task, participants began with 20 practice trials that presented each exemplar image once for categorization as “Eco-friendly” or “Not eco-friendly” followed by blocks of IAT trials for which response times were collected. During testing participants were interrupted randomly between trials from one to three times on the critical mixed category trial blocks to provide reports from awareness of two types: (a) an estimate of the number of trials over the last 10 that seemed difficult, and (b) a rating along a 7-point Likert scale of the amount of hesitation on the previous trial. The verbal prompts to elicit these reports were printed, and the reports were written, on a separate assessment sheet next to the computer. Upon completion of the IAT participants answered questions about their experience and their considered reasons why some trials were more difficult than others. Participants took approximately 20 minutes to complete the IAT and verbal reports.

Results

Mean difference scores (D-score) for implicit attitude and scores from the explicit environment-friendliness scale revealed the sample was not dissimilar to previous samples in which implicit attitude was observed (e.g. Beattie & McGuire, 2012). The mean D-score of 1.31 ($SE = .36$) from this environmental IAT and the modal rating value of 4 ($M = 4.17$, $SE = .14$) from the explicit attitude question (“moderately prefer sustainable consumables”) both indicated a similar positive attitude toward the environment in the present sample. Also in alignment with previous findings (Beattie & McGuire, 2015), there were 8 participants (23.5%) with negative D-scores indicating a cognitive bias away from pro-environment attitudes although every one scored their explicit attitude Likert rating as 4 or 5 and confirmed these

strong positive environmental attitudes in their open-ended responses. Correlation analysis also resulted in a replication of the characteristic null relationship between IAT scores measuring implicit attitude and participants' explicit attitude ratings, $r(32) = -.02$, as can be seen in Figure 1.

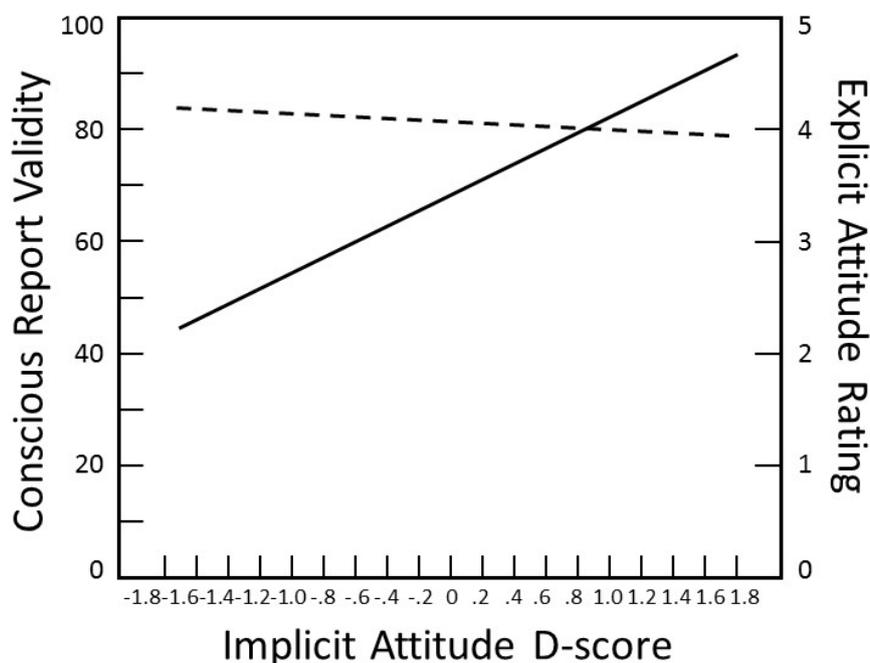


Figure 1: Simple least squares regression lines for D-scores as a function of conscious report validity and as a function of explicit attitude rating ($n = 34$).

Further to the central question regarding participant awareness of their implicit environmental attitudes measured by IAT, a thorough analysis of the conscious reports first required a metric by which conscious features of the categorization task could be validated against what actually happened during test. More than accuracy, report validity indexes the degree of correct awareness. That is, for the analysis of awareness the actual IAT served as the benchmark for what *should be* contents in participants' awareness, to the extent they are aware of them and according to the theoretically intended task demands. Furthermore, because we obtained conscious reports constrained to identify participant awareness of task-related events, and because the conscious reports took place at random interruption points identifiable in the trial-by-trial data, the analytic technique provided the necessary validation of conscious reports for the present critical evaluation of the environmental IAT's adequacy. Accordingly, reports of hesitancy in awareness were validated by reliable positive correlation between participants' hesitancy ratings and their reaction times for the trial in question, $r(32) = .41$, $p < .01$, clearly demonstrating that during the IAT these participants became aware of the influence of their own environment-related associations on their trial-by-trial response times.

Conscious reports of trial difficulty provided for the IAT evaluation a manipulated variable that should not be in awareness during a test of unconscious cognitions. The correspondence between the reported number of difficult trials and the number of trials that should have been

slow by experimental manipulation, served as the report validity. For example, if there were a report of four difficult trials over the last 10 where the data record revealed five of those trials were manipulated to be difficult, then the report validity score was assigned a scaled value of .80 for the conscious recognition of 80 percent of those trials. Task difficulty in awareness for trials presenting weakly associated exemplar images was confirmed by the report validity sample mean, .68 ($SE = .15$), and by significant positive correlation between the number of difficult trials reported and the number of difficult trials determined by actual task demands, $r(32) = .72, p < .001$. The validities of reported trial difficulty, however, did not show a relationship with ratings of explicit attitude. Thus, it appears there was no connection in this sample between participants' preference for sustainable living and their awareness of this particular behavioral influence of IAT trials. Nevertheless, in their written responses to open-ended questions a total of 28 participants (82.4 percent) correctly attributed difficult trials to mismatching categories or the mixing of labels. And finally, with a validity score for each participant's conscious report of IAT difficulty, our systematic assessment of awareness also made possible an analysis of the predictability of those report validities. Implicit environmental attitudes measured by IAT scores were reliably predicted by the conscious report validities, $r(32) = .54, p < .001$. As shown in Figure 1, higher D-scores (stronger pro-environment associations) corresponded with greater validity of task difficulty awareness during the IAT.

Discussion

Reporting on their study of attitudes to the environment and visual targets on product labels, Beattie and McGuire (2012) argued that the attitudes controlling our environmentally sustainable behavior “may not even be available to introspection and may be represented unconsciously in the brain” (p. 318). Such claims of unconscious representation are commonplace because they follow the cognitive theoretical tradition of dual processes (Evans, 2008; Kihlstrom, 1999; Wilson, et al., 2000) that assumes two kinds of mental representation in separate cognitive systems, one explicit and the other implicit (Bargh & Chartrand, 1999; Greenwald & Nosek, 2008). The usual dissociation of consciously explicit beliefs from the behavioral influence of attitudes outside of awareness (Garwonski & Bodehausen, 2006) is taken in support of the standard dual-processing cognitive model, and was repeated in the present data for environmental attitudes in particular. Nonetheless, as associations presumed to be unconscious mental representations, participants were surprisingly aware of the impact of their attitudes toward the environment as evoked during the test. Valid recognition of implicit attitudes accords with recent research questioning the IAT as a measure of purely implicit cognitions (Hahn, et al., 2014). Contrary to the assumptions underlying implicit association tests (Greenwald, et al., 1998), not only were participants greatly aware of the difficult categorisation trials, the validity of this awareness predicted their IAT scores, and the task difficulty was accurately attributed to incongruent category targets in free responses. From these critical results it appears the IAT is inadequate as a measure of environmental attitudes that are outside of awareness.

To the degree participants were aware of the influence of their environment-related attitudes they could be said to have discriminated the IAT trials on the basis of events passing in their awareness. They could tell, over varying degrees of report validity, which trials took more time and why. The analytic technique began with an analysis of task-related stimulus features of which participants could become aware, making possible the construction of the directed conscious reports and their provision of quantifiable validity against real events. Collecting these constrained reports appears to be an effective method for achieving introspective access

to representations that should be mental representations unavailable to conscious awareness (Greenwald & Banaji, 1995; Kihlstrom, 1987; Lewicki, et al., 1992; Wilson et al., 2000). One implication of using the awareness assessment technique is the potential discovery of predictive contents in awareness within other areas of implicit cognition. For example, constrained verbal reports of prime manipulations (e.g. Grecco, Robbins, Bartoli, & Wolffe, 2013; Shanks, et al., 2013) may reveal contents in awareness that are related to primed facilitation (behavior) previously considered inaccessible to awareness.

Another implication for sustainable development education is the ease with which introspective access to these associative attitudes toward the environment can be achieved. Accordingly, individuals who express preference for sustainable living but otherwise persist in choosing environmentally harmful products might receive training to recognise and respond to the resulting contents in awareness evoked by their own environment-related associations (Rudman, McLean, & Bunzl, 2013). Alternatively, simply learning to be mindful of one's own hesitations when making product choices may assist in aligning those choices with the consumer's explicit environmental beliefs and attitudes. In perhaps numerous ways, the analytic technique to awareness assessment may have applied value in the discovery of potential objects of our conscious awareness that would otherwise remain hidden, outside of awareness, and considered a function of the cognitive unconscious by theory.

On evidence of the IAT's prediction from the validity of conscious reports of trial difficulty, it may be said that the influence of environment-related associations evoked by IAT trials were available in awareness. For each participant their reported task awareness can be characterized as a symbolic mental representation of an event captured in conscious memory, in this case a representation of the duration of their responses intended by the logic of the IAT trials. An alternative interpretation to the standard dual-processing view of unconscious influence (e.g. Beattie & McGuire, 2015) is to posit that symbolic mental representation is a cognitive function exclusive to consciousness; what is not conscious are the complex associative relations that connect conscious mental episodes that cannot be mentally represented as objects of awareness in the first instance. In the present case, we might say implicit environmental attitudes are not unconscious representations of a mental type, i.e. becoming active in a separate mental system that operates automatically and outside of awareness. Instead they are the interrelations of environment-related associations themselves that, when activated, produce the logical IAT response times which can themselves become symbolically represented contents of consciousness available to introspective report. Further investigation of conscious accessibility from an analytic posture is necessary before the nuanced assumptions of alternative approaches to implicit cognition can be competitively tested.

Methodologically, the present research and analytic technique limit what can be known of the nature of environmental attitudes because direct evidence of environment-related associations in awareness was not provided, only awareness of associative strength during task performance in terms of the behavioral impact consciously recognised. We believe our approach effectively probed sufficient contents in awareness for the purpose of IAT evaluation because, by scientific standards, an adequate measure of any hypothetical construct would never produce an awareness of the measure's intention or its operational features that could confound test results. The awareness assessment technique also placed constraints (by design) on the conscious contents to be reported. Consequently, what remains are additional researchable questions regarding awareness of implicit attitudes such as whether categorisation of exemplar images of sustainability predicts subsequent IAT performance as Hahn, et al. (2014) found for social attitudes. As a first attempt at collecting conscious reports related to a measure of implicit

cognition, some latitude was taken in terms of the demands of the report and the timing of assessment interruptions. Participants were only invited to report on difficult trials in awareness, yet awareness of other features of the categorisation task might be examined such as rapid or flowing categorisations, recognition of particular stimuli associated with decision hesitancy or multiple errors, decreasing response times to the point of automaticity, emotional affectivity and emotionality of responses evoked by the exemplars, etc. In addition, random interruptions of the IAT may have interfered with its performance in ways that place the resulting scores in doubt. Additional research may require alternative schemes for collecting concurrent conscious reports. For example, the presentation of implicit test trials might be paced at fixed intervals and conscious elicited regarding participant awareness of keeping the pace and of missed trials counted as errors. Finally, as a critical evaluation of the implicit test, the present research did not include a performance measure external to the environmental IAT (e.g. visual fixation points, product purchases) to demonstrate under what conditions the hypothesized influence of implicit attitudes on sustainable behavior becomes available to consciousness.

We began this critique by questioning the claim that attitudes toward the environment influence behavior outside of awareness. Examination of the IAT used to observe and measure these implicit attitudes produced valid conscious reports that would seem to be a challenge to the methodological assumption that the test operationalises attitudes that are unconscious. In their empirical report Beattie and McGuire (2015) observed, “Currently, despite the plethora of research on self-report attitudes to the environment we actually know very little about the nature of implicit attitudes in this important domain.” (p. 256). On the present finding that sampled behavioral influences of implicit attitudes were accessible in conscious awareness, we agree with this observation and add that psychology will continue to “know very little about the nature” of environmental attitudes whilst researchers continue to measure those hypothetical attitudes with versions of the IAT. In our evaluation of the implicit test, an analytical approach to awareness assessment was taken that may prove to be an effective tool for gaining introspective access to various implicit cognitions and to their influences on one’s own behavior. Whether the technique assists the scientific scrutiny of other implicit tests, the environmental attitudes examined in the present study were not implicit in the sense of operating outside of awareness. Before more claims are made to the unconscious influence of environmental attitudes, continuing research should contrast the present findings with an awareness analysis applied to other implicit tests. Rather than attempting to explain individual resistance to sustainable behavior as a dissociation of environmental attitudes from separate explicit and implicit mental systems, we suggest that an analysis of conscious awareness in ongoing investigations may provide the empirical basis for introspective procedures that promote environmental awareness, personal attitude mindfulness, and positive behavior change toward the environment. The psychological detection and analysis of environmental attitudes available to conscious awareness seems a good place to start.

References

- Angerström, J., & Rooth, D. O. (2011). The role of automatic obesity stereotypes in real hiring discrimination. *Journal of Applied Psychology, 96*, 790–805. <https://doi.org/10.1037/a0021594>
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*(7), 462–479. <https://doi.org/10.1037/0003-066X.54.7.462>
- Beattie, G., & McGuire, L. (2012). See no evil? Only implicit attitudes predict unconscious eye movements towards images of climate change. *Semiotica, 192*, 315–339. <https://doi.org/10.1515/sem-2012-0066>
- Beattie, G., & McGuire, L. (2015). Harnessing the unconscious mind of the consumer: How implicit attitudes predict pre-conscious visual attention to carbon footprint information on products. *Semiotica, 204*, 253–290. <https://doi.org/10.1515/sem-2014-0079>
- Beattie, G., & Sale, L. (2009). Explicit and implicit attitudes to low and high carbon footprint products. *International Journal of Environmental, Cultural, Economic, and Social Sustainability, 5*, 191–206. <https://doi.org/10.18848/1832-2077/CGP/v05i04/54652>
- Berdik, C., Wax, A., & Tetlock, P. E. (2007). Does the Implicit Association Test (IAT) measure racial prejudice? In J. A. Nier (Ed.) *Taking sides: Clashing views in social psychology* (2nd ed.), 314–323. New York: McGraw-Hill.
- Blair, I. V. (2002). The malleability of automatic stereotypes and prejudice. *Personality and Social Psychology Review, 6*(3), 242–261. https://doi.org/10.1207/S15327957PSPR0603_8
- Blair, I. V., Ma, J. E., & Lenton, A. P. (2001). Imagining stereotypes away: The moderation of implicit stereotypes through mental imagery. *Journal of Personality and Social Psychology, 81*, 828–841. <https://doi.org/10.1037/0022-3514.81.5.828>
- Brooks, J., Oxley, D., Vedlitz, A., Zahran, S., & Lindsey, C. (2014). Abnormal daily temperature and concern about climate change across the United States. *Review of Policy Research, 31*(3), 199–217. <https://doi.org/10.1111/ropr.12067>
- Chartrand, T. L., & Bargh, J. A. (2002). Nonconscious motivations: Their activation, operation, and consequences. In A. Tesser, D. A. Stapel, & J. V. Wood (Eds.) *Self and motivation: Emerging psychological perspectives*. Washington, DC: American Psychological Association. <https://doi.org/10.1037/10448-001>
- De Houwer, J. (2002). The Implicit Association Test as a tool for measuring dysfunctional associations in psychopathology: Strengths and limitations. *Journal of Behavior Therapy and Experimental Psychiatry, 33*, 115–133. [https://doi.org/10.1016/S0005-7916\(02\)00024-1](https://doi.org/10.1016/S0005-7916(02)00024-1)
- Dempsey, M., & Mitchell, A. (2010). The influence of implicit attitudes on choice when consumers are confronted with conflicting attribute information. *Journal of Consumer Research, 37*, 614–625. <https://doi.org/10.1086/653947>
- Dulany, D. E. (2002). Mentalistic metatheory and strategies. *Behavioral and Brain Sciences, 24*, 337–338. <https://doi.org/10.1017/s0140525x02290068>
- Dulany, D. E. (2003). Strategies for putting consciousness in its place. *Journal of Consciousness Studies, 10*(1), 33–43.
- Evans, J. S. B. T. (2008). Dual-processing accounts of reasoning, judgment and social cognition. *Annual Review of Psychology, 59*, 255–278. <https://doi.org/10.1146/annurev.psych.59.103006.093629>
- Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. *Psychological Bulletin, 132*, 692–731. <https://doi.org/10.1037/0033-2909.132.5.692>

- Grecco, E., Robbins, S. J., Bartoli, E., & Wolff, E. F. (2013). Use of nonconscious priming to promote self-disclosure. *Clinical Psychological Science*, *1*(3), 311–315. <https://doi.org/10.1177/2167702612472176>
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, *102*, 4–27. <https://doi.org/10.1037/0033-295X.102.1.4>
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, *74*, 1464–1480. <https://doi.org/10.1037/0022-3514.74.6.1464>
- Greenwald, A. G., & Nosek, B. A. (2008). Attitudinal dissociation: What does it mean? In R. E. Petty, R. H. Fazio, & P. Brinol (Eds.), *Attitudes: Insights from the new implicit measures*. Hillsdale, NJ: Erlbaum.
- Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology*, *85*, 197–216. <https://doi.org/10.1037/0022-3514.85.2.197>
- Hahn, A., Judd, C. M., Hirsh, H. K., & Blair, I. V. (2014). Awareness of implicit attitudes. *Journal of Experimental Psychology: General* *143*(3), 1369–1392. <https://doi.org/10.1037/a0035028>
- Hawkins, C. B., & Nosek, B. A. (2012). Motivated independence? Implicit party identity predicts political judgments among self-proclaimed independents. *Personality and Social Psychology Bulletin*, *38*(11), 1437–1452. <https://doi.org/10.1177/0146167212452313>
- Kihlstrom, J. F. (1987). The cognitive unconscious. *Science*, *237*, 1445–1452. <https://doi.org/10.1126/science.3629249>
- Kihlstrom, J. F. (1999). Conscious and unconscious cognition. In R. J. Sternberg (Ed.), *The nature of cognition*. Cambridge, MA: MIT Press.
- Lewicki, P., Hill, T., & Czyzewska, M. (1992). Nonconscious acquisition of information. *American Psychologist*, *47*, 796–801. <https://doi.org/10.1037/0003-066X.47.6.796>
- Lorenzoni, I., & Pidgeon, N. F. (2006). Public views of climate changes: European and USA perspectives. *Climate Change*, *77*, 73–95. <https://doi.org/10.1007/s10584-006-9072-z>
- Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports of mental processes. *Psychological Review*, *84*, 231–259. <https://doi.org/10.1037/0033-295X.84.3.231>
- Nosek, B. A., & Smyth, F. L. (2007). A multitrait–multimethod validation of the Implicit Association Test: Implicit and explicit attitudes are related by distinct constructs. *Experimental Psychology*, *54*, 14–29. <https://doi.org/10.1027/1618-3169.54.1.14>
- Palfai, T. P., & Ostafin, D. B. (2003). Alcohol and motivational tendencies in hazardous drinkers: assessing implicit response tendencies using the modified IAT. *Behavioral Research and Therapy*, *41*, 1149–1162. [https://doi.org/10.1016/S0005-7967\(03\)00018-4](https://doi.org/10.1016/S0005-7967(03)00018-4)
- Pidgeon, N. (2012). Public understanding of, and attitudes to, climate change: UK and international perspectives and policy. *Climate Policy*, *12*, S85–S106. <https://doi.org/10.1080/14693062.2012.702982>
- Rudman, L. A., McLean, M. C., & Bunzl, M. (2013). When truth is personally inconvenient, attitudes change: The impact of extreme weather on implicit support for Green politicians and explicit climate-change beliefs. *Psychological Science* *24*(11), 2290–2296. <https://doi.org/10.1177/0956797613492775>
- Sargent, M. J., Kahan, T. A., & Mitchell, C. J. (2007). The mere acceptance effect: Can it influence responses on racial Implicit Association Tests? *Journal of Experimental Social Psychology*, *43*(5), 787–793. <https://doi.org/10.1016/j.jesp.2006.07.006>

- Shanks, D. R., Newell, B. R., Lee, E. H., Balakrishnan, D., Ekelund, L., et al. (2013). Priming intelligent behavior: An elusive phenomenon. *PLoS ONE* 8(4): e56515. <https://doi.org/10.1371/journal.pone.0056515>
- Sherman, J. W., Gawronski, B., & Trope, Y. (Eds.). (2014). *Dual-process theories of the social mind*. New York: Guilford.
- Spence, A., Poortinga, W., Butler, C., & Pidgeon, N. F. (2011). Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change*, 1, 46–49. <https://doi.org/10.1038/nclimate1059>
- Walker, G., & King, D. (2008). *The hot topic: How to tackle global warming and still keep the lights on*. London: Bloomsbury.
- Weber, E. U. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). *Climate Change*, 77, 103–120. <https://doi.org/10.1007/s10584-006-9060-3>
- Wilson, T. D., Lindsey, S., & Schooler, T. Y. (2000). A model of dual attitudes. *Psychological Review*, 107, 101–126. <https://doi.org/10.1037/0033-295X.107.1.101>

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