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Validity of the Salience Asymmetry Account of the Implicit Association Test: Reply to Greenwald, Nosek, Banaji, and Klauer (2005)

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In their comment on K. Rothermund and D. Wentura (2004), A. G. Greenwald, B. A. Nosek, M. R. Banaji, and K. C. Klauer (2005) agreed that salience asymmetries can be a source of Implicit Association Test (IAT) effects. The authors applaud this conclusion but point to problems with the other points that Greenwald et al. made. The authors have difficulties understanding the nominal feature account that Greenwald et al. put forward and have doubts about the usefulness of their broad conception of the concept *association*. The authors also argue that existing evidence concerning the construct validity of the IAT does not allow one to discriminate between the association and the salience accounts. In addition, the new studies that were presented by Greenwald et al. do not provide insights into what the IAT measures because they are either irrelevant for a decision between the different accounts or contain methodological problems that prevent a meaningful interpretation in terms of the models.

Keywords: IAT, salience asymmetries, associations, implicit measurement, strategies

Implicit Association Test (IAT) effects are commonly assumed to reflect associations between concepts or between concepts and evaluations (Greenwald et al., 2002; Greenwald, McGhee, & Schwartz, 1998). Contrary to this assumption, Rothermund and Wentura (2004) recently reported evidence that IAT effects reflect salience asymmetries rather than associations: IAT effects of similar magnitude emerged for association-free variants of the IAT, and these modified IATs showed similar correlations with self-report measures, as did standard variants of the IAT (Rothermund & Wentura, 2004, Experiments 1B, 1C, 1E, 2A, and 2B; see also Rothermund & Wentura, 2001). Furthermore, inverting the salience asymmetries of a given IAT by experimental manipulations led to a reversal of IAT effects (Rothermund & Wentura, Experiments 3A and 3B), and associations did not have an influence on IAT effects if salience asymmetries were held constant (Rothermund & Wentura, 2004, Experiment 4).

In a comment on Rothermund and Wentura (2004), Greenwald, Nosek, Banaji, and Klauer (2005) proposed a nominal feature account of the IAT in combination with a "theory-uncommitted" (Greenwald et al., 2005, p. 420) conception of association. Greenwald et al. argued that nominal features are more important than salience asymmetries in explaining IAT effects.

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Commonalities and Differences Between Theoretical Claims of Greenwald et al. (2005) and Rothermund and Wentura (2004)

Salience Asymmetries as a Source of IAT Effects

Greenwald et al. (2005) accepted salience asymmetries as a possible source of IAT effects. This is an important point to start with, because this is also the central message of the Rothermund and Wentura (2004) article. A direct implication of this assumption for research with the IAT is that it cannot be taken for granted that any possible IAT measures some kind of association, nor can it be assumed that it measures only associations. Accordingly, at least some degree of caution is needed when interpreting IAT effects as a measure of associations in memory. We propose that using modified, association-free variants of the IAT in parallel to standard association IATs is a simple and straightforward way to decide between the association and salience accounts and to test the discriminant validity of the IAT as a measure of associations.

Nominal Features as a Source of IAT Effects

There is also no disagreement about the fact that salience asymmetries are not the only source of IAT effects. Greenwald et al. (2005) proposed that nominal features are another source of IAT effects. We agree that nominal features can be a source of IAT effects, but we also have difficulties understanding what exactly the nominal features account implies. The main problem we have with this account is that Greenwald et al. did not specify a process model of how nominal features (or associations between nominal features) produce IAT effects. A second problem with the nominal features account is that although it seems easy to identify nominal features for bipolar conceptual dimensions like old versus young

(age), male versus female (gender), and so forth, we were unable to identify the nominal features for other contrasts that are often used in the IAT, like insects versus flowers (Greenwald et al., 1998), self versus other (Greenwald & Farnham, 2000; Rothermund & Wentura, 2004), or other category contrasts that are not bipolar (e.g., alcohol vs. sodas, Wiers, van Woerden, Smulders, & de Jong, 2002; spiders vs. snakes, Teachman, Gregg, & Woody, 2001).

When we set these problems aside, the difference between the position of Greenwald et al. (2005) and that of Rothermund and Wentura (2004) mainly concerns the relative importance of salience asymmetries and nominal features as a source of IAT effects. Whereas Greenwald et al. (2005) argued that most IAT effects reflect associations between nominal features, Rothermund and Wentura (2004) argued that salience asymmetries play a role in many so-called standard IAT effects. It should be clear that this difference in opinion should be and can be tested empirically. Rothermund and Wentura (2004) argued that this can be done by routinely including independent measures of salience and association-free variants of the IAT in experiments to specify the contribution of salience asymmetries to IAT effects. In addition, when conducting such studies, it is important to control for strategic recoding. Both Rothermund and Wentura and Greenwald et al. acknowledged that nominal features of the categories can lead to IAT effects if participants apply strategic recoding (see also Kinoshita & Peek-O'Leary, in press). That is, participants might tend to strategically recode all stimuli in terms of only one feature (e.g., valence), which reduces the complexity of the two-dimensional classification task to a simple binary decision task in the compatible block and thus results in an IAT effect (Rothermund & Wentura, 2001, p. 95; Rothermund & Wentura, 2004, p. 158). IAT effects that are based on a strategic recoding of the categories provide little information about the automatic activation of associations because recoding strategies in the IAT can build on any kind of structural feature that helps to simplify the task, regardless of conceptual associations (e.g., Mierke & Klauer, 2003, reported artificial IAT effects that are based on a strategic recoding of confounded stimulus dimensions that are conceptually unrelated, i.e., color and size). Hence, it is important to detect and exclude strategic recoding when testing the nominal feature account or when comparing the relative importance of the nominal feature account and the salience account. From this perspective, it is surprising that Greenwald et al. do not seem to have problems with a strategic recoding account of IAT effects, as becomes clear from their statement that "Rothermund and Wentura's strategic recoding interpretation becomes empirically interchangeable with Greenwald et al.'s association-strength interpretation" (Greenwald et al., 2005, p. 423).

In sum, then, Rothermund and Wentura (2004) wanted to analyze the underlying mechanisms of IAT effects. Rothermund and Wentura proposed two different process models for the IAT, one (the *salience account*) that focuses on automatic processes caused by salience asymmetries and one (the *strategic recoding account*) that explains IAT effects by a strategic recoding of four categories into two. If the nominal feature account is identical with the strategic recoding account—some sentences of Greenwald et al. (2005) read as if it should be seen that way (see, e.g., p. 422)—we have the impression that its acceptance as the leading theory for the IAT will result in a decrease of interest in IAT research. If not, then a process model of how nominal features cause IAT effects is still lacking.

Theory-Committed and Theory-Uncommitted Conceptions of Association

Greenwald et al. (2005) proposed a broad, theory-uncommitted conception of association. Drawing on the philosophical writings of Aristotle and Hume, Greenwald et al. argued for such a broad usage because the term *association* can indicate very different things, like contiguity (in time or place), frequency, similarity, contrast, or causation (Greenwald et al., 2005, p. 421).[1] This usage can be contrasted with theoretically more constrained accounts that use the term *association* to indicate links in a semantic network structure (e.g., Bower, 1981; Collins & Loftus, 1975) or the similarity of distributed activation patterns (e.g., Masson, 1995). Despite their apparent heterogeneity, all of these theory-committed usages of association have one common element: Associations are used to explain that activation of a concept has a facilitative influence on the processing of subsequently presented associated concepts (e.g., Neely, 1977).

The main problem with a theory-uncommitted account is that the concept of association becomes meaningless and inconsequential. When used in a broad sense, it can refer to any process or relation. Also, if an IAT effect is found, one can always find some feature that the concepts of the IAT have in common. Hence, we agree with the view of Kinoshita and Peek-O'Leary (in press): "In the absence of a commitment to a theory of association, association can be defined only post hoc, by the data. Thus, the target and attribute dimensions are said to be associated when there is an IAT effect, and unassociated when no IAT effect is observed. . . . This is clearly circular, and the claim that the IAT effect taps associations between the target and attribute dimensions can never be falsified" (footnote 3). In contrast, a typical theory-committed usage of the concept of association captures the fundamental idea that an activation of mental representations of social categories or the self leads to an automatic activation of associated semantic or evaluative content, which corresponds with current theorizing regarding the cognitive bases of attitudes, prejudice, stereotypes, self-concept, and so forth (cf. Bower, 1981; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Fiske, 1998; Kunda, 1999).

Evidence Regarding Effects of Salience Asymmetries in the IAT

Greenwald et al.'s (2005) Criticism of the Evidence Reported by Rothermund and Wentura (2004)

Most of the evidence in support of the salience asymmetry account was reported by Rothermund and Wentura (2001, 2004), but some other researchers have also reported findings that can be explained with the salience asymmetry account and are difficult to reconcile with an association account of the IAT (Brendl, Markman, & Messner, 2001; Kinoshita & Peek-O'Leary, 2003; Mitch-

[1] As we read them, rather than arguing for a broad conception of association comprising multiple meanings, Aristotle and Hume aimed to distinguish between different usages of the term *association* to avoid misunderstandings and equivocations.

ell, 2004). Greenwald et al. (2005, pp. 420–425) criticized this evidence mainly on the basis that "nonstandard" procedures were used in the IAT. For example, the use of dichotomies like word versus nonword or names of publicly known versus unknown persons is criticized as being nonstandard. Greenwald et al. (2005) paraphrased Greenwald and Nosek (2001) that "the IAT does not function properly" (p. 423) in these cases, but this criticism is not bolstered by any arguments. Nonstandard manipulations of task features reveal how the IAT functions in standard cases and can provide unique insights into the processes underlying performance in the task. Such manipulations have to deviate from what is standard to separate influences that were previously confounded. Rothermund and Wentura reported several effects of such manipulations that are at odds with an association account but can be explained on the basis of a salience account. Hence, we conclude that results obtained with nonstandard procedures do favor the salience account.

Another criticism of Greenwald et al. (2005) refers to the fact that IAT effects were not calculated using the *D* measure developed by Greenwald, Nosek, and Banaji (2003). Greenwald et al. (2005) argued that the *D* measure is more suitable as a measure of IAT effects for the studies of Rothermund and Wentura (2004) because it might be less susceptible to a confound of IAT effects with cognitive control abilities. This criticism is not convincing. First, a reanalysis of our data with the *D* measure yields a highly similar pattern of findings. Second, the argument of a cognitive skill confound does not apply to most of the findings reported by Rothermund and Wentura (and others): Even if cognitive skill is a major factor in IAT effects, this confound cannot explain global IAT effects but only interindividual differences regarding these effects. A cognitive skill confound thus cannot explain why IAT effects can be found on the basis of salience asymmetries without associations or why manipulating the valence of stimuli does not have an influence on IAT effects if salience asymmetries are held constant (Rothermund & Wentura, 2001, 2004). A global cognitive skill confound is also not capable of explaining the pattern of relations between IAT effects and measures of salience asymmetries reported by Rothermund and Wentura (2004) because in this case, IAT effects would have to correlate with all measures of salience asymmetries in the same way. These correlations, however, were restricted to the theoretically predicted cases (Rothermund & Wentura, 2004, Experiments 2A and 2B). Besides using a millisecond metric on the basis of correct responses, eliminating outliers is the norm rather than the exception in experimental psychology. The *D* measure, however, is nonstandard: It is based on individually standardized reaction time differences; makes use of practice trials; does not eliminate outlier values at the right or left tail of the response time distribution; and includes reaction times based on second, correcting responses after erroneous responses or uses arbitrary error penalties. Finally, it should be emphasized that the *D* measure might be sensitive to strategic factors, because it was chosen to yield maximal correlations of IAT effects with self-report measures (Greenwald et al., 2003).

Null Findings Reported by Greenwald et al. (2005)

Greenwald et al. (2005) reported two studies that were conducted to test implications of the salience asymmetry account. Both studies failed to support predictions that were purportedly derived from this account. A closer look at these studies reveals, however, that they contain methodological flaws. The reported findings thus do not represent an adequate test of the Rothermund and Wentura (2004) model nor do they pose a problem for the salience asymmetry account.

Experiment 1 is a replication of a standard flower-versus-insect IAT with an additional color manipulation to induce salience asymmetries between the target categories. Greenwald et al.'s (2005) color manipulation did not have an influence on the resulting IAT effects. This null finding stands in contrast to the results of Rothermund and Wentura's (2004) Experiment 3B, in which a color-based manipulation of salience asymmetries led to a reversal of IAT effects. There are two major differences between the two studies. First, in Rothermund and Wentura's experiment, color was task relevant because color categories were used as attribute labels, whereas in Greenwald et al.'s study, color was a redundant feature of the task because colors were not used as category labels in the IAT. Making color irrelevant for the task might reduce the potential impact of a color-based salience manipulation on the IAT because participants might try to inhibit the processing of task-irrelevant stimulus attributes that tend to interfere with correct responding (De Houwer, Rothermund, & Wentura, 2001; such an inhibition is impossible if a stimulus feature is task relevant). Second, in Greenwald et al.'s study, the color-based salience manipulation had to compete with the effects of a preexisting salience asymmetry between insects and flowers (no such competition was present in Rothermund & Wentura's experiment because color was used as the attribute dimension). Rothermund and Kaul (2002) found a strong salience asymmetry between insects and flowers in a visual search task. Using these categories should override any effect of a color manipulation that is task irrelevant.

Another major goal of Experiments 1 and 2 by Greenwald et al. (2005) was to investigate relations between IAT effects and salience asymmetries that were measured with different variants of a visual search task. A direct comparison of the findings reported by Greenwald et al. with their salience measures and the findings reported by Rothermund and Wentura (2004) with their version of the visual search task is illuminating: Greenwald et al. were unable to produce any kind of effect at all with their salience measures, whereas Rothermund and Wentura always got the theoretically predicted effects with their version of the search task. We suppose that most experimental psychologists would agree that a measure that produces robust and theoretically predicted effects is prima facie superior compared with other measures that produce null findings. In the following paragraphs, we list some arguments why the search tasks used by Greenwald et al. might be incapable of detecting salience asymmetries.

In all search tasks used by Greenwald et al. (2005), search categories were specified in advance before each trial of the search tasks. Specification of a search category by task instructions, however, exerts an influence on attentional and search processes (e.g., Jonides & Gleitman, 1972; Wolfe, 1998; Yantis, 1998) and can eliminate or invert preexisting search asymmetries: Even strong salience asymmetries can be overridden by search instructions (Rothermund & Wentura, 2004, Experiment 3A). Because specification of search categories has a major impact on attentional processes, the search tasks used by Greenwald et al. cannot be used to detect default search asymmetries. Another flaw of the salience measures of Greenwald et al. was that in each case, measures of

search asymmetries were confounded with response tendencies because only "yes" responses were analyzed. This confound is critical because two thirds of all trials in their tasks were "yes" trials, which should induce strong response tendencies (this is reflected in the finding that, on average, "no" responses were 500 ms slower than "yes" responses). In addition, in our search task, we always found stronger search asymmetries for the "no" responses because in these trials, the whole display has to be processed, whereas in the "yes" trials, the search is terminated as soon as two stimuli of different categories are detected (see Rothermund & Wentura, 2004, p. 149, footnote 5). A further criticism of their salience measures refers to the fact that Greenwald et al. presented eight word stimuli in each trial of the search tasks, which is twice the number of stimuli that we used in our search tasks. With these large display set sizes, participants may be inclined to process the word stimuli one by one, which reduces potential effects of salience asymmetries. Another criticism refers to one of their salience measures in which distractor stimuli were drawn from multiple categories. Such a procedure likely makes it impossible to detect pop-out effects for any target category (Wolfe, 2001).

The previous arguments suggest that Greenwald et al.'s (2005) search tasks were incapable of detecting existing salience asymmetries. The null findings reported by Greenwald et al. thus reflect deficits in implementing the salience account rather than posing a problem for the salience account.

Construct Validity of the IAT

Greenwald et al. (2005) reviewed previous studies in which the IAT correlated with self-report measures (Greenwald et al., 2005, pp. 420–425). We do not think that simple correlations between IAT effects and self-report measures can be used to decide between the association and salience asymmetry accounts of the IAT. Rothermund and Wentura (2004) argued—and Greenwald et al. (p. 421) seem to acknowledge this possibility—that associations and salience asymmetries are often empirically confounded. Such an assumption can account for the reported correlations, which are mostly quite modest anyway (e.g., a recent meta-analysis by Hofmann, Gawronski, Gschwendner, Le, & Schmitt, in press, that was based on more than 100 IAT publications yielded a mean raw correlation of .19 between IAT effects and self-report measures; correcting for measurement error increased this estimate to .24). Thus, according to a salience asymmetry account, correlations between IAT effects and self-report indicators of associations are spurious (Rothermund & Wentura, 2004, p. 157). The spuriousness hypothesis can also be applied to findings quoted by Greenwald et al. regarding IAT differences between known groups and the prediction of stereotyping or prejudiced behavior with IAT effects. The underlying assumption is that differences between groups or differences in attitudes and personally held stereotypes typically imply selective exposure to certain classes of stimuli, which implies interindividual differences in salience asymmetries (Rothermund & Wentura, 2004, p. 157). This confound may account for the emergence of group differences and relations between IAT effects and behavior.

In their Experiments 2A and 2B, Rothermund and Wentura (2004) supported the spuriousness hypothesis empirically by showing that correlations between IAT effects and self-report measures of group identification or gender self-concept also emerged for association-free variants of the IAT. In these experiments, the attribute categories of the original IATs were replaced with the neutral dichotomy of words versus nonwords. Additionally, Rothermund and Wentura showed that the correlations between IAT effects and self-report measures disappeared or were reduced after controlling for salience asymmetries. Greenwald et al. (2005, p. 422) seem to ignore these findings; they wrote instead that in case of a confounding of salience asymmetries and associations, both accounts would become empirically indistinguishable, which is not the case.

Conclusion

The nominal feature account proposed by Greenwald et al. (2005) and the way in which they define the concept *association* are not likely to further the understanding of the processes underlying the IAT. We also see no arguments that could make one doubt the validity of the salience asymmetry account. On the positive side, Greenwald et al. made it clear that they believe that IAT effects can be based on salience asymmetries. The disagreement is about how important those asymmetries are. This is mainly an empirical question that needs to be investigated in future research. Such research should focus on IAT effects that are not based on strategic recoding and should use appropriate independent measures of salience asymmetries.

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New Editors Appointed, 2007–2012

The Publications and Communications (P&C) Board of the American Psychological Association announces the appointment of three new editors for 6-year terms beginning in 2007. As of January 1, 2006, manuscripts should be directed as follows:

- *Journal of Experimental Psychology: Learning, Memory, and Cognition* (www.apa.org/journals/xlm.html), **Randi C. Martin, PhD,** Department of Psychology, MS-25, Rice University, P.O. Box 1892, Houston, TX 77251.
- *Professional Psychology: Research and Practice* (www.apa.org/journals/pro.html), **Michael C. Roberts, PhD,** 2009 Dole Human Development Center, Clinical Child Psychology Program, Department of Applied Behavioral Science, Department of Psychology, 1000 Sunnyside Avenue, The University of Kansas, Lawrence, KS 66045.
- *Psychology, Public Policy, and Law* (www.apa.org/journals/law.html), **Steven Penrod, PhD,** John Jay College of Criminal Justice, 445 West 59th Street N2131, New York, NY 10019-1199.

Electronic manuscript submission. As of January 1, 2006, manuscripts should be submitted electronically through the journal's Manuscript Submission Portal (see the Web site listed above with each journal title).

Manuscript submission patterns make the precise date of completion of the 2006 volumes uncertain. Current editors, Michael E. J. Masson, PhD, Mary Beth Kenkel, PhD, and Jane Goodman-Delahunty, PhD, JD, respectively, will receive and consider manuscripts through December 31, 2005. Should 2006 volumes be completed before that date, manuscripts will be redirected to the new editors for consideration in 2007 volumes.

In addition, the P&C Board announces the appointment of **Thomas E. Joiner, PhD** (Department of Psychology, Florida State University, One University Way, Tallahassee, FL 32306-1270), as editor of the *Clinician's Research Digest* newsletter for 2007–2012.