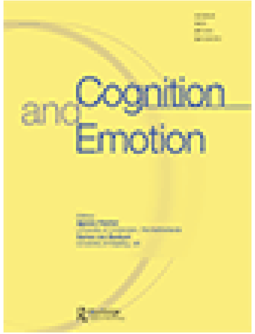

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The affective priming effect: Automatic activation of evaluative information in memory

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The Affective Priming Effect: Automatic Activation of Evaluative Information in Memory

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Fazio, Sanbonmatsu, Powell, and Kardes (1986) argued that affect may be activated automatically from memory on the *mere* observation of an affect-loaded stimulus. Using a variant of the standard sequential priming paradigm, it was demonstrated that the time needed to evaluate target words as positive or negative decreased if they were preceded by a similarly valenced prime word, but increased when preceded by a prime of opposite valence. Several aspects of their procedure, however, do not warrant their conclusion concerning the unconditionality of the effect. The present research investigated the generality of this affective priming effect. In Experiment 1, it was tested whether the effect can be generalised to more complex visual material. Stimulus pairs consisted of colour slides. Subjects had to evaluate the targets as quickly as possible. In Experiment 2, the standard word-word procedure was used, but target words had to be pronounced. In both experiments, significant affective priming effects were observed, supporting Bargh, Chaiken, Govender, and Pratto's (1992) assertion that the automatic activation effect is a pervasive and relative unconditional phenomenon. Implications for theories of affect and emotion are discussed.

INTRODUCTION

Recent theories of affect and emotion assume that organisms are capable of evaluating environmental stimuli/events as "good" or "bad" for the self at a pre-attentive level (e.g. Bargh, Litt, Pratto, & Spielman, 1989;

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Öhman, 1987, 1988; Williams, Watts, MacLeod, & Mathews, 1988). It is argued that the outcome of this affective decision process can influence subsequent cognitive and emotional processes. Although this assumption has been influential, direct experimental evidence is sparse, and little is known about the conditions under which such automatic affective processing is possible.

Fazio, Sanbonmatsu, Powell, and Kardes (1986) addressed this issue empirically. They reported a series of studies which support the idea that affect can be activated automatically on the mere observation of an affect-loaded stimulus. A variant of the standard sequential priming procedure was used, in which the affective relation between primes and targets was manipulated. On each trial, a noun was presented for 200msec on a computer monitor. This prime stimulus could be either positive (e.g. baby), negative (e.g. spider), or a string of three identical letters (e.g. BBB), and was followed by the target after a 100msec blank-screen interval. Subjects were instructed to indicate whether the target-adjective had a positive or negative connotation by pressing one of two keys as quickly as possible. After evaluating the target, the subject had to recite the prime-word out loud. It was found that response latencies to the target words were facilitated if both prime and target had the same valence (*positive-positive* or *negative-negative*: congruent pairs), but were inhibited if they were of opposite valence (*positive-negative* or *negative-positive*: incongruent pairs), as compared to the control trials (*control-positive* or *control-negative*: control pairs) for which the prime was a three-letter string. These results were observed in three successive experiments.

In the standard procedure used by Fazio et al. (1986), the interval between the onset of the prime and the onset of the target (stimulus onset asynchrony: SOA) was only 300msec, which is too brief for subjects to develop controlled response strategies concerning the evaluation of the target (Neely, 1977; Posner & Snyder, 1975). Following their line of argument, the observed effects of affective congruence should therefore, under these conditions, be attributed to automatic processes. Moreover, if the SOA was prolonged from 300msec to 1000msec (Fazio et al., 1986, Experiments 2 and 3), the activation effect disappeared. This is an important finding, as it is an indirect, but rather strong indication that automatic processes are responsible for the effect. Indeed, if the effect should be attributed to controlled expectancies or response strategies, one would expect even stronger, or at least similar results, if subjects were provided with more time to process the prime-target relation.

Based on these data, Fazio concluded that the affective value of stimuli can be automatically activated from memory on the *mere* presentation of the affective stimulus. It was hypothesised that the presentation of the prime not only results in the activation of the related representation in memory, but also activates the evaluation (good/bad) associated with this memory representation.

The relevance of this affective priming effect in general, and for theories of affect and emotion in particular, largely depends on its preconditions (Hermans & De Houwer, 1993). This is in line with recent ideas of automatic processes in general (Logan, 1989; Logan & Cowan, 1984). Bargh (1989, 1992a, in press) argues for the decomposition of automaticity, contrary to more traditional views that have characterised automaticity as a unitary concept (Power & Brewin, 1991). The latter have done so by drawing a contrast between automatic and controlled processes, assigning a set of defining features in an all-or-none fashion to both types of cognitive processes (Bargh, 1992a), so that a process should be either controlled or automatic. Automatic processes are assumed to be fast, parallel, involuntary, effortless, unintentional, they can occur outside awareness, and they cannot be inhibited. Controlled processes, on the other hand, contrast for each of these characteristics. In our view, this account of cognitive processes is far too simple. The same would apply to a related version that places cognitive processes on a continuum of automatic through effortful processes (Hartlage, Alloy, Vasquez, & Dykman, 1993).

Following the position of Bargh (1989, 1992a, in press), we would argue for a *conditional* approach to automaticity. Automatic processes can be characterised by a set of defining features (e.g. intentional vs. unintentional, efficient vs. attention-demanding, awareness vs. not dependent upon awareness, and controllable vs. uncontrollable), which do not have to co-occur perfectly in an all-or-none fashion. A process might, for example, be unintended, but controllable and requiring some attentional resources. Thus, several types of automatic processes are feasible, as combinations of different features. As a consequence, automaticity can no longer be viewed as a unitary concept. This approach makes it obligatory for researchers to investigate the preconditions that are necessary for the studied effect to occur.

In addition, the knowledge is essential if one wants to generalise accurately findings from the laboratory to the "real world" (Bargh, 1992a, p. 187). The following example might illustrate this point. Concerning the automatic activation effect described by Fazio et al. (1986) one might speculate whether the memory word instruction (subjects had to memorise the prime word, and recite it after target evaluation) is a necessary precondition for the effect to occur. If this is the case, it might have severe restrictions pertaining to the ecological validity of the phenomenon. Bargh et al. (1992, Experiment 3), however, have demonstrated that the affective priming effect is not dependent on such memory word instructions.

Although the abovementioned results suggest that the affective priming effect is rather unconditional, we believe that, given the proposed theoretical framework concerning automaticity, more research has to be conducted to assess the necessary preconditions of the affective priming effect before one can legitimately conclude that affect can be activated automatically on the *mere* observation of an affective stimulus, as was argued by Fazio et al. (1986, pp. 236). Two experiments were carried out to address this issue empirically. Both studies used variations of the paradigm used in the Fazio et al. (1986) research.

To test whether the affective priming effect is only confined to the affective processing of words, or whether it can be generalised towards other types of stimulus material, primes and targets in Experiment 1 were selected from a set of pictures, which were not simple line drawings but complex, real-life colour pictures. To our knowledge, no affective priming study has been published employing similar picture stimuli as primes and/or targets.[1] If the affective priming effect is indeed unconditional, the results of this picture-picture variant should parallel those observed in the word-word studies by Fazio. Secondly, in order to attain additional confirmation for the idea that the priming effect is not due to controlled response strategies (Fazio et al., 1986), the SOA level (300msec vs. 1000msec) was manipulated within subjects. If deliberate response strategies are indeed important, stronger or at least similar, priming effects are expected when subjects are allowed more time to process the prime-target relation (SOA 1000msec). In Experiment 2, it was tested whether the priming effect is conditional on the subjects (consciously) thinking in terms of "good" and "bad". To the extent that such an evaluative mind set is not a necessary precondition, removing evaluative features from the traditional procedure (e.g. stimulus selection phase, target evaluation task) should not eliminate the priming effect.

EXPERIMENT 1

Experiment 1 was a replication of Fazio et al. (1986, Experiment 2). There were, however, a few differences between the current procedure, and the one used by Fazio. First, prime *and* target selection was based on an idiographic rating of affective extremity, and not on the evaluative latency task employed by Fazio. In fact, he asked his subjects to evaluate a series

[1] Since we conducted this study, Bargh (in press) mentions an unpublished study in which line drawings were used as stimuli. Also, Fazio mentions an unpublished experiment in his addendum to Chaiken and Bargh (1993) in which colour images were used as primes. It is, however, unclear whether these were simple line drawings or more complex real-life pictures.

of 70 words as quickly as possible, and based on these response latencies, two sets of primes were selected for the actual priming phase. Namely, a set of positive and negative words with the shortest evaluative latencies (strong primes), indicating a strong object-evaluation association (Powell & Fazio, 1984), and a set of positive and negative words for which evaluative response latencies had been slowest (weak primes). Second, as we were not predominantly interested in the effect of the strength of the object-evaluation associations, the strong vs. weak primes manipulation was omitted (for a recent discussion concerning this issue, see Chaiken & Bargh, 1993; Fazio, 1993). Third, neutrally rated pictures were used as controls. So, control primes differed from positive and negative primes only with respect to their affective rating, whereas in the Fazio studies, control primes were nonsensical letter-strings, so that they also differed in their wordness. Fourth, the memory word instructions were omitted for reasons described earlier. Moreover, subjects were asked to totally ignore the primes. Finally, in this study subjects were to evaluate the targets verbally, whereas in Fazio's study subjects were to press a "good" or "bad" key.

It was predicted that good/bad evaluations of pictorial stimuli would be facilitated by the previous activation of affectively congruent primes, whereas inhibition is predicted for affectively incongruent trials. No such priming effects are expected in the SOA 1000msec condition.

Method

Subjects. A total of 24 psychology students (15 females, 9 males) volunteered to participate in the experiment in partial fulfilment of undergraduate course requirements. All had normal or corrected-to-normal vision.

Stimuli. A set of 100 colour pictures and 100 identical colour slides were used for both primes and targets throughout the entire experiment. Stimuli were selected in order to obtain a very wide range of content as well as affective value (e.g. a mutilated face of a young woman, a typewriter on a blue background, two kittens sitting on a windowsill). During the priming procedure, 42cm × 64cm slides were presented, at a viewing distance of about 3 metres.

Apparatus. The experiment was carried out in a dimly lit room. Primes and targets were back-projected on a translucent glass projection screen, which separated the experimenter's room from the subject's room. Two random-access slide projectors (Kodak Carousel S-RA 2000 and S-RA 2500) were installed in the experimenter's room. Both projectors were equipped with a Compur electronic m3 shutter. Response latencies were recorded with a microphone-activated voice key attached to an IBM-compatible XT computer. This microcomputer controlled both slide presentation and exposure duration.

Procedure. The experiment consisted of two phases: an affective rating/stimulus selection phase and a priming phase. First, each subject was given a paper which outlined that the study concerned likes and dislikes, and that it aimed at examining the processes underlying these evaluations. Subjects were told that they had to perform two separate tasks. The first would consist of the affective rating of a set of colour pictures, the second would be a reaction time task during which they were required to evaluate a smaller subset of colour slides as fast as possible. In fact, both tasks were not independent because the affective rating was implemented as a procedure for individual prime and target selection. Subjects were asked to evaluate the 100 colour pictures on a 21-category scale (-100 = *very unpleasant*, 0 = *neutral*, $+100$ = *very pleasant*). It was stressed that they had to give their *first* reaction to the colour picture as a whole.

Next, subjects were asked to fill out both parts of the Spielberger, Gorsuch, Lushene, Vagg, and Jacobs (1983) State-Trait Anxiety Inventory (STAI; Dutch adaptation by Van der Ploeg, Defares, & Spielberger, 1980), which took about 10 minutes.[2] Meanwhile, out of the subject's sight, the evaluative ratings were used to select 18 primes and 18 targets. For that purpose the 15 most negatively, and the 15 most positively rated stimuli, together with 6 neutral pictures (rating = 0) were selected. At random, 6 positive, 6 negative, and 6 neutral stimuli were designated as primes, the remaining 9 positively and 9 negatively valenced pictures were chosen as targets. The corresponding slides were placed in the proper projector, as one projector served for the presentation of the primes and the second for target presentation.

Following the stimulus selection phase, subjects were seated in front of the glass projection screen. They were informed that they would see several pairs of slides of which the second one had to be evaluated as quickly as possible. Subjects were instructed to express their evaluation by saying aloud "pleasant" (*aangenaam*) or "unpleasant" (*onaangenaam*) in the microphone. It was stressed that all attention had to be directed to the target slide, while totally ignoring the prime.

The SOA level was manipulated as a within-subjects variable. Each subject received a block of trials with SOA 300msec, and an SOA

[2] Data from the State-Trait Anxiety Inventory were omitted from further analyses as none of both subject variables mediated the Prime × Target interaction.

1000msec block. The order of both SOA levels was counterbalanced over subjects. Each SOA level consisted of 18 practice trials, and 54 test trials. All selected primes and targets were presented once in each practice block, and three times within each test block. The presentation order of both primes and targets was randomised for each test block. Primes were randomly assigned to the targets, with the restriction that there had to be equally large sets of affectively congruent (9 Positive-Positive, 9 Negative-Negative), affectively incongruent (9 Negative-Positive, 9 Positive-Negative), and control prime-target pairs (9 Positive-Positive, 9 Negative-Negative). On any given trial, the prime was displayed for 200msec; the inter-stimulus interval (ISI) was either 100msec (SOA 300msec level), or 800msec (SOA 1000msec level). The target picture disappeared following the subject's response. The inter-trial interval was always 7sec. At the end of the experiment, subjects were invited to give questions or comments.

Results

In less than 1% of the test trials, the voice key was not appropriately activated. The data of these trials, together with the data of the practice trials were excluded from all analyses. In addition, latencies over 1500msec, or shorter than 250msec were excluded to reduce the influence of outlier responses. For each subject, mean response latencies were calculated for each of the 12 cells of the design [the SOA levels (300/1000) crossed by the affective value of the target (positive/negative) and the affective value of the prime (positive/negative/neutral)]. All relevant means are shown in Table 1.

Next, facilitation scores were computed by subtracting the means in the positive target conditions from the neutral prime-positive target mean, and by subtracting the negative target means from the neutral prime-negative target mean. These difference scores are presented in Fig. 1,

TABLE 1
Mean Reaction Times as a Function of SOA Level, Target Valence, and Prime Valence (Experiment 1), and Target Valence and Prime Valence (Experiment 2)

Target Valence	*Positive*			*Negative*		
Prime Valence	*Positive*	*Negative*	*Neutral*	*Positive*	*Negative*	*Neutral*
Experiment 1						
SOA 300msec	574	597	586	621	589	606
SOA 1000msec	588	591	596	607	618	626
Experiment 2						
	456	473	458	469	458	472

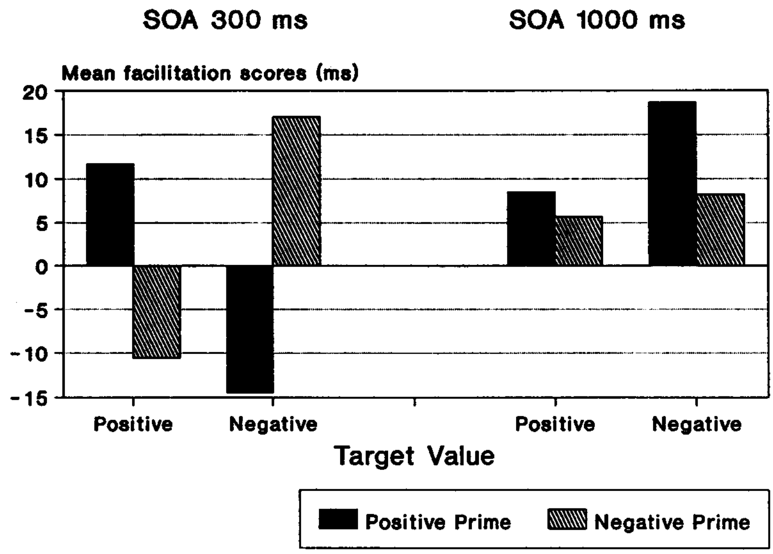

FIG. 1 Mean facilitation scores for target evaluation (in msec), as a function of SOA level, Target Valence, and Prime Valence.

where positive and negative scores, respectively, represent facilitation and inhibition of the response latencies. Hence, for the SOA 300msec condition, facilitation was expected for the affectively congruent trials and inhibition for the incongruent pairs. No such effect was predicted for the SOA 1000msec condition.

These difference scores were analysed in a 2 (SOA: 300msec vs. 1000msec) × 2 (Target Valence: positive vs. negative) × 2 (Prime Valence: positive vs. negative) analysis of variance with repeated measures for all variables. The ANOVA revealed the expected three-way interaction between SOA, Target Valence, and Prime Valence [$F(1, 23) = 21.045$; $P < 0.0002$]. All other main effects and interactions failed to reach significance. Subsequently, we followed the approach used by Fazio et al. (1986) by testing for the simple interaction between Target Valence and Prime Valence on both SOA levels. As expected, we obtained a reliable Target Valence × Prime Valence interaction at the SOA 300msec level [$F(1, 23) = 12.564$; $P < 0.002$]. If primes were positive, evaluative response latencies were shorter for positive targets compared to negative targets [$F(1, 23) = 4.597$; $P < 0.05$], whereas with negative primes, response latencies were longest for positive targets [$F(1, 23) = 5.569$; $P < 0.05$]. The interaction was, however, totally absent at the SOA 1000msec condition [$F(1, 23) < 1$; n.s.], thus replicating the findings of Fazio et al. (1986, Experiment 2).

Discussion

The results clearly indicate that the affective priming effect can be replicated when complex visual stimuli are used. Latencies to evaluate target stimuli were influenced by the affective relation between prime and target. Target pictures preceded by an affectively congruent prime were evaluated faster than target pictures preceded by a neutral control prime. Inhibition, on the other hand, was apparent for affectively incongruent trials. Both facilitation and inhibition were restricted, however, to the SOA 300msec condition. If the inter-stimulus interval (ISI) was prolonged with 700msec (SOA 1000msec), the affective priming effect disappeared completely, as was hypothesised. This latter finding might be due either to the fact that the activation instigated by the prime had already vanished at the moment of target presentation, or to an active suppression of this influence, as the affect of the prime was irrelevant for the task at hand (Neely, 1977).

Although Fazio et al. (1986) used evaluation latencies as a procedure for prime selection (see earlier), which was proposed as a measure of attitude accessibility, we employed a rating of affective extremity. Thus, the present results demonstrate that the affective priming effect can also be observed when affective extremity ratings are used for stimulus selection. A finding which should probably not come as a surprise as Bargh et al. (1992) reported a significant correlation of −0.69 between affective extremity and evaluation latencies, indicating that more extremely valenced primes are also evaluated more rapidly.

Compared to the Fazio study, the effect was observed under conditions that more closely approximate the *mere observation* of the prime, as the memory word instructions were omitted. Moreover, subjects were asked to actively ignore the primes. In the post-experimental interview all subjects indeed reported that they had spent little or no attention to the primes. Consequently, our data indicate that the active, conscious rehearsal of the prime is not a necessary precondition. Hence, allocation of attentional resources does not seem to be a decisive aspect of the affective priming effect. On the efficient versus attention-demanding dimension of automaticity it might therefore be situated more to the former side.

EXPERIMENT 2

In all published studies on the affective priming effect, the experimental task always involves the *evaluation* of the target. Subjects are therefore continuously engaged in the act of consciously evaluating, which certainly does not reflect a person's most representative state of consciousness in everyday life. If the effect is conditional on this aspect of the procedure, it might be classified under what Bargh (1989) has named "unintended goal-dependent automaticity". This class of automatic processes are unintended consequences of specific intentional thought processes. To investigate the necessity of such an evaluative mental set, evaluative aspects that could induce this state were removed from the priming paradigm. Therefore, the SOA 300msec condition of Experiment 1 was replicated in a word-word priming task, eliminating the explicit instructions to evaluate the target adjectives, and seplacing it with a pronunciation task. Additionally, the individual affective extremity rating was dropped, and replaced with a fixed stimulus-set for all subjects. This is important in so far as the mere evaluation of stimuli prior to the priming phase might be sufficient to create an evaluative processing goal. Consequently, if affective priming is not dependent on an intentional, conscious evaluative process, significant priming effects are expected under these conditions.

Several authors have used naming latencies as a dependent variable in both word reading tasks (e.g. Huttenlocher & Kubicek, 1983, Experiment 2; Keefe & Neely, 1990; La Heij, Happel, & Mulder, 1990; La Heij, Van der Heijden, & Schreuder, 1985) and picture naming experiments (e.g. Biggs & Marmurek, 1990; Huttenlocher & Kubicek, 1983, Experiment 1; La Heij, 1988; La Heij, Dirkx, & Kramer, 1990; for an overview: Glaser, 1992; W.R. Glaser & M.O. Glaser, 1989). In fact, there is some evidence that naming has some advantages over traditional tasks as the lexical decision task (LDT). Balota and Lorch (1986), for example, demonstrated that the pronunciation task is superior in revealing the depth of automatic spreading activation. Recently, Shelton and Martin (1992) have also argued that the target pronunciation task is less likely to engage subject strategies than the LDT, and consequently suggest that pronunciation would be the preferred task for assessing automatic priming, notwithstanding that priming effects are generally smaller in the pronunciation task (Neely, 1991).

Method

Subjects. A total of 24 undergraduate students (8 males and 16 females) participated in the experiment in partial fulfilment of course requirements. None of them had taken part in Experiment 1. All had normal or corrected-to-normal vision.

Stimuli and Apparatus. Fifteen positive and 15 negative adjectives were used as target stimuli. Primes were 20 nouns (10 positive, 10 negative), and 10 nonword three-letter strings (e.g. BBB) which served as controls. Mean affective ratings for positive and negative targets discriminated significantly [*M* positive = 2.18 (SD = 0.23); *M* negative = −2.2

(SD = 0.36); $t(28) = 39.28$; $P < 0.001$]. The same holds for the affective discrimination between positive and negative primes [*M* positive = 2.18 (SD = 0.62); *M* negative = −2.51 (SD = 0.34); $t(18) = 20.88$; $P < 0.001$]. These data are based on a normation study conducted at our department (Hermans & De Houwer, 1993) in which subjects had to rate the affective connotation of 200 Dutch words on 7-point Visual Analogue Scales (−3 = *very negative*; +3 = *very positive*). A complete list of the selected stimulus words is provided in the Appendix.

An IBM-compatible 386 computer with a super-VGA colour monitor controlled the stimulus presentation, and recorded the response latencies which were activated by means of a voice key. Letters had a constant height of 8mm, and were 5mm wide. Words were written in white upper case letters in the centre of an all-black background.

Procedure. Subjects were told that they were participating in an experiment on word recognition and word reading. They were seated in front of the monitor, were given the microphone, and were invited to silently read the instructions from the computer screen. The text indicated that pairs of words would be presented, of which they had to read the second one aloud to the microphone. It was stressed that they should be pronounced as quickly as possible, because response latencies would be recorded. In addition, they had to ignore totally the first word, as it was completely irrelevant for the pronunciation task. Correct registration of the response would lead to the immediate offset of the target. As this required a slightly strong intensity of the voice, subjects were asked to repeat their response, and to articulate somewhat louder on subsequent trials if the target failed to disappear upon the first response. Next, the experimenter explained that the experiment would start with a series of 10 practice trials during which potential inaccuracies could be corrected. Following the practice trials, the experimenter left the room, and the subject started the first of four test blocks. Subjects were allowed to take a short break after each block.

Each block consisted of 30 trials. Prime-stimuli were randomly assigned to the 30 targets, with the restriction to generate 10 Affective Congruent (5 Positive-Positive, 5 Negative-Negative), 10 Affective Incongruent (5 Negative-Positive, 5 Positive-Negative), and 10 Control trials (5 Neutral-Positive, 5 Neutral-Negative). This randomisation was done for each block separately. Primes were presented for 200msec, followed by a blank screen during 100msec, after which the target was presented. The target disappeared on the subject's response. If the subject did not respond, or if the voice key was not appropriately activated, the target remained on the screen for 2sec after which it disappeared. The inter-trial interval was always 4sec. Each new trial started with a 200msec 1000Hz warning tone.

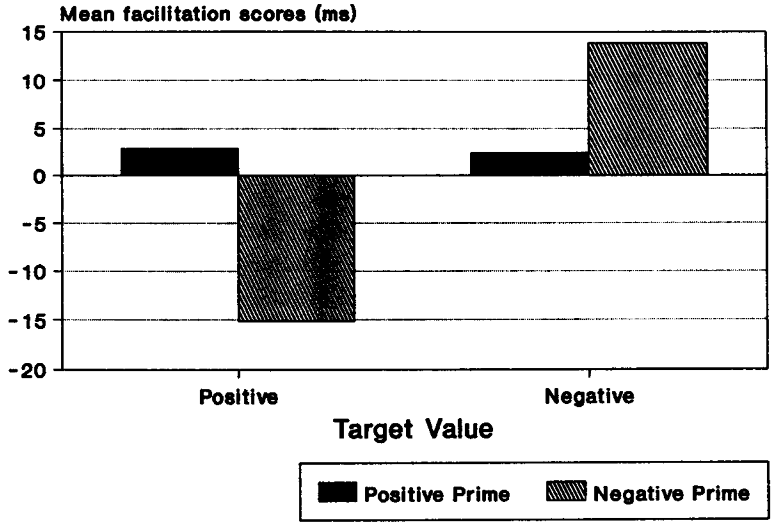

FIG. 2. Mean facilitation scores for target pronunciation (in msec), as a function of Target Valence and Prime Valence.

Results

All reaction times under 250msec and over 1500msec (9.5%), together with the data of the practice trials, were discarded from the analyses. As in Experiment 1, mean facilitation scores were computed for each subject separately, based on the means provided in Table 1 (see earlier), and were analysed in a 2 (Target Valence: positive vs. negative) × 2 (Prime Valence: positive vs. negative) analysis of variance with repeated measures for all variables.

A reliable Target Valence × Prime Valence interaction was obtained, as expected [$F(1, 23) = 9.286$; $P < 0.01$]. Pronunciation latencies were longer for affectively incongruent trials, and were shorter for affectively congruent prime-target pairs. All other effects failed to reach significance. Figure 2, however, shows that the priming effect are restricted to negative primes.

Discussion

To eliminate a possible evaluative processing goal, the traditional evaluation task was replaced by the instruction to pronounce the target words as quickly as possible. The experiment was introduced as a study concerning word reading, and no single reference had been made regarding the affective value of both primes and targets. In addition, primes and targets were selected normatively in order to prevent the generation of an evaluative mental set as a consequence of a prior idiographic affective extremity rating. Nevertheless, target word pronunciation was clearly affected by the affective relation with the prime. Therefore, it seems plausible to conclude that an evaluative processing goal is not a necessary precondition for the automatic affect activation effect to occur. Similar results have also been reported by Bargh (1992b, in press). He and his colleagues also observed facilitation of target pronunciation, for both normatively and idiographically selected primes (personal communication, 30 September 1992). Bargh (1992b) even mentions a study in which they replaced target adjectives by mildly positive or negative words for which the valence was not obviously apparent (e.g. lake, tobacco), as a supplementary measure to prevent the activation of an evaluative processing goal. Even under these conditions, the activation effect was present.

Both the response latency procedure for prime selection used by Fazio, and the affective extremity procedure for prime and target selection used in Experiment 1 requires the subjects to intentionally express their evaluations towards all possible primes. As this phase takes place only a few minutes prior to the actual priming procedure, it may be that this temporary activation of the association between the primes and their respective evaluations (good or bad) holds a prerequisite for the activation effect. Bargh et al. (1992, Experiment 2) have empirically tested the importance of a prior temporary activation. They reasoned that a two-day delay between the stimulus procedure and the priming phase would eliminate this prior activation. Nevertheless, under these circumstances, the activation effect was still present. Not administering an individual stimulus selection procedure as was done in Experiment 2 seems, however, a better alternative to test the importance of temporary activation. Hence, it can be concluded from our data that the effect is not due to such prior temporary activation.

The activation effect in this study seems to be restricted to trials where the prime had a negative valence. This is inconsistent with the data from Experiment 1, where there was an effect for both positive and negative trials. One possible explanation for the absence of the effect for positive primes in Experiment 2 might be that negative primes were somewhat more extreme than positive primes. Although not significant [M positive $= 2.18$ (SD $= 0.62$); M negative $= 2.51$ (SD $= 0.34$); $t(18) = -1.45$; $P = 0.17$], negative primes tended to be somewhat more affectively extreme than positive primes. Also, extremity ratings for the negative primes show less variability. This could indicate that the effect is mediated by the normative affective extremity of the prime. Related studies, however (Bargh et al., 1989; Pratto & John, 1991), in which affective extremity was manipulated as an experimental variable did not show any effect of this stimulus characteristic. Moreover, regression analyses (Bargh et al. 1992; Fazio, 1993) showed that the affective priming effect does not vary as a function of normative affective extremity. However, in the context of the generality of the effect it would be interesting to explore this observation in more detail.

GENERAL DISCUSSION

The present experiments clearly replicated the affective priming effect. The data of Experiment 1 indicate that this priming effect can be generalised to rather complex pictorial stimulus material. At SOA 300msec, evaluation of the target colour slides was facilitated if preceded by an affectively congruent prime, but inhibited when the prime was of opposite valence. For the SOA 1000msec condition, affective priming effects were absent, supporting the automatic character of the effect and thus replicating the Fazio et al. (1986, Experiment 2) findings. Additionally, the results of Experiment 2 show that the effect can be generalised to another experimental task, as a significant priming effect was still obtained when subjects were asked to pronounce the target adjectives, instead of evaluating them.

These data not only add to the generality of the phenomenon, but also provide information about the conditions needed to produce the automatic activation of affective information in memory. As argued before, we believe that Fazio's contention that affect can be activated automatically on the *mere* presentation of an affective stimulus was premature at that time, as it presupposed a considerable unconditionality, which had not yet been fully tested. Since then, however, a limited number of studies which replicated the effect, have contributed to the investigation of its preconditions. Greenwald, Klinger, and Liu (1989), for example, have obtained similar affective priming effects under both visible and masked priming conditions. Recently, Croizet (1992) replicated this automatic activation effect for masked primes, which indicates that *awareness* of the priming stimuli is not a necessary condition for the affective priming effect. The present studies provide additional information concerning the necessary preconditions, as they indicate that the effect is independent of an evaluative processing goal (Experiment 2), a previous temporal activation of the relevant evaluations (Experiment 2), the verbal character of the stimuli (Experiment 1), and the active, conscious rehearsal of the primes (Experiments 1 and 2). All in all, these studies, together with the Fazio et al. (1986) and Bargh et al. (1992) experiments, provide strong evidence for the fact that the observed phenomenon is robust and unconditional.

The idea of immediate affective reactions is certainly not new (e.g. LeDoux, 1986; Zajonc, 1980) and has clear implications for theories of cognitive processing. Niedenthal and Cantor (1986), for example, have stressed the importance of such immediate affective reactions for social judgements. Also, in recent cognitive-representational theories of emotion the concept that organisms are capable of automatically evaluating environmental stimuli/events as good or bad for the self, has gained much support. Based on an evolutionary cognitive perspective on emotions, Öhman (1985, 1987, 1988) has proposed a model of emotion generation. He states that automatic processing mechanisms, which take place early in the emotion generation process, are able to locate emotionally significant stimuli in a pre-attentive analysis. Such mechanism is functionally important for organisms, as it enables them to react more appropriately. Also, Williams et al. (1988) have proposed a pre-attentive Affective Decision Mechanism (ADM) which assesses the affective valence of registered stimuli. They assume that if a threatening stimulus is detected by the ADM, this might affect the priorities for subsequent information-processing. In high trait-anxious people this might, for example, lead to the direction of more processing resources towards the threatening stimulus (Pratto & John, 1991; Roskos-Ewoldsen & Fazio, 1992), which is a standard observation in attentional bias studies (e.g. MacLeod & Rutherford, 1992). Also, other researchers in the domain of affect and emotion have discussed the role of automatic affective processing (e.g. Cacioppo, Berntson, & Klein, 1992; Kitayama, 1990; Làdavas, Cimatti, Del Pesce, & Tuozzi, 1993; Sherer, 1993).

If we want to learn more about the role of automatic stimulus evaluation in emotions, it will be necessary to investigate the processes and representations that are responsible for this automatic stimulus evaluation. Concerning the representation of affect in memory and its activation, De Houwer and Hermans (1994) have argued that affect is stored in semantic memory, and can be conceptualised as an evaluative tag (good/bad) directly linked to the related representation. So, on perceiving a stimulus, the relevant memory representation will be immediately activated, and therefore also the related affect node. A similar account has been proposed by Fiske and Pavelchak (1986). Pertaining to the explanation of the effects observed in Experiments 1 and 2, an additional assumption is required, namely, that *all* positively valenced memory concepts are related, and likewise for all negative memory representations. Activation of a positive concept would spread to all other positive concepts, consequently facilitating the evaluation or pronunciation of another positive concept (Bargh, 1988). Similarly, to explain inhibition, activation of a positive concept is supposed to inhibit all negative representations, and vice versa. Of course, this is still speculative and deserves closer examination.

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APPENDIX

Words used as Primes and Targets in Experiment 2

Positive Targets

1. tolerant (tolerant)
2. origineel (original)
3. actief (active)
4. opgewekt (cheerful)
5. vriendelijk (friendly)
6. creatief (creative)
7. sociaal (social)
8. oprecht (sincere)
9. gelukkig (happy)
10. eerlijk (honest)
11. optimistisch (optimistic)
12. goedaardig (benignant)
13. sympathiek (likable)
14. begrijpend (understanding)
15. betrouwbaar (reliable)

Negative Targets

16. bedrieglijk (deceitful)
17. onoprecht (insincere)
18. agressief (aggressive)
19. oppervlakkig (superficial)
20. onbeleefd (impolite)
21. vals (false)
22. wreed (cruel)
23. gemeen (mean)
24. oneerlijk (dishonest)
25. jaloers (jealous)
26. passief (passive)
27. koud (cold)
28. lusteloos (listless)
29. afstotelijk (repulsive)
30. misleidend (misleading)

Positive Primes

1. warmte (warmth)
2. poes (cat)
3. feest (party)
4. vrede (peace)
5. liefde (love)
6. lach (smile)
7. kus (kiss)
8. humor (humour)
9. vrijheid (freedom)
10. geluk (happiness)

Negative Primes

11. pijn (pain)
12. dood (death)
13. kanker (cancer)
14. angst (anxiety)
15. slachting (slaughter)
16. haat (hatred)
17. kerkhof (cemetery)
18. executie (execution)
19. tumor (tumour)
20. lijk (corpse)

Control Primes

21. BBB
22. CCC
23. DDD
24. GGG
25. LLL
26. NNN
27. OOO
28. QQQ
29. RRR
30. TTT