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Reports

Affective regulation of implicitly measured stereotypes and attitudes: Automatic and controlled processes

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ABSTRACT

Three experiments indicate that affective cues regulate expression of implicitly measured stereotypes and attitudes. In Experiment 1, negative mood led to less stereotypic bias on the weapon-identification task [Payne, B. K. (2001). Prejudice and perception: The role of automatic and controlled processes in misperceiving a weapon. *Journal of Personality and Social Psychology, 81*, 181–192] than positive mood. In Experiment 2, negative mood led to less implicitly measured racial prejudice than positive mood. In Experiment 3, negative, relative to positive, mood decreased women's implicitly measured preference for the arts over math. Process–dissociation analyses suggested that affect regulated automatic attitude and stereotype activation rather than controlled influences on attitude expression. The results show that mood can shape even rudimentary forms of cognition.

Though there is great interest in the intersection between affect and cognition (e.g., Forgas, 1995; Schwarz & Clore, 2007), very little research has examined affective influences on implicitly measured attitudes and stereotypes. Recent research, however, showed that anger enhanced implicitly measured prejudice toward outgroups (DeSteno, Dasgupta, Bartlett, & Cajdric, 2004) whereas negative mood did not. The results were interpreted as due to differences in the relevance of anger and negative mood for intergroup relations. In the present research, we examine the role of more diffuse affective states (i.e., moods) and determine whether they might influence implicitly measured attitudes and stereotypes for reasons apart from their content relevance or irrelevance. We also explored whether this influence stems from changes in automatic processing or from changes in controlled processing via the process–dissociation procedure (Jacoby, 1991).

Although no research to date has directly explored whether mood regulates expression of implicitly measured stereotypes and attitudes, two prominent approaches to affect and cognition converge on the idea that people in negative moods might be less likely than those in positive moods to express them (Clore & Huntsinger, 2007; Schwarz & Clore, 2007). But this same result might emerge from two rather different models of how mood interacts with controlled and automatic processing. This result may occur because negative moods increase controlled processing or because negative moods decrease automatic processing.

The first possibility assumes that negative affect, as compared to positive affect, signals a problematic environment, whereupon controlled, data-driven processing is engaged (e.g., Bless & Schwarz, 1999; Schwarz & Clore, 2007). In this view, negative, as compared to positive, moods will constrain attention to the information at hand and focus processing on task or goal-relevant information; this in turn should prevent automatically activated attitudes and stereotypes from informing responses. From this perspective, then, the role of affect is to regulate controlled processing rather than automatic processing. Consistent with this perspective, many affect–cognition models propose that negative affect, compared to positive affect, is associated with greater systematic, data-driven processing (Schwarz, 2001), accommodation processes (i.e., avoiding mistakes, conserving input; Fiedler, 2001), and effortful processing (Petty, Fabrigar, & Wegener, 2003).

The second possibility is that affect signals the value of automatic processing rather than the need for increased controlled processing. In this view, negative mood, in contrast to positive mood, would convey negative value on automatic processing, reducing the automatic activation and consequent expression of ready-made responses such as attitudes and stereotypes, and have no effect on controlled processing. If so, then the role of affect is to regulate automatic processing rather than controlled processing (e.g., Clore & Huntsinger, 2007; Clore et al., 2001). Results consistent with this model come from research showing that people in negative moods were less likely than those in positive moods to use routine or automatic perceptual (Gasper & Clore, 2002) and information-processing (Storbeck & Clore, 2005) styles.

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Both of the aforementioned perspectives therefore predict implicitly measured attitudes and stereotypes are less likely to be expressed in negative than in positive moods. However, the proposed mechanisms differ between the two. We are able to tease apart these two explanations via procedures designed to estimate the relative contribution of controlled and automatic processes on measures of implicit attitudes.

Process–dissociation procedures

In recent years, researchers have begun to use a variety of decomposition strategies (i.e., the process–dissociation procedure; Jacoby, 1991; Payne, 2005; the QUAD model; Conrey, Sherman, Gawronski, Hugenberg, & Groom, 2005), to parse individuals' responses on implicit measures into the product of controlled and automatic processing. In general, underlying these decomposition strategies is the idea that controlled and automatic processes are independent, and can simultaneously contribute to behavior on a given task. These strategies compare responses to instances in which controlled and automatic processes are likely to work in concert to those in which controlled and automatic processes are likely to work in opposition in order to estimate the relative contribution of each to performance in a given task. We used the process–dissociation procedure (PDP; Jacoby, 1991), as opposed to other decomposition strategies, in the current research because the estimates of controlled and automatic processing produced by this method correspond most closely to the two theoretically-based reasons mood might regulate expression of implicitly measured stereotypes and attitudes. That is, it parses responses into general controlled and automatic components rather than making finer distinctions (e.g., overcoming bias vs. guessing) that are not pertinent to the current theoretical context.

The PDP recently has been applied to performance in the weapon-identification task, a measure of implicit stereotypes (Payne, 2001). In this task, participants determine whether a presented object is a weapon or a tool. Preceding the presentation of a weapon or tool, participants are briefly exposed to either a Black or White face. In this, and similar, paradigms participants are more likely to mistakenly categorize a tool as a weapon if it follows exposure to a Black face than a White face (Correll, Park, Judd, & Wittenbrink, 2002; Greenwald, Oakes, & Hoffman, 2003; Payne, 2001).

To determine the relative contribution of controlled and automatic processing to responses obtained within this paradigm one compares performance on stereotype congruent (i.e., Black face/weapon; White face/tool) versus incongruent (i.e., Black face/tool; White face/weapon) trials. In congruent trials, correct identification of a weapon or tool could result from controlled processing (i.e., efforts to constrain processing to task-relevant information) or automatic processing (i.e., automatic stereotype activation; Payne, 2005). For example, in congruent trials, both controlled efforts to implement the correct response to the presented object and automatically activated stereotypes associating African Americans with criminality could facilitate the correct response when presented with a weapon. In incongruent trials, however, these controlled and automatic processes work in opposition to one another. On the one hand, controlled processing should facilitate correct responding (e.g., respond tool when presented with a tool). On the other hand, the influence of automatic stereotype activation (e.g., an association between African Americans and crime) should facilitate errors (e.g., respond weapon when presented with a tool).

Given these conditions, the PDP can estimate the contribution of controlled and automatic processing to behavior in the weapon-identification task (Payne, 2001). Specifically, on congruent trials, correct responses could be driven by either controlled processing (C) or automatic processing (A) given the failure of control ($1 - C$). This can be expressed by the following equation:

$$P(\text{correct}|\text{congruent}) = C + A(1 - C) \quad (1)$$

On incongruent trials, these two processes work in opposition to one another. If control fails, automatic processing (i.e., activated stereotypes) drives participants' responses, leading to incorrect responses. This can be expressed by the following equation:

$$P(\text{error}|\text{incongruent}) = A(1 - C) \quad (2)$$

Based on these two equations, one can algebraically solve for estimates of controlled and automatic processing:

$$C = P(\text{correct}|\text{congruent}) - P(\text{error}|\text{incongruent}) \quad (3)$$

$$A = P(\text{error}|\text{incongruent})/(1 - C) \quad (4)$$

Existing research has successfully estimated the role of controlled and automatic processes in the weapon-identification task, established that the PDP controlled estimate represents controlled efforts to constrain processing to task or goal-relevant information and the PDP automatic estimate represents the strength of automatic stereotype activation (Payne, 2005).

These two estimates correspond nicely with the two reasons mood may shape expression of implicitly measured stereotypes and attitudes. If the operative mechanism is that mood causes differences in controlled processing rather than automatic processing, then this should be reflected in changes in the controlled estimate, but not in the automatic estimate. Specifically, if people in negative moods exert greater controlled processing than those in positive moods, then the controlled estimate should be higher for participants in negative moods than positive moods, and the automatic estimate should remain unchanged. If the operative mechanism is that mood regulates automatic processing rather than controlled processing, then this should be reflected in changes in the automatic estimate, but not the controlled estimate. That is, if people in negative moods exhibit less automatic attitude and stereotype activation than those in positive moods, then the automatic estimate should be lower for participants in negative moods than positive moods, and the controlled estimate should remain unchanged.

To illustrate, consider the weapon-identification task in which two estimates of automatic processing and two estimates of controlled processing are created (Payne, 2001). Higher values on the two automatic estimates represent a greater automatic tendency to respond gun in the presence of a White or Black prime. Automatic stereotype activation is observed when the Black automatic estimate is higher than the White automatic estimate. Higher values on the two controlled estimates represent a greater tendency to exert cognitive control following presentation of White or Black primes. If mood regulates automatic processing, then participants in negative moods should display less automatic stereotype activation than those in positive moods. If mood regulates controlled processing, then participants in negative moods should display a greater tendency to exert cognitive control following White and Black primes than those in positive moods.

Overview

In the present research we examined whether and how negative versus positive mood shaped expression of implicitly measured stereotypes and attitudes. In Experiment 1, we predicted that participants in negative moods would display less stereotyping on the weapon-identification task (Payne, 2001) than those in positive moods. In Experiment 2, we predicted that participants in negative moods would exhibit less of the prejudice commonly detected using the implicit association task (IAT; Greenwald, McGhee, & Schwartz, 1998) than participants in positive moods. In Experiment 3, because women tend to have an implicitly measured preference for arts over math (Nosek, Banaji, & Greenwald, 2002), we predicted that women in negative moods would exhibit less preference for arts over math than women in positive moods. In each experiment we employed the process–dissociation procedure to disentangle the two explanations for mood effects on their expression.

Experiment 1

Participants

Eighty-two (68 women) participants completed this experiment for partial fulfillment of a course requirement.

Procedure

Once participants arrived, they were seated in front of a computer, signed an informed consent agreement, and were told they would complete a series of computer-based measures and then complete a brief questionnaire.

Participants were then told we were pre-testing a series of musical selections for another, unrelated experiment. All participants agreed to take part in the pre-testing and were randomly assigned to one of two mood inductions that lasted ten minutes. Participants in the positive-mood condition listened to Mozart's *Eine Kleine Nachtmusik* and participants in the negative-mood condition listened to Mahler's *Adagietto*. These musical selections have been shown to reliably induce a positive and negative mood, respectively (e.g., Niedenthal & Setterlund, 1994; Storbeck & Clore, 2005). Following the mood induction, participants completed the weapon-identification task, a mood manipulation check, and some demographic items. Participants were thoroughly debriefed and thanked for their participation.

Materials

Weapon-identification task

The weapon-identification task used in this experiment was identical to Payne's (2001) Experiment 1. Participants were informed that the task measured speed and accuracy and that they would see two pictures briefly presented on the computer screen. They were told to ignore the first picture, a face, and only respond to the second picture by indicating whether it was a gun or tool using one of two computer keys. Participants were told to respond as quickly and accurately as possible and if they made a mistake to continue to the next trial.

The task began with 24 practice trials in which participants were only exposed to weapons or tools in order to acquaint them with the task. In the test trials (128 total trials), participants were first exposed to a prime (a White or Black face) and then a target (a tool or gun). The prime remained on the screen for 200 ms and was immediately replaced by the target. The target remained on the screen for 200 ms and was then replaced by a visual mask, which remained on the screen until participants responded.

Mood-manipulation check

Participants were asked four questions to determine the efficacy of the mood induction (e.g., How positive did you feel while you listened to the musical selection; 1 = *not at all* to 7 = *very much*). After appropriate recoding, a composite measure of positive mood was formed ($\alpha = .92$).

Results

Mood-manipulation check

The mood manipulation was successful. Participants felt less positive during the negative-mood induction ($M = 4.64$) than the positive-mood induction ($M = 5.79$), $t\ (80) = 4.76$, $p < .0005$, $d = 1.06$.

Latencies

Reaction times for incorrect responses were dropped from analyses and, following Payne (2001), a priori cut-offs of 100 ms and 1000 ms were used to trim the data. All analyses were conducted using the log-transformed reaction times to reduce skew, but milliseconds are reported for ease of interpretation.

We submitted the reaction time data to a 2 (mood: positive, negative) $\times$ 2 (prime: black, white) $\times$ 2 (target: weapon, tool) mixed-model analysis of variance (ANOVA) with the last two factors varying within participants. This analysis revealed the predicted three-way interaction, $F\ (1,80) = 9.56$, $p = .003$, $\eta_p^2 = .11$. Consistent with predictions, participants in negative moods displayed less stereotyping than participants in positive moods (see Fig. 1). Specifically, positive-mood participants were faster to identify weapons when they were preceded by Black primes than White primes, $t\ (80) = 2.76$, $p = .007$, $d = .62$, and they were faster to identify tools when they were preceded by White primes than Black primes, $t\ (80) = 2.08$, $p = .047$, $d = .47$. Negative-mood participants displayed no differences in how fast they identified weapons and tools as a function of prime, all *ts* < 1.4, *ps* > .15.

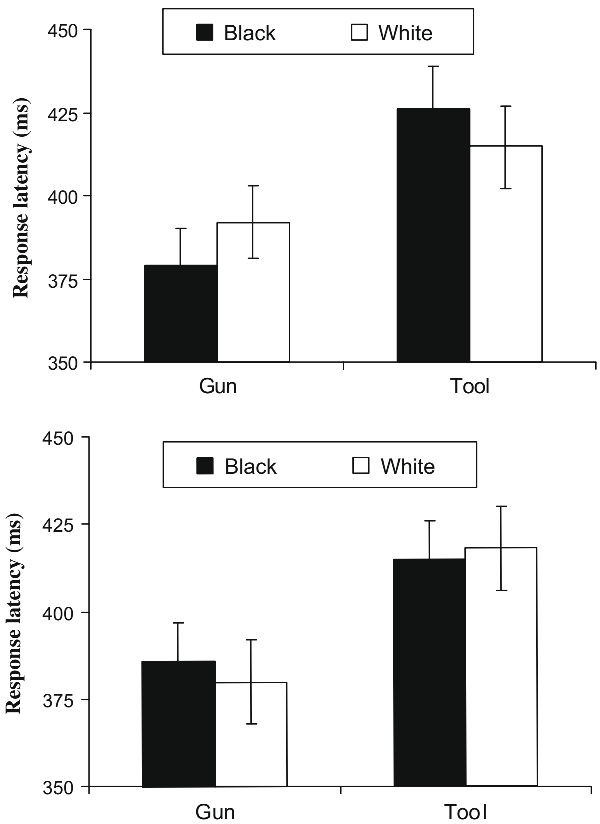

Fig. 1. Mean response latencies as a function of target (gun versus tool) and prime (Black versus White). Results for participants in positive moods are displayed in the top figure and results for participants in negative moods are displayed in the bottom figure. Note: Error bars represent standard errors.

Error rates

The overall error rate was low ($M = 6.9\%$, $SD = 5.5\%$). When we submitted the error-rate data to the same mixed-model ANOVA used above no theoretically relevant significant effects emerged, all $ps > .11$. Though one might expect predictable differences in error rates, Payne (2001; Experiment 1) also found no differences in error rates on a weapon-identification task with no response deadline. He argued that is not surprising because "[participants] may have used a certainty criterion, in which they waited to respond until they were relatively confident that their response was correct." (2001; p. 185).

PDP analyses

Estimates of controlled and automatic processing on the weapon-identification task were created using Eqs. (1)–(4) described earlier. Following Payne (2001), for the Black prime conditions, the controlled estimate was created by subtracting the probability of incorrect responses when tool was primed with a Black face from the probability of correct responses when gun was primed with a Black face. The automatic estimate was then derived by taking the probability of incorrect responses when tool was primed with a Black face and dividing it by $(1 - C)$. Estimates of controlled and automatic processing for the White prime conditions were created using the same method. Higher values on the two controlled estimates represented a greater tendency to exert cognitive control upon presentation of White or Black primes. Higher values on the two automatic estimates represented a greater automatic tendency to respond gun in the presence of a White or Black prime.

We submitted the PDP controlled and automatic estimates to separate 2 (mood: positive, negative) $\times$ 2 (prime: black, white) mixed-model analyses of variance (ANOVAs) with the last factor varying within participants. These analyses revealed that mood regulated automatic processing rather than controlled processing. There was a significant interaction for automatic estimates, $F(1,80) = 6.61$, $p = .012$, $\eta_p^2 = .08$ (see Fig. 2). Positive-mood participants displayed a greater stereotype-consistent automatic tendency to respond gun after presentation of Black primes than White primes, $t(80) = 2.62$, $p = .01$, $d = .59$. In contrast, negative-mood participants displayed no differences in their response tendencies, $t(80) = 1.00$, $p = .32$, $d = .22$. Controlled estimates did not vary as a function of mood and/or prime, all $ps > .18$.

In summary, as predicted, participants in negative moods displayed less implicitly measured stereotypes than those in positive moods. Process–dissociation analyses revealed that this difference in stereotyping was driven by changes in automatic processing and not controlled processing.

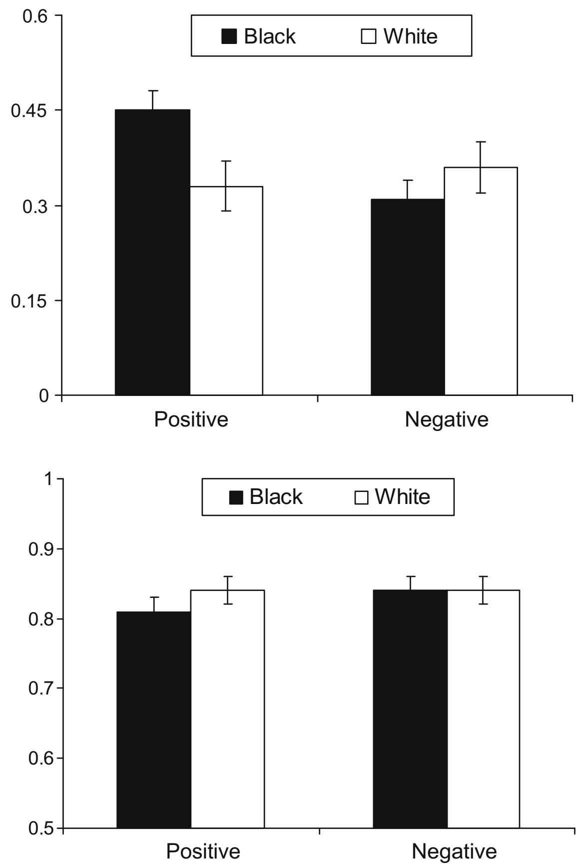

Fig. 2. Estimates of automatic (top panel) and controlled (bottom panel) processing displayed for participants in positive moods and negative moods. Note: Error bars represent standard errors.

Experiment 2

In Experiment 2, we moved our focus to affective regulation of implicitly measured attitudes. Performance on many implicit measures of attitudes, like that on the weapon-identification task, reflects the contribution of both controlled and automatic processes (Conrey et al., 2005; Payne, 2005), and involves trials in which controlled and automatic processes work in concert or in opposition to one another. One such measure is the IAT (Greenwald et al., 1998).

To illustrate, in a prejudice IAT participants are asked to accurately categorize names typically associated with African Americans and European Americans, as well as pleasant and unpleasant words. In the critical blocks the four types of stimuli are categorized into two response options. The congruent critical block is typically recognized as the blocks in which European American names + pleasant words are represented by one response option (i.e., the right key) and African American names + unpleasant words are represented as another response option (i.e., the left key). In the incongruent critical block, this pairing is reversed, such that European American names + unpleasant words now represent one response option and African American names + pleasant words represent the other response option.

As in the weapon-identification task, correct responses on congruent IAT trials could be driven by either automatic processing or controlled processing. On incongruent trials, these two processes work in opposition to one another. Controlled processing should facilitate correct responding (i.e., assign the name or word to the correct key). Automatically activated prejudice should facilitate errors (i.e., assign the name or word to the incorrect key).

Given the conceptual and procedural overlap between the IAT and the weapon-identification task, it should be possible to derive estimates of controlled and automatic processing on the IAT that are similar to those derived from responses on the weapon-identification task using the process–dissociation procedure. Specifically, for the IAT the PDP automatic estimate should represent the strength of the automatic activation of attitudes and the controlled estimate should represent efforts to constrain processing to task-relevant information and respond as intended. We discuss justifications for assumptions concerning the nature of the PDP estimates further in the General Discussion.

In Experiment 2, participants' mood was manipulated to be positive or negative as they completed a prejudice IAT. We predicted that participants in negative moods would display less implicitly measured prejudice than those in positive moods. The PDP was used to determine whether observed change in implicitly measured prejudice as a function of mood was due to change in automatic or controlled processing.

Method

Participants

Fifty White participants (28 women) completed this experiment for partial fulfillment of a course requirement.

Procedure

The procedure was identical to Experiment 1, with the only change being that we measured participants' prejudice instead of stereotypes.

Materials

Prejudice. The IAT served as the measure of prejudice toward African Americans versus European Americans. It assesses the strength of associations between concepts, in this case it compares the speed with which one can pair European American + pleasant and African American + unpleasant versus European American + unpleasant and African American + pleasant. European American (e.g., John, Heidi) and African American (e.g., Rashan, Yolanda) names were used to represent the categories European and African American. Pleasant (e.g., good) and unpleasant (e.g., death) words were used to represent the categories pleasant and unpleasant. The names and words were from previous research (Dasgupta & Greenwald, 2001; Lowery, Hardin, & Sinclair, 2001).

The IAT task consisted of seven blocks and was constructed based on guidelines outlined by Nosek, Greenwald, and Banaji (2007). The order of the congruent (practice + test; 40 trials each) and incongruent (practice + test; 40 trials each) blocks was counterbalanced across participants (Blocks 3–4 and 6–7). Response latencies were dealt with following the recommendations of Greenwald, Nosek, and Banaji (2003) and all reported analyses used the *D-600* measure for the assessment of prejudice because error feedback was not given during congruent and incongruent blocks. Higher values indicate greater prejudice. The IAT showed good internal consistency, $\alpha = .73$.

Mood-manipulation check. Participants were asked the same four questions as in Experiment 1 to determine the efficacy of the mood induction ($\alpha = .83$).

Results

Mood-manipulation check

The mood induction was successful. Results of an independent means *t*-test revealed that participants felt less positive during the negative-mood induction ($M = 5.14$) than the positive-mood induction ($M = 5.80$), $t\ (48) = 2.69$, $p = .01$, $d = .77$.

Latencies

As predicted, results of the same *t*-test revealed that negative-mood participants exhibited less prejudice ($M = .38$, $SD = .45$) than positive-mood participants ($M = .60$, $SD = .27$), $t\ (48) = 2.12$, $p = .04$, $d = .61$.

Error rates

The overall error rate on the IAT was low ($M = 5.2\%$, $SD = 3.6\%$). When we submitted the error-rate data to a 2 (mood: positive, negative) $\times$ 2 (IAT block: congruent, incongruent) mixed-model ANOVA with the last factor varying within participants, only a main effect of block emerged, $F\ (1, 48) = 21.68$, $p < .0005$, $\eta_p^2 = .31$ (all other effects, $ps > .25$). Participants made more errors on incongruent ($M = 6.5\%$) than congruent ($M = 3.8\%$) blocks.

PDP analyses

Congruent and incongruent trials on the IAT are grouped in blocks making creation of four separate estimates of controlled and automatic processing for Black versus White names as done in Experiment 1 impossible. Therefore, we constructed one estimate of controlled processing and one estimate of automatic processing. The estimate of controlled processing on the IAT was created by subtracting the probability of incorrect responses on the incompatible blocks (practice and test) from the probability of correct responses on the compatible blocks (practice and test). The automatic estimate was created by taking the probability of incorrect responses on the incompatible blocks and dividing it by $(1 - C)$. Higher values on the controlled estimate reflect greater cognitive control during the task. Higher values on the automatic estimate reflect greater automatic activation of negative associations toward Blacks over Whites than the reverse.

Conceptually replicating Experiment 1, when the PDP estimates of controlled and automatic processing were submitted to separate independent means *t*-tests, results indicated that mood regulated automatic processing rather than controlled processing. The automatic estimate was lower for participants in negative ($M = .59$, $SD = .26$) than positive ($M = .73$, $SD = .20$) moods, $t\ (48) = 2.00$, $p = .05$, $d = .58$. The controlled estimate, however, did not differ for participants in negative ($M = .88$, $SD = .09$) versus positive ($M = .90$, $SD = .06$) moods, $t\ (48) = 1.14$, $p = .26$, $d = .34$.

Experiment 3

In Experiment 3, we moved our focus to implicitly measured arts–math attitudes. Women tend to have an implicitly measured preference for arts over math (Nosek et al., 2002). It was predicted that female participants in negative moods would exhibit lesser preference for arts over math than participants in positive moods and this would occur via differences in automatic rather than controlled processing.

Method

Participants

Thirty-seven female participants completed this experiment for partial fulfillment of a course requirement.

Procedure

The procedure was identical to Experiments 1–2 with the only change being that we measured participants' arts–math preferences instead of prejudice via the IAT.

Materials

Arts–math preferences. The IAT was used to measure arts–math preferences (see Nosek et al., 2002). Again, the IAT *D-600* score was computed with higher values indicating greater implicit arts preference. The IAT showed acceptable internal consistency, $\alpha = .58$.

Mood-manipulation check. Participants were asked the same four questions as in Experiments 1–2 to determine the efficacy of the mood induction ($\alpha = .83$).

Results

Mood- manipulation check

The mood induction was successful. Results of an independent means *t*-test revealed that participants felt less positive during the negative-mood induction ($M = 5.30$) than the positive-mood induction ($M = 6.14$), $t\ (35) = 2.79$, $p = .008$, $d = .95$.

Latencies

As predicted, an independent means *t*-test revealed that negative-mood participants displayed less implicitly measured preference for arts over math ($M = .38$, $SD = .31$) than did positive-mood participants ($M = .70$, $SD = .28$), $t\ (34) = 3.18$, $p = .003$, $d = 1.08$.

Error rates

The overall error rate on the IAT was low ($M = 5.3\%$, $SD = 4.2\%$). When we submitted the error-rate data to a 2 (mood: positive, negative) $\times$ 2 (IAT block: congruent, incongruent) mixed-model ANOVA with the last factor varying within participants, only a main effect of block emerged, $F\ (1, 34) = 11.14$, $p < .0005$, $\eta_p^2 = .25$ (all other effects, $ps > .14$). Participants committed more errors on incongruent ($M = 6.8\%$) than congruent ($M = 3.7\%$) blocks.

PDP analyses

Estimates of controlled and automatic processing on the IAT were created in the same fashion as Experiment 2.

Replicating Experiments 1–2, when the PDP estimates of controlled and automatic processing were submitted to separate independent means *t*-tests, results indicated that mood regulated automatic processing rather than controlled processing. The automatic estimate was lower for participants in negative ($M = .52$, $SD = .29$) than positive ($M = .71$, $SD = .20$) moods, $t\ (34) = 2.25$, $p = .03$, $d = .76$. However, there were no differences in the controlled estimate across conditions as a function of mood (positive: $M = .89$, $SD = .08$; negative: $M = .89$, $SD = .09$), $t\ (34) = .12$, $p = .90$, $d = .04$.

General discussion

The present research demonstrates that incidental and fleeting affective cues (i.e., moods) regulate the expression of implicitly measured stereotypes and attitudes. Negative-mood participants were less likely to express implicitly measured stereotypes, prejudice and preference for arts over math than positive-mood participants (Experiments 1–3, respectively). Process–dissociation analyses revealed that changes in implicitly measured attitudes and stereotypes were due to differences in automatic processing rather than controlled processing.

We interpret the two processing estimates derived from performance on the weapon-identification task and the IAT as reflecting the operation of controlled and automatic processing for several reasons. Existing research has established that the two processing estimates derived from the weapon-identification task do indeed reflect controlled and automatic processing (Payne, Jacoby, & Lambert, 2005). The controlled estimate, but not the automatic estimate, for example, correlates with measures of executive function (e.g., antisaccade task) and the automatic estimate, but not the controlled estimate, increases as the salience of race increases (Payne et al., 2005). The processing estimates derived from the IAT exhibit similar properties. The IAT controlled estimate, but not the automatic estimate, correlates with measures of executive function (e.g., Stroop task) and, mirroring Payne, Lambert, and Jacoby (2002), calling attention to race by telling participants to suppress prejudice while they complete the IAT ironically increases the automatic estimate (Huntsinger & Sinclair, 2006). Finally, the finding that mood influences the automatic estimate from the weapon-identification task and the IAT in a similar fashion suggests that the two estimates reflect similar constructs. Future research, however, is essential to firmly establish the properties of the processing estimates derived from the IAT.

As advocated by Sherman et al. (2008), the principal motivation behind choosing the process–dissociation procedure as our decomposition strategy was our theoretically-grounded research question—the two estimates derived from this model most closely correspond to the reasons mood might regulate expression of implicitly measured stereotypes and attitudes. Nevertheless, the version of the procedure we employed comes with a specific model of mental control that assumes automatic processing only influences responses when controlled processing fails. This model differs from many in social psychology that assume automatic processing drives responses unless cognitive control is exerted to correct for its influence. These models are sometimes referred to as the up-front and after-the-fact correction models (Govorun & Payne, 2006), respectively.

There is also a variation of the process–dissociation procedure that estimates the relative contribution of automatic and controlled processing to responses on a given task using an after-the-fact correction model (Payne et al., 2005). Though one could plausibly interpret theory pertaining to the affective regulation of cognitive processing as advocating an after-the-fact model, analyses employing the up-front model better characterized our data. Analyses of estimates of automatic and controlled processing derived from the after-the-fact correction model, for example, yielded no theoretically meaningful or consistent findings across experiments.[1] Further, results of multinomial modeling analyses revealed that the up-front model fit the data well across experiments (all $ps > .3$) and that this model fit the observed data as well as (Experiments 2–3) or better (Experiment 1) than the after-the-fact model.[2] These findings are consistent with previous research, which finds that the up-front model fits data from the weapon-identification task better than the after-the-fact correction model (Payne et al., 2005) and also provides a satisfactory fit to data from the implicit association task (Sherman et al., 2008). Based on these empirical grounds, we were comfortable utilizing an up-front model in the present research and interpreted the meaning of the processing estimates accordingly (for similar arguments see Ferreira, Garcia-Marques, Sherman, & Sherman, 2006). Future research should determine whether there are contexts in which affective regulation of cognitive processing unfolds in an after-the-fact fashion.

The current research has important implications for the literature on moderation of implicitly measured stereotypes and prejudice. Aside from efforts directed at exposing people to counter-stereotypic (Blair, Ma, & Lenton, 2001) or admired outgroup members (Dasgupta & Greenwald, 2001), most researchers assume that implicitly measured prejudice and stereotypes are regulated via effortful, controlled processes (Devine & Monteith, 1999). As a consequence, most efforts to reduce such biases have concentrated on making people aware of, and training them to consciously control, their impact on responses (see Monteith & Mark, 2005, for a review). The current results, however, suggest that the strength of these biases is also subject to change. In the present data, affective cues from mood appear to have altered the degree to which these biases were manifested in the first place.

CODA

An important function of affective cues is the regulation of thinking (Clore & Huntsinger, 2007, 2009). To date, researchers have generally focused on how affective cues shape relatively controlled cognitive processes. Perhaps this is because prominent models of affect and cognition assume that the influence of affective cues is limited to such outcomes (e.g., Bower & Mayer, 1985; Forgas, 1995). The current experiments, however, suggest that

[1] Full results are available from the first author.

[2] A full description of relevant model specifications and model comparison results are available from the first author. We thank Keith Payne for providing valuable assistance in constructing the multinomial process–dissociation models used in these analyses.

affective cues also shape automatic cognitive processes—negative affect, compared to positive affect, reduced the expression of implicitly measured stereotypes and attitudes due to negative affect reducing automatic processing as opposed to increasing controlled processing.

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