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FlashReport

Not all implicit measures of attitudes are created equal: Evidence from an embodiment perspective

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ABSTRACT

We hypothesize that while evaluative priming involves proprioceptive cues, the IAT is representational due to its structural features and the specific algorithm upon which the IAT-effect rests. As predicted, evaluative priming is shown to rely on differential facial muscle activity while the IAT as a measurement instrument is not influenced by proprioceptive information. Evaluative priming does not yield differential responsiveness for congruent and incongruent trials when facial muscle activity is inhibited whereas the IAT-effect is shown to be impervious to such inhibition. Implications for the underlying mechanisms of implicit measures are discussed.

Introduction

The implicit measurement of a range of diverse constructs (cf. Fazio & Olson, 2003) such as attitudes (e.g., Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Greenwald, McGhee, & Schwartz, 1998; Klauer & Musch, 2003), stereotypes (e.g., Wittenbrink, Judd, & Park, 1997), and self-esteem (e.g., Bosson, Swann, & Pennebaker, 2000) has gained considerable ascendance over the last few decades. Two of the more prominent techniques are evaluative priming (Fazio et al., 1986) and the Implicit Association Test (IAT; Greenwald et al., 1998).[1] Interestingly, even in cases designed to assess the same underling construct (e.g., attitude toward social groups) these two techniques have shown disappointingly low correlation (Fazio & Olson, 2003, but see Cunningham, Preacher, & Banaji, 2001) suggesting that they may differ regarding the processes that drive them (De Houwer & Moors, 2010).

Our reactions to in- and out-group members are affectively grounded (Niedenthal, 2007) as a result of repeated associations between bodily affective states and members of social categories. This is manifested in differential facial expressions of affect to members of liked versus disliked groups (cf. van der Schalk et al., 2011; Vanman, Paul, Ito, & Miller, 1997). To which extent do these two implicit measures reflect and measure such affective processes? The experiment we report here is based on the argument that while embodied processes (i.e., activation of facial muscles) are important components during *evaluative priming* in all likelihood by inducing proprioceptive feedback, the IAT paradigm and the algorithm on which its effects is based disguises the role that any embodied input may have. Namely, affective priming effects are driven by proprioceptive information activated by primes and targets (cf. Semin & Foroni, under review).

This argument is derived from earlier research showing that the zygomatic and corrugator are activated app. 500 ms after valenced stimulus presentation (e.g., Dimberg, Thunberg, & Elmehed, 2000). The translation of this finding to evaluative priming suggests that a target that is presented *after* a prime usually appears just when the prime is potentially beginning to activate the corresponding facial muscles. In the case of congruent trials, this would mean that the target boosts the proprioceptive cue activated by the prime, inducing the usual response-time advantage on congruent trials. Thus, blocking possible facial mimicry in an evaluative priming experiment should impair the affective priming effect (i.e., canceling the response time advantage when prime and target are congruent in valence). Preliminary data across two experiments (Semin & Foroni, under review) showed that the differential activation of facial muscles – as a response to evaluatively loaded stimuli (Cacioppo, Petty, Losch, & Kim, 1986) – is an important component of the evaluative priming effect. In other words, bodily reactions to a prime affect the processing of the subsequent valenced target according to the prime-target valence congruency.

In the case of the *IAT*, on the other hand, stimuli are presented individually and the IAT algorithm is computed by comparing performance across different blocks (compatible vs. incompatible). These blocks do not differ with respect to the stimuli used or their presentation, but rather in the classification rules (response mapping). The

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[1] Although considerable controversy surrounds the appropriateness of the IAT (e.g. Blanton, Jaccard, Christie, & Gonzales, 2007; Blanton, Jaccard, Gonzales, & Christie, 2006), the IAT continues to be a widely used measure in the study of implicit attitudes.

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manner in which the final index is calculated (difference in performance between compatible and incompatible block) makes it unlikely that bodily reactions to the individual stimuli could feature in the final index. Consequently, the IAT measure is an amodal representational index that is not affectively grounded (Niedenthal, 2007).

The present experiment was designed to investigate this difference between evaluative priming and IAT, by examining if bodily processes (i.e., facial muscle resonance to members of positively and negatively evaluated social categories) play a role in the measurement of implicit attitudes toward in- and out-group members.

Overview

The goal of this experiment was to assess attitudes toward ethnic social categories using evaluative priming and the IAT with a view to examine if these implicit measures were sensitive to different proprioceptive reactions to stimuli representing members of a liked vs. disliked social category. If our earlier arguments are correct, then blocking the zygomatic – which is activated by positive and inhibited by negative stimuli – by holding a pen with protruded lips ('pen condition', cf. Foroni & Semin, 2009; Strack, Martin, & Stepper, 1988) should inhibit differential proprioceptive activity and eliminate the distinctive evaluative priming pattern as an indicator of an attitude toward an in- and out-group. However, this should not be the case for the IAT effect.

Participants were assigned to one of 4 conditions as a result of the type of paradigm (priming vs. IAT) and muscle condition (standard vs. pen). Both paradigms used the exact same stimulus material consisting of photos of individuals with a dark-skin tone or light-skin tone and positive and negative words.

We expected that the IAT would not be modulated by the pen condition revealing the same standard IAT-effect (i.e., negative attitude toward dark-skin tone individuals) obtained in the standard condition. In contrast, the priming paradigm was expected to show the standard priming effect (i.e., negative attitude toward dark-skin tone individuals) only in the standard condition.

Method

Participants and stimulus material

Hundred-eighty Dutch students (116 women, *Mean age* = 20.14) participated as paid volunteers and were randomly allocated to one of the 4 experimental conditions (Priming-standard: $N = 56$; Priming-pen: $N = 60$; IAT-standard: $N = 29$; IAT-pen: $N = 35$). The experimental stimuli (from Foroni & Bel-Bahar, 2010) consisted of a set of 8 photos (4 pictures of dark-skin tone individuals and 4 pictures of light-skin tone individuals) and 8 Dutch words (of which 4 positive and 4 negative).[2]

Procedure

Upon arrival, participants were led to individual cubicles where the experiment was presented as a computer administered concentration task. In the pen condition, participants were informed that they had a secondary 'coordination' task, namely, holding a pen in their mouth while performing the task. The experimenter explained and demonstrated how the pen should be held and then ascertained that the participant understood it and could reproduce it. The pen manipulation implemented here requires the participants to hold a pen between their lips (in a kiss-like position: Strack et al., 1988), a condition known to produce a continuous activation of the *zygomatic*. This position inhibits the possibility of differential muscular resonance to stimuli (Foroni & Semin, 2009; Strack et al., 1988) and preliminary data suggest that does not have any interference effects (Semin & Foroni, under review).

Priming task

The sequence of events in each trial was as follows: First, a fixation point appeared (2000 ms) and was replaced by a photo (prime: 200 ms), followed by a blank screen (100 ms) and then the target word appeared and remained until response. After the response and a subsequent inter-trial interval (500 ms) the next trial was presented. Participants received 8 practice trials during which they received feedback after which they completed the test phase consisting of 4 blocks of 32 trials each. In each block, there was an equal number of each prime-target pair type (i.e., 8 dark skin-tone face/positive-word, 8 dark skin-tone face/negative-word, 8 light skin-tone face/positive-word, and 8 light skin-tone face/negative-word) randomly generated for each participant. Response-key assignment was counterbalanced across participants.

IAT task

IAT followed the traditional structure consisting of a total of 3 single-classification practice blocks and 2 combined test blocks (Greenwald et al., 1998). As in previous research implementing the IAT in the Netherlands (Foroni & Bel-Bahar, 2010), the evaluative classification labels were 'good' and 'bad' while the social category labels were 'Immigrants' and 'Natives'.[3] Based on the response key assignment, test blocks were compatible (dark-skin-face/negative-word one key and light-skin-face/positive-word the second key) or incompatible (dark-skin-face/positive-word one key and light-skin-face/negative-word the second key). Response-key assignment and order of the compatible and incompatible blocks were counterbalanced across participants.

Data analyses and results

First, the results of priming and IAT paradigms were analyzed separately. Then, we compared the two paradigms in the two conditions by means of a z-transformation of the respective dependent variables in order to test the impact of the pen-blocking manipulation across the two paradigms.

Priming

The dependent variable was the average response time (RTs) for the congruent trials (dark skin-tone face/negative-word, light skin-tone face/positive-word) and incongruent trials (dark skin-tone face/positive-word, light skin-tone face/negative-word). Trials with incorrect responses (5.0%) or with response times (RTs) below 300 ms (0.5%) or above 1500 ms (0.8%) were excluded from the analyses (total excluded trials: 6.0%). The design was a 2 (*trial congruency*: congruent vs. incongruent) × 2 (*condition*: standard vs. pen) with the last variable between participants. As expected (Fig. 1, left panel), the standard condition shows a significantly larger priming effect than the pen-priming condition as indicated by the interaction between congruency and manipulation, $F(1,114) = 6.46$, $p = 0.012$. No other effect was significant. In particular, the standard condition reveals the usual significant priming effect, $t(55) = -3.059$, $p = 0.003$, with congruent trials ($M = 570$, $SD = 57.76$) showing a response time advantage over incongruent trials ($M = 578$, $SD = 56.92$). On the other hand, the pen condition revealed, as expected, no priming effect ($t(59) < 1$, ns.) with the congruent trials ($M = 589$, $SD = 88.32$) not significantly different from the incongruent ones ($M = 585$, $SD = 80.30$).

[2] Stimuli are presented here in the English translation with the original Dutch between parentheses. *Positive words*: friendly (vriendelijk), loving (liefdevol), pleasure (plezier), laugh (lachen); *Negative words*: poison (vergif), dreadfully (vreselijk), beastly (beestachtig), tragic (tragisch).

[3] The classification in 'Immigrants' and 'Natives' (in Dutch Allochtoon and Autochtoon) overlaps with the Black-/White-American classification both for physical distinction and in terms of evaluation.

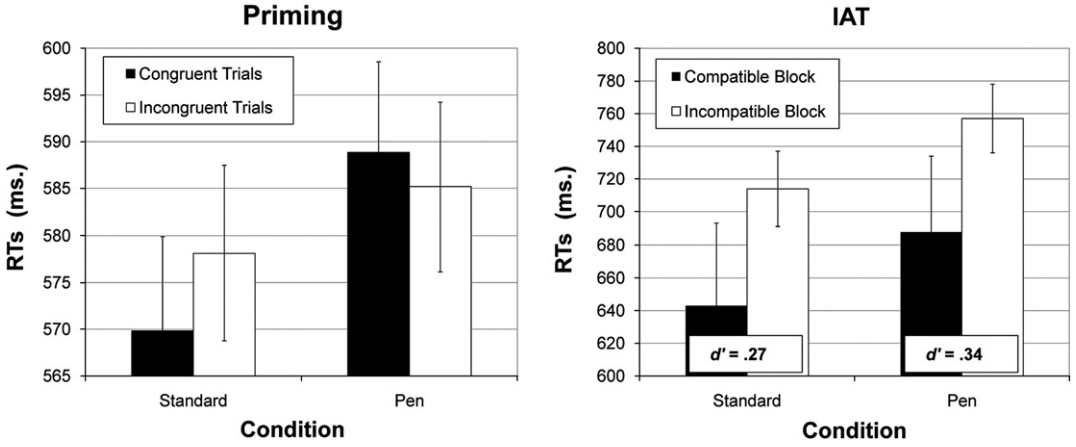

Fig. 1. Left panel (Priming paradigm): Mean reaction times (RTs) and Standard error of means (SE) as a function of trial congruency (congruent vs. incongruent) and condition (standard vs. pen). Right panel (IAT paradigm): Mean RTs and SE of means as a function of block compatibility (compatible vs. incompatible) and condition (standard vs. pen). IAT-effect (in *d'*) is reported as a function of condition.

IAT

Data reduction followed the *improved scoring algorithm* and the dependent variable was the IAT-effect expressed by Cohen's *d'* (see Greenwald, Nosek, & Banaji, 2003). The IAT-effect reflects the difference in performance between the two test blocks (compatible vs. incompatible). The design consisted in a between-participants variable *condition* (standard vs. pen). Fig. 1 (right panel) reports the IAT-effect in *d'* as well as the average RTs for the compatible and incompatible blocks. The usual and significant IAT-effect is present both in the standard condition ($t(28) = 4.76$, $p < 0.001$) and the pen condition ($t(34) = 4.72$, $p < 0.001$). Moreover, the IAT-effect in the standard condition ($M = 0.27$, $SD = 0.31$) did not differ from the one in the pen condition ($M = 0.34$, $SD = 0.43$), $t(62) < 1$, ns.

Priming vs. IAT

In order to test whether the pen condition differently affects the two paradigms, participant scores on the main dependent variable (difference in RTs for priming or *d'* for IAT) was z-transformed. The resulting z-score was entered as a dependent measure in the 2 (*paradigm*: priming vs. IAT) × 2 (*condition*: standard vs. pen) ANOVA. The 2 × 2 (all between subject) design produced the predicted significant two-way interaction between *paradigm* and *condition*, $F(1,176) = 4.29$; $p = 0.04$. No other effect was significant. This result confirmed that the inhibition of the zygomatic muscles (pen condition) has different consequences in the two paradigms. It affects only the outcome of the priming paradigm.

Discussion

Our study reveals that inhibiting the activation of the *zygomatic* eliminates evaluative priming effects (see also Semin & Foroni, under review). However, the pen-induced manipulation had no effects on the IAT measure which revealed the same systematic effect across both experimental conditions. These findings suggest that evaluative priming relies on distinct somatic processes and in all likelihood on proprioceptive feedback (Strack et al., 1988). One could wonder if the absence of the evaluative priming effect in the pen condition here could be due to distraction. We believe that this is not the case. First, holding a pen does not have any interference effects on the IAT; secondly, preliminary data suggest that this is not the case and that holding a pen does not have interference effects (Semin & Foroni, under review).

We argue that in the standard condition, the muscular activation in response to the prime facilitates the response to congruent targets. An alternative interpretation suggests that, similar to negative mood, the pen manipulation signals that something may be problematic about the current environment inducing a more careful processing of the stimuli and thus dampening the activation of implicit attitudes (e.g., Clore & Huntsinger, 2009; Storbeck & Clore, 2008).[4] The present data cannot disentangle between these two interpretations. However, previous research showed that the IAT effect is significantly reduced by negative mood (e.g., Huntsinger, Sinclair, & Clore, 2009; for a review see Clore & Huntsinger, 2009) while here the pen manipulation has no impact on the IAT effect. Thus, the latter interpretation seems to be less likely.

When muscle resonance is inhibited, as in the pen condition, then one would expect the processing of affective stimuli to be slowed down due to the lack of differential somatic information (see Winkielman, Niedenthal, & Oberman, 2008 for a review). The RT data from both the priming and IAT paradigms reported here are in line with this claim, albeit not significantly so, (see Fig. 1). In both paradigms, blocking muscle resonance to affective stimuli increases the processing time (RTs). However, the differential muscle response to affective stimuli is reflected only in the case of the priming-effect due to the facilitation of the target processing during valence-congruent trials. On the other hand, any differential muscle resonance to affective stimuli in the case of the IAT is averaged within blocks and is masked by how the IAT-effect is computed.

The issue of the degree of convergence or divergence and the reasons underlying these two options has been an important point of discussion in the literature on implicit measures (cf. De Houwer & Moors, 2010). The lack of a correlation between evaluative priming measures and IAT has been reported earlier (Fazio & Olson, 2003) and as can be seen from our research, one of the reasons for this divergence is likely to be found in the different processes contributing to these measures. While somatic processes play a role in evaluative priming, they do not in the IAT. This is an important difference if one considers the role that the body plays in a number of our socio-cognitive processes.

These results are in line with the argument that evaluative priming is driven by the response to the specific exemplars that are presented as primes, whereas the IAT is driven by the ease of associating the response category labels. The conclusions we reach from this research converge with the contention raised by numerous authors that IAT is largely driven by abstract representations (e.g., Brendl, Markman, & Messner, 2001; De Houwer & Moors, 2007; Foroni & Mayr, 2005; Klauer, Voss, Schmitz, & Teige-Mocigemba, 2007; Rothermund & Wentura, 2001).

The present findings are important for our understanding of the unique mechanisms underlying different implicit measures. Priming

[4] We would like to thank Russell Fazio for suggesting this alternative interpretation.

and IAT seem to access different aspects of the attitudes toward social groups and our study contributes to a more informed understanding of how rapid evaluation processes are grounded. One of the many practical implications of these findings refers to the question of how to determine the appropriate implicit measure for a specific research issue and the informed interpretation of the results one obtains (see De Houwer, 2001).

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References

Blanton, H., Jaccard, J., Christie, C., & Gonzales, P. M. (2007). Plausible assumptions, questionable assumptions and post hoc rationalizations: Will the real IAT, please stand up? *Journal of Experimental Social Psychology*, *43*, 399–409.

Blanton, H., Jaccard, J., Gonzales, P. M., & Christie, C. (2006). Decoding the implicit association test: Implications for criterion prediction. *Journal of Experimental Social Psychology*, *42*, 192–212.

Bosson, J. K., Swann, W., & Pennebaker, J. W. (2000). Stalking the perfect measure of implicit selfesteem: The blind men and the elephant revisited? *Journal of Personality and Social Psychology*, *79*, 631–643.

Brendl, C. M., Markman, A. B., & Messner, C. (2001). How do indirect measures of evaluation work? Evaluating the inference of prejudice in the implicit association test. *Journal of Personality and Social Psychology*, *81*, 760–773.

Cacioppo, J. T., Petty, R. E., Losch, M. E., & Kim, H. S. (1986). Electromyographic activity over facial muscle regions can differentiate the valence and intensity of affective reactions. *Journal of Personality and Social Psychology*, *50*, 260–268.

Clore, G. L., & Huntsinger, J. R. (2009). How emotions inform judgment and regulate thought. *Trends in Cognitive Sciences*, *11*, 393–399.

Cunningham, W. A., Preacher, K. J., & Banaji, M. R. (2001). Implicit attitude measures: Consistency, stability, and convergent validity. *Psychological Science*, *12*, 163–170.

De Houwer, J. (2001). A structural and process analysis of the Implicit Association Test. *Journal of Experimental Social Psychology*, *37*, 443–451.

De Houwer, J., & Moors, A. (2007). How to define and examine the implicitness of implicit measures. In B. Wittenbrink, & N. Schwarz (Eds.), *Implicit measures of attitudes: Procedures and controversies* (pp. 179–194). NewYork: Guilford Press.

De Houwer, J., & Moors, A. (2010). Implicit measures: Similarities and differences. In B. Gawronski, & B. K. Payne (Eds.), *Handbook of implicit social cognition: Measurement, theory, and applications*. New York, NY: Guilford Press.

Dimberg, U., Thunberg, M., & Elmehed, K. (2000). Unconscious facial reactions to emotional facial expressions. *Psychological Science*, *11*(1), 86–89.

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and use. *Annual Review of Psychology*, *54*, 297–327.

Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology*, *50*, 229–238.

Foroni, F., & Bel-Bahar, T. S. (2010). Picture-IAT vs. Word-IAT: Level of stimulus representation influences on the IAT. *European Journal of Social Psychology*, *40*, 321–337.

Foroni, F., & Mayr, U. (2005). The power of a story: New, automatic associations from a single reading of a short scenario. *Psychonomic Bulletin and Review*, *12*, 139–144.

Foroni, F., & Semin, G. R. (2009). Language that puts you in touch with your bodily feelings: The multimodal responsiveness of affective expressions. *Psychological Science*, *20*, 974–980.

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.

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.

Huntsinger, J. R., Sinclair, S., & Clore, G. L. (2009). Affective regulation of implicitly measured stereotypes and attitudes: Automatic and controlled processes. *Journal of Experimental Social Psychology*, *45*, 560–566.

Klauer, K. C., & Musch, J. (2003). Affective priming: Findings and theories. In K. C. Klauer, & J. Musch (Eds.), *The psychology of evaluation* (pp. 7–49). Mahwah, NJ: Erlbaum.

Klauer, K. C., Voss, A., Schmitz, F., & Teige-Mocigemba, S. (2007). Process components of the Implicit Association Test: A diffusion-model analysis. *Journal of Personality and Social Psychology*, *93*, 353–368.

Niedenthal, P. M. (2007). Embodying emotion. *Science*, *316*, 1002–1005.

Rothermund, K., & Wentura, D. (2001). Figureground asymetries in the Implicit Association Test. *Zeitschrift für Experimentelle Psychologie*, *48*, 94–106.

Semin, G.R., & Foroni, F. (manuscript under review). The Significance of Proprioceptive Feedback for Evaluative Priming.

Storbeck, J., & Clore, G. L. (2008). The affective regulation of cognitive priming. *Emotion*, *8*, 208–215.

Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*, 768–777.

van der Schalk, J., Fischer, A., Doosje, B., Wigboldus, D., Hawk, S., Rotteveel, M., & Hess, U. (2011). Convergent and divergent responses to emotional displays of ingroup and outgroup. *Emotion*, *11*(2), 286–298.

Vanman, E. J., Paul, B. Y., Ito, T. A., & Miller, N. (1997). The modern face of prejudice and structural features that moderate the effect of cooperation on affect. *Journal of Personality and Social Psychology*, *73*, 941–959.

Winkielman, P., Niedenthal, P., & Oberman, L. (2008). The embodied emotional mind. In G. R. Semin, & E. R. Smith (Eds.), *Embodied grounding: Social, cognitive, affective, and neuroscientific approaches* (pp. 263–288). New York: Cambridge University Press.

Wittenbrink, B., Judd, C. M., & Park, B. (1997). Evidence for racial prejudice at the implicit level and its relationship to questionnaire measures. *Journal of Personality and Social Psychology*, *72*, 262–274.