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Affective priming with liked and disliked persons: Prime visibility determines congruency and incongruency effects

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The present research investigated whether the affective priming paradigm from Fazio, Sanbonmatsu, Powell, and Kardes (1986) can be used as an implicit measure of person schemata. Names and faces of friends or romantic partners and of a disliked person were used as primes. It was explored whether: (1) stimuli relating to liked and disliked persons elicit congruency priming effects similar to those reported for words; (2) masked and unmasked priming procedures had similar effects; and (3) whether individual differences in the implicit measure were related to explicit measures of relationship quality. For clearly visible primes the expected congruence priming effects were found across names and faces. For marginally visible primes, however, unexpected reverse priming effects were observed for the disliked person. In a second experiment, a confound of the familiarity and evaluation of the significant other primes was removed. Now a reverse priming effect could be demonstrated for masked primes in both liked and disliked person conditions. On the group level, effects were consistent across name and face primes, thus providing strong evidence that priming effects were caused by the activation of person schemata. The reliability of inter-individual differences in person-specific priming effects was found to be unsatisfactory, and correlations with explicit measures were not consistent across name and face priming conditions. An explanation of reverse priming effects is discussed, and measures to improve the psychometric quality of individual affective priming indices are suggested.

In the last decade, an increasing number of social psychologists have been attracted to methods such as affective or semantic priming for assessing ''implicit'' attitudes and stereotypes. This attraction is due to the potential of these methods to access more directly than verbal report methods those

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knowledge structures and mechanisms of automatic information processing which are supposed to be the substrate of social cognition. Some facets of attitudes and stereotypes may be genuinely nonverbal or unconscious and therefore difficult to verbalise (Greenwald, 1992; Greenwald & Banaji, 1995), others may be accessible but are distorted voluntarily by self-presentation concerns (Fazio, Jackson, Dunton, & Williams, 1995). Implicit methods such as affective priming (Fazio et al., 1995; Murphy & Zajonc, 1993), semantic priming (Wittenbrink, Judd, & Park, 1997), or the Implicit Association Task (Greenwald, McGhee, & Schwartz, 1998) have been proposed to overcome both problems because they are not transparent to the respondent, and rely not on direct verbalisation but on the automatic activation of attitudes or stereotypes.

The present study applied an implicit assessment method to the field of personal relationships. The mental substrate of personal relationships has been conceptualised as an *inner working model* (Bowlby, 1969) or *relational schema* (Baldwin, 1992), consisting of relationship-specific representations of the partner, the self, and their interaction. At least with respect to an evaluative component relational schemata are obviously akin to stereotypes and attitudes, and therefore measurement methods for the latter should also work for the former. The use of implicit methods for the assessment of relational schemata is attractive for the same reasons as in the case of attitudes and stereotypes: Many aspects of personal relationships are socially valued so that verbal report measures are likely to be contaminated by individual self-presentation concerns, and some facets of relationship schemata may be genuinely unconscious and therefore difficult or even impossible to verbalise.

In a previous study, Banse (1999) used the affective priming paradigm of Murphy and Zajonc (1993) to assess automatic affective reactions to romantic partners and friends. It was investigated how marginally visible first names and faces of relationship partners influenced subsequent liking ratings of affectively neutral Chinese ideographs. The results showed that partner-related primes caused a more positive evaluation than self-related primes. This effect replicated across name primes and face primes, thus providing strong evidence that effects were caused by an activation of person schemata and not by other features of the primes. Contrary to these reliable effects at the group level the data provided little evidence that priming effects reflected individual differences in relationship quality. The internal consistency and retest reliability of inter-individual differences was marginal at best, and in consequence, no reliable correlations with explicit measures of relationship quality were found. This finding could indicate that inter-individual differences in affective priming effects are *essentially* uninformative because they reflect only a gross positive-negative distinction, but bear no information about a differentiated evaluation of relationship partners (Banse, 1999). Alternatively, the indirect assessment of implicit person evaluation via an evaluation of neutral stimuli may lack sensitivity. In this case the affective priming approach could work if a more sensitive measure was used.

An alternative approach to assess automatic affective reactions is the evaluative decision task developed by Fazio, Sanbonmatsu, Powell, and Kardes (1986). In this task the presentation of affectively polarised primes is followed by positive and negative target words, and the participants have to decide whether the target words are positive or negative. Numerous studies have shown that this paradigm produces congruence priming effects, that is, positive primes cause faster evaluative decisions and fewer errors for positive than for negative target words, and negative prime words cause faster evaluative decisions and fewer errors for negative than for positive target words (e.g., Bargh, Chaiken, Govender, & Pratto, 1992; Chaiken, & Bargh, 1993; Greenwald, Klinger, & Liu, 1989; Hermans, De Houwer, & Eelen, 1994; Klauer, Roßnagel, & Musch, 1997). The aim of these studies was to specify the boundary conditions under which prime words of known valence cause the affective priming effect. In a study on racial prejudice, Fazio et al. (1995) reversed the focus by using the strength of priming effects *to infer* individual differences in the automatic evaluation of primes (pictures of black and white persons). This implicit measure of attitudes of whites towards blacks was unrelated to explicit measures of racial prejudice, but it predicted the quality of interaction with a black experimenter that could not be predicted by the explicit measures of racial prejudice. In an analogous way it was the aim of the present study to adapt the affective priming paradigm for the assessment of person schemata.

Present research

The primary goal of the study was to evaluate the validity of Fazio's affective priming paradigm (Fazio et al., 1986, 1995) for assessing the implicit evaluation of relationship partners. As in a previous experiment (Banse, 1999), the faces and names of a relationship partner and the participants, as well as the face of a stranger and a neutral word were used as primes. To parallel the procedure by Fazio et al. (1995), and to establish a normative reference point of implicit evaluation, the face and name of a clearly *disliked person* were additionally included. It was expected that person-related primes would cause congruency priming effects, that is primes related to liked persons should facilitate the evaluation of positive and inhibit the evaluation of negative target words, whereas primes related to the disliked person should facilitate the evaluation of negative and inhibit the evaluation of positive target words. Since the default evaluation of strangers is reported to be moderately positive (Fiske, 1981), a moderate positive priming effect was expected for the face of the stranger, and a more neutral effect for the neutral word. No clear prediction could be made for self-related primes. Whereas Banse (1999) found a more negative implicit evaluation of the self as compared to significant others, there is also evidence that the automatic affective reaction towards one's own name is clearly positive (Nuttin, 1985, 1988).

There seems to be a broad consensus among researchers that affective priming effects reflect an automatic activation of prime-related affect independent of conscious or controlled processes (Klauer, 1998). To directly address the question whether affective priming effects depend on the degree to which primes are available to conscious identification, a prime visibility manipulation was added to the experimental design. It was expected that marginally visible primes would cause similar priming effects as clearly visible primes. Masked priming procedures have only occasionally been used in affective priming studies with the evaluation task, and both congruency effects (Draine & Greenwald, 1998; Greenwald, Klinger, & Schuh, 1995; Musch, 1999; Otten & Wentura, 1999) and null or incongruency effects have been observed (e.g., Hermans, 1996; Wentura, 1999).

For the purpose of exploration, self-report questionnaire measures of relationship satisfaction and adult attachment style (Bartholomew & Horowitz, 1991) were included. If the implicit evaluation of relationship partners tapped aspects of the person schema that are also relevant for the explicit evaluation of the relationship with that person, one should expect low to moderate positive correlations between the implicit evaluation of relationship partners and explicit measures of relationship quality (e.g., relationship satisfaction and secure vs. insecure attachment). However, even if implicit and explicit measures were found to be uncorrelated, the implicit measure could still be valid, as demonstrated for the implicit measure of racial prejudice (Fazio et al., 1995).

Although the primary goals of the present study are more applied, some aspects of the study might be interesting also from a basic research perspective on affective priming. Up to now, most studies have used affectively polarised words as prime and target stimuli. Only occasionally have other types of stimuli been used as primes, for example affective pictures (Hermans, 1996), or faces of majority and minority group members (Fazio et al., 1995). In order to delimit the boundary conditions of the affective priming effect it seems therefore desirable to expand the scope of investigation to attitude objects that are more personally relevant, more familiar, and more emotionally extreme than valenced words.

In summary, it was expected that clearly visible stimuli relating to liked and disliked persons would facilitate the evaluative decision for positive and negative target words, respectively. If affective priming operates independently of a conscious identification of primes, similar person identity effects should be obtained when primes are only marginally visible. It was further expected that individual differences in partner priming effects can be measured reliably. It was planned to investigate the nature of implicit evaluations of relationship partners more narrowly by correlating them with explicit measures of relationship quality, such as relationship satisfaction and secure versus insecure attachment style. Here, it was expected that implicit evaluations of the relationship partner would show at least moderate correlations with explicit measures of relationship satisfaction and secure versus insecure attachment style.

EXPERIMENT 1

Method

Participants. Out of more than 100 pairs of romantic partners or friends that had participated in a previous study (Banse, 1999), a total of 37 psychology students were contacted to participate in the present experiment and each received a research participation credit. For 23 participants the significant other was their romantic partner, for 14 a close friend. The minimal relationship duration requirement was 6 months. The mean duration of the relationships was 9.0 years for friendships, and 3.7 years for romantic partnerships.

Material and apparatus. For the *liked person* and *self* conditions, the faces and first names of the participants and one individual relationship partner of these participants were obtained from a previous priming experiment several months before the present study. In a control condition, the faces of a male and a female stranger were used as primes. Since there is no name equivalent to the face of a stranger, the affectively neutral word ''occasion'' (*Anlass*) was selected from a German normative word evaluation study (Schwibbe et al., 1994) and used as a control prime for names. The face and first name of Saddam Hussein served as primes in the *disliked person* condition. Saddam Hussein was in fact disliked by most participants as indicated by a very negative mean rating of 1.24 (SD = 0.49) on a 5-point liking scale (1 = *very unfavourable* to 5 = *very favourable*). All face photographs were black and white and showed the faces in full frontal view, with neutral expressions against a black background. On the 15 inch PC monitor, the photos were 85 mm high and 65 mm wide. The name primes and the neutral word were presented in white on a black background using an Ariel-type font of 15 mm height.

As a mask for face primes, the picture of an additional face was cut in 16 rectangular pieces and rearranged in three different random orders. To mask the names and the neutral word, three pattern masks (containing letters with vertical, diagonal and round shapes, respectively) were superimposed (Figure 1). Eighty target words (50% nouns, 50% adjectives) rated as unambiguously positive or negative in normative word evaluation studies (Ostendorf, 1994; Schwibbe et al., 1994) were selected. Words that referred to personal relationships (e.g., love, friendship), or that might be associated with Saddam Hussein (e.g., war, poison) were not selected. The experiment was run on an IBM-compatible PC with a fast monitor (95.3 Hz) using the Experimental Run Time System (Beringer, 1994). The response ''negative'' was assigned to the ''a''-key on the left side of the keyboard, the answer ''positive'' to the ''5''-key on the number pad on the right side.

Procedure. The experiment was run in individual sessions. The participants filled in the computer based questionnaire on relationship quality, then they

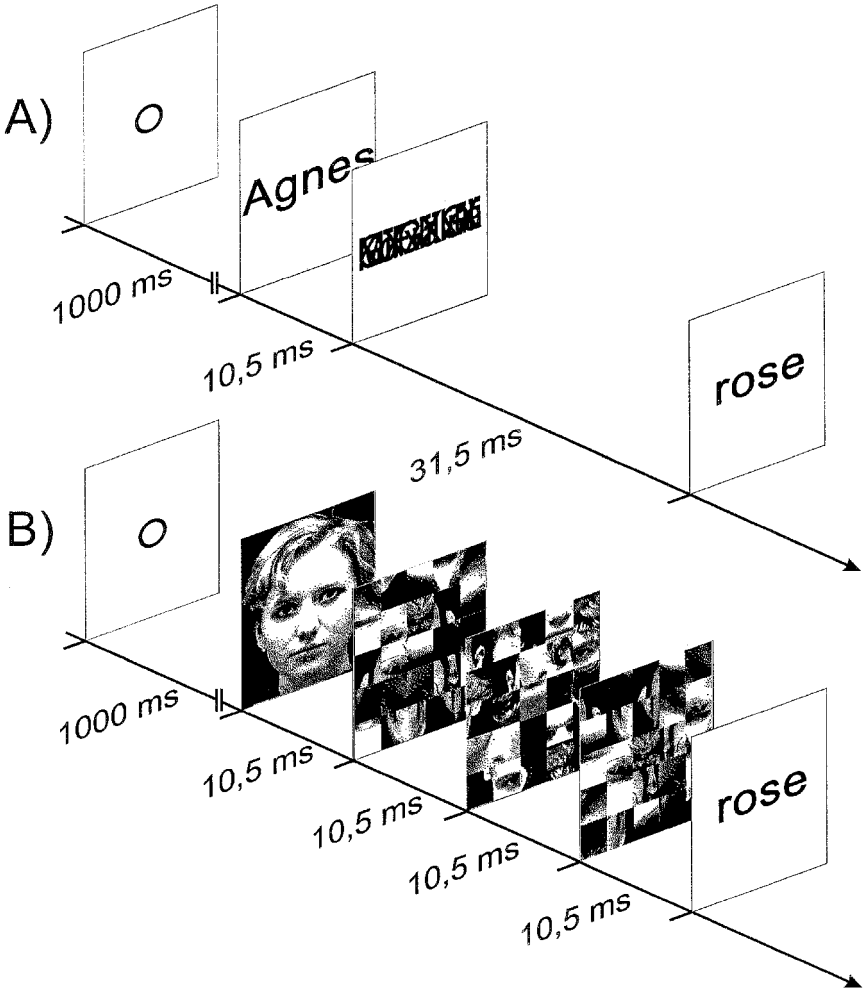

Figure 1. Time sequence of the priming procedure for: (A) name priming; and (B) face priming. On the computer monitor all material was presented white on a black background.

were instructed about the evaluation task and asked to react as quickly and as accurately as possible. Errors and response latencies longer than 2000 ms were indicated by visual feedback on the computer monitor. The time course of the priming procedure is described schematically in Figure 1. Each trial started with the presentation of a round symbol (1000 ms) followed by the prime (10.5 ms). Under low visibility conditions, face primes were immediately followed by three successively presented scrambled faces (each for 10.5 ms), and name primes by

a single pattern mask (for 31.5 ms). Then the target word was presented with a constant prime-target SOA of 42 ms and remained on the screen until an answer key was pressed (or 2000 ms elapsed). The high visibility conditions were similar in all respects, except that the masks were replaced by a blank screen. The intertrial interval was 1500 ms.

A training block of 16 trials was followed by 320 experimental trials, resulting from the following fully crossed design: 4 (person identity: liked person, disliked person, self, control) × 2 (prime modality: faces, names) × 2 (prime visibility: masked, unmasked) × 2 (target valence: positive, negative). A total of 80 target words were presented four times, once in each of the four different prime person identity conditions. So each target word was used as its own control with respect to prime person identity effects. Target valence extremity was balanced across prime visibility, prime modality, and target valence conditions. The experimental trials were split into two successive blocks of 160 trials using one half of the target words for each block. The trial order was randomised within each block for each participant. Between the two experimental blocks participants could take a break.

Measures. The relationship satisfaction of romantic partners was assessed using a German translation (Sander & Böcker, 1993) of the Relationship Assessment Scale (Hendrick, 1988). Additionally, a friendship version was created by reformulating several items appropriately. The internal consistency in the present sample was $\alpha = .77$. For measuring *adult attachment*, the German translation (Doll, Mentz, & Witte, 1995) of Bartholomew and Horowitz's (1991) four prototype descriptions (secure, anxious, preoccupied, dismissing) of adult attachment was reworded to refer specifically to the romantic partner or to a friend. Participants rated on 5-point scales to what extent each prototype correctly described their relationship. As the attachment scales had been filled in already for the previous study, scores were aggregated across the two measurements (Cronbach's alphas were: Secure .66, Anxious .52, Preoccupied .71, Dismissing .48). This aggregate score can be interpreted as a trait measure of attachment from which state influences of current relationship quality have been partially removed by aggregation. The validity of this measure is supported by substantial and theoretically meaningful correlations between the four aggregated attachment measures and relationship satisfaction: Secure .46, Anxious −.36, Preoccupied −.54, Dismissing −.43 (all $ps < .05$).

Treatment of outliers and data analysis. Out of the 11,840 experimental trials two trials with answer latencies below 250 ms and 252 trials (1.9%) with answer latencies above 1000 ms were eliminated to obtain an approximately normal distribution of reaction latencies. The remaining sample contained 11,060 trials (93.4%) with correct and 526 trials (4.4%) with a false response in the evaluation task. Due to the low frequency of errors, only answer latencies

were used as a dependent variable. In order to simplify the report of statistical analyses and results, difference scores of answer latencies between negative minus positive target valence conditions were used as dependent variables. Positive difference scores indicate faster reactions for positive than for negative target words, negative difference scores indicate faster reactions for negative than for positive target words. This simple priming index was also used for the analysis of individual differences in specific priming effects. Please note that the more common significance test of the prime identity × target valence interaction is *equivalent* to the prime identity main effect of difference scores used here.

Results and discussion

General priming effects

Preliminary data analysis. A significant main effect of target valence was found, $F(1, 36) = 45.42$, $p < .001$. Response latencies were shorter for target words with positive valence ($M = 660$) than for target words with negative valence ($M = 683$ ms). No effects were expected for the type of relationship (romantic partner vs. friend). A preliminary analysis showed that only the three-way interaction relation type × prime visibility × person identity was statistically significant, $F(3, 33) = 3.65$, $p < .05$. As this effect was mainly caused by the control condition and hence of minor theoretical importance the factor relationship type was dropped from subsequent analyses.

Priming effects. These were analysed using a three factorial ANOVA with the within subject variables 4 (person identity) × 2 (prime modality) × 2 (prime visibility). The three main effects and the three two-way interactions were significant. The significant main effects of prime visibility: $F(1\,36) = 24.87$, $p < .001$; and prime modality: $F(1, 36) = 7.64$, $p < .01$, are qualified by a two way interaction of both factors: $F(1, 36) = 7.44$, $p < .01$. Whereas more positive priming effects (i.e., faster reactions for positive than for negative target words) were found for clearly visible faces than for clearly visible names, the opposite pattern was obtained for marginally visible primes (Figure 2). Although this finding is interesting, only the effects of the person identity factor are critical with respect to the hypotheses. As expected, the person identity did influence priming effects, $F(3, 34) = 5.53$, $p < .01$. However, this main effect is qualified by a significant person identity × prime visibility interaction, $F(1, 36) = 29.95$, $p < .001$, that was due to qualitatively different person identity effects for masked and unmasked primes.

In a separate analysis of unmasked priming conditions, the person identity factor yielded a strong main effect, $F(3, 34) = 20.75$, $p < .001$, and the expected pattern of means was observed: Priming with the liked person led to a faster evaluation of positive than negative target words, and priming with the disliked

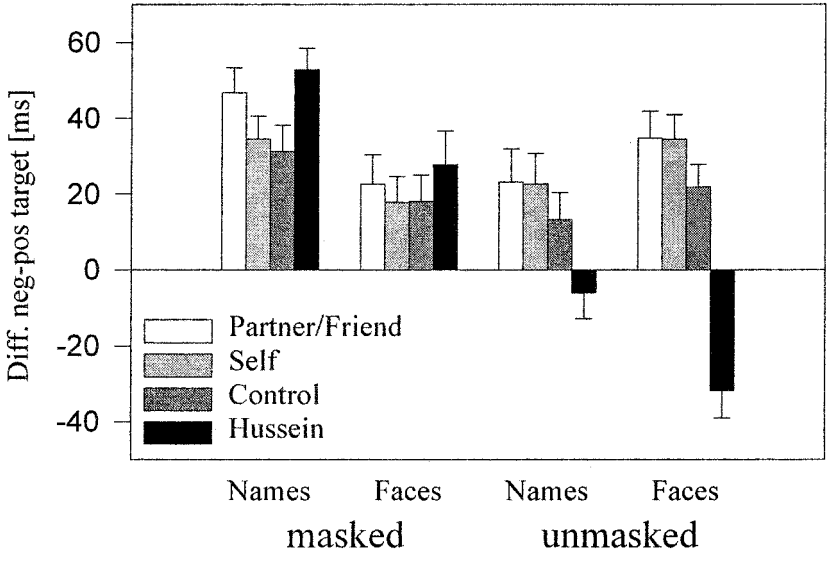

Figure 2. Experiment 1: Mean response latency differences between negative and positive targets as a function of person identity and prime modality.

person led to faster evaluation of negative than positive target words. The control conditions showed intermediate values. The person identity effect was qualified by a prime modality interaction, $F(3, 34) = 5.89$, $p < .01$, due to stronger effects for face primes than for name primes, but importantly, the order of means across person identities was identical for face and name primes. *Post-hoc* comparisons showed that for both face and name modalities, priming with the disliked person led to more negative reaction latency differences than the three other person identity conditions: All $ts(36) > 2.50$; $ps < .05$.

A significant main effect for person identity was also found for masked primes, $F(3, 34) = 2.90$, $p < .05$. This priming effect was generally stronger for name primes than for face primes, $F(3, 34) = 17.89$, $p < .001$, but the person identity effect did not interact with the prime modality, $F(3, 34) < 1$, n.s. As for clearly visible primes, this consistency of priming effects across names and faces provides strong evidence that the obtained priming effects are due to the intended activation of person schemata and not to other features of the stimuli.

As compared to clearly visible primes, the masked primes produced a very different and unexpected pattern of means. For both name and face primes, the liked and the disliked person yielded more positive priming effects than the self-related primes and the control primes. A *post-hoc* specific contrast showed this effect to be significant, $F(1, 36) = 8.61$, $p < .01$. These results indicate a significant qualitative difference between masked and unmasked priming. When

only marginally visible, primes relating to the liked *and* the disliked person elicited similar and more positive priming effects than the self and control conditions.

Individual differences in priming effects. To estimate the reliability of priming effects, the internal consistency of the first and the second half of the experiment was calculated using Cronbach's alpha (Table 1). Two participants had to be excluded from the congruence analysis because they showed extreme differences in priming effects between the first and the second block thus distorting the consistency estimates (but not other results). The consistencies are generally low (Table 1), maximal values are obtained for the marginally visible face of Saddam Hussein ($\alpha = .54$), and clearly visible primes relating to the relationship partner (names, $\alpha = .57$; faces, $\alpha = .43$). If the difference scores for the person identity conditions were subtracted from the difference score of the corresponding control condition (as suggested by Fazio et al., 1995), consistencies were considerably lower, reaching a maximum Cronbach's alpha of .26 for priming with the partner's name. However, besides the general reliability problem of a score based on two differences this individual priming index seems not to be appropriate here because neither the face of a stranger nor the neutral word are fully adequate neutral baseline conditions and may therefore lead to an overcorrection of person specific priming effects.

Although the consistencies of priming measures were low, relations with relationship satisfaction and adult attachment scales were explored. No significant correlations with relationship satisfaction were found. As the four adult

TABLE 1
Consistency (Cronbach's alpha) of individual priming effects across experimental conditions

	Prime presentation			
	Masked		*Unmasked*	
	Names	*Faces*	*Names*	*Faces*
Experiment 1 ($N = 37$)				
Partner/Friend	–	.10	.57	.43
Self	.02	.19	.22	.25
Control	–	–	.05	.39
Saddam	–	.54	–	–
Experiment 2 ($N = 40$)				
Chaplin	–	–	.0	.39
Control	.42	–	.15	.12
Saddam	.22	–	.38	.36

Note: Cronbach's α is reported for positive retest correlations.

attachment scales are correlated, they were simultaneously regressed on priming effects for each experimental condition separately. Three multiple regressions were significant. All three had either to do with unexpected experimental conditions (e.g., the marginally visible face of Hussein), or the regression weights for specific attachment scales had an unexpected sign (e.g., dismissing attachment was related with a *more positive* and secure attachment with a *more negative* implicit evaluation of the visible face of the relationship partner). When person priming effects were subtracted from the control priming effect as proposed by Fazio et al. (1995), similar but weaker correlations emerged, and only one effect remained marginally significant. To confidently attribute priming effects to the activation of person schemata, effects should be consistent across name and face primes. This was not the case. However, this criterion may be too conservative, because the absence of significant name prime effects could reflect a substantial advantage in the affective processing of pictures as demonstrated by De Houwer and Hermans (1994). In summary, although the use of the priming paradigm by Fazio et al. (1986) produced more reliable measures than the Murphy and Zajonc (1993) paradigm used in Banse (1999), their psychometric quality seems still insufficient for the analysis of individual differences in the implicit evaluation of relationship partners.

Implications of the dissociation between masked and unmasked priming. It was hypothesised that congruency effects would be found for both masked and unmasked priming conditions. Such a result would have strengthened the claim that affective priming effects are not influenced by conscious or controlled processes. However, the findings did not confirm this hypothesis. If the unexpected masked priming results turn out to be replicable they raise an important question. It has to be explained why marginally visible primes show dramatically different effects than visible primes, and more specifically, it has to be explained how marginally visible primes of opposite valence can cause similar effects. It is possible, however, that the nature of the observed masked priming effects can be more easily described as a reverse priming or incongruency effect (i.e., negative primes facilitate the evaluation of positive, and positive primes facilitate the evaluation of negative target words). Reverse affective priming effects of this type seem atypical but have been occasionally found in other studies (Glaser & Banaji, 1999; Hermans, 1996; Klauer et al., 1997; Wentura, 1999).

The person identity effects under masked priming in the present study are compatible with a reverse priming effect except for the significant other condition. Here, the direction of priming was the same as in unmasked priming. However, a major asymmetry between liked and disliked person conditions could be responsible for this inconsistency: The relationship partners were much more familiar than Saddam Hussein. It is conceivable that even marginally visible primes relating to significant others may have very similar effects as

clearly visible primes, whereas marginally visible primes of less familiar persons do not.

Both interpretations of the masked priming results can be tested by replicating the experiment using a liked person that is as familiar for participants as Saddam Hussein. If the complex pattern of Experiment 1 were substantial, one would expect the same masked priming effects again (i.e., both the liked and the disliked person should elicit more positive priming effects than the control conditions). The *reverse priming hypotheses*, however, predicts a general incongruency effect of masked primes across all person identity conditions.

Rationale of Experiment 2. The aims of a second experiment were: (1) to replicate the effects of liked and disliked persons under conditions of masked and unmasked priming; and (2) to test the two alternative interpretations of unmasked priming effects in Experiment 1. Whereas the general priming procedure remained unchanged, the highly familiar primes relating to the self and the relationship partner were removed. Instead of the relationship partner, a popular person was used for the liked person condition. In quest of a well-known and liked person Charlie Chaplin was eventually selected. Besides the fact that he seemed to meet the popularity criterion, Chaplin had the additional advantage of resembling Hussein, being male, dark-haired and wearing a moustache, thus limiting possible confounds of person identity effects. For the purpose of exploration, adult attachment measures were also included in Experiment 2. As no participation of individual relationship partners was planned, adult attachment was assessed for several types of relationships in order to create an aggregate measure.

EXPERIMENT 2

Method

Participants. A total of 40 psychology students participated in the experiment and received research participation credit.

Material and procedure. The material and priming procedure was the same as in Experiment 1, except that Charlie Chaplin was used as a liked person (instead of the relationship partner), and the self prime condition was omitted. As expected, liking ratings were very negative for Hussein (M = 1.13, SD = 0.41) and positive for Chaplin (M = 3.9, SD = 0.96) on a 5-point liking scale ranging from 1 to 5. However, the rating of Chaplin was not as extreme and unanimous as in the case of Hussein, as indicated by a larger standard deviation, a modal value of 4, with 29% of the ratings ranging from negative to neutral. In order to evaluate the efficiency of the masking procedure, the participants' suspicions about masked priming were assessed in a post-experimental structured interview. Participants were first questioned about their hypotheses

concerning the experiment, then whether they had noticed anything unexpected. Finally, participants were specifically asked about their perception of the control stimuli.

Measures. The attachment prototype descriptions by Bartholomew and Horowitz (1991) were reformulated to refer to ''my romantic partner'', ''my friends'', and ''other people'' and were aggregated across these relationship types. The consistencies (Cronbach's alphas) of the four resulting attachment scores were: Secure .44, Anxious .72, Preoccupied .69, and Dismissing .74.

Treatment of outliers and data analysis. After eliminating trials with reaction times above 1000 ms, 8536 trials (88.9%) with correct and 600 trials (6.3%) with incorrect answers were analysed. In addition to the analyses conducted in Experiment 1, specific a-priori contrasts were used to test the dissociation between masked and unmasked priming conditions, a replication of the person identity effects for masked priming, as well as the *reverse priming* hypotheses.

Results and discussion

General priming effects. As in Experiment 1, answer latencies were shorter for positive (M = 678 ms) than for negative (M = 693 ms) target words, $F(1, 39) = 10.58$, $p < .01$. Based on the results of Experiment 1, a dissociation in person identity effects between masked and unmasked priming conditions was expected. This hypothesis was confirmed (Figure 3), the overall prime visibility × person identity interaction was significant, $F(2, 38) = 6.47$, $p < .01$. A *post-hoc* specific contrast revealed that this dissociation was even stronger if the control conditions were omitted and only liked and disliked person conditions were contrasted, $F(1, 39) = 11.86$, $p = .001$. No other effects approached significance. For unmasked primes, the person identity main effect was significant, $F(2, 38) = 7.78$, $p = .001$, and as expected, Chaplin elicited more positive priming effects than Hussein, $F(1, 39) = 14.76$, $p < .001$. A marginally significant prime modality × person identity interaction, $F(1, 39) = 2.52$, $p < .10$, was mainly driven by the control face and disappeared if the control conditions were omitted, $F < 1$. For Chaplin and Hussein, name and face primes had very similar effects. The unexpected finding that the face of the unknown person elicited a somewhat more positive priming effect than the face of Chaplin may have to do with a comparably high physical attractiveness, but this difference was not statistically significant, $t(39) = 1.25$, $p = .219$. In summary, clearly visible primes of the liked and the disliked person produced the expected congruency priming effects, and thus replicated the results of Experiment 1.

For masked primes, the overall person identity main effect failed to reach statistical significance, $F(2, 38) = 2.07$, $p = .14$. The a-priori specific contrast

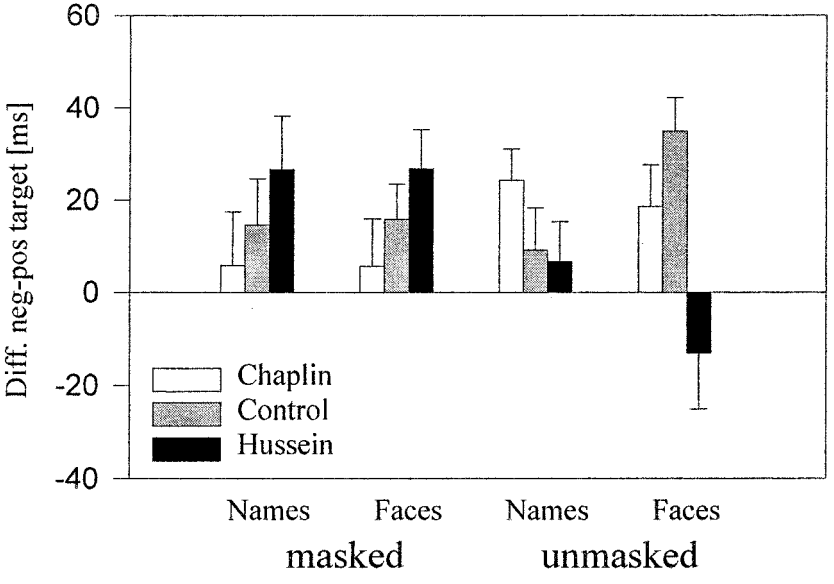

Figure 3. Experiment 2: Mean response latency differences between negative and positive targets as a function of person identity and prime modality.

testing the person identity pattern of Experiment 1, that is, more positive priming effects for Chaplin and Hussein than for the control condition, was not significant either, $F < 1$. On the contrary, the specific contrast testing the reverse priming hypothesis (i.e., Chaplin eliciting more negative priming effects than Hussein) was significant, $F(1, 39) = 4.22$, $p < .05$. As in Experiment 1, the person identity results show a qualitative difference between masked and unmasked priming conditions. The use of a liked and a disliked person of comparable familiarity produced a clear-cut pattern of means that confirmed the reverse priming hypothesis. As in Experiment 1, for both masked and unmasked priming the person identity effects were very consistent across face and name primes. Only the control primes (the face of a stranger and a neutral word) that did not relate to the same person elicited a somewhat different pattern of means. Therefore the data again provided strong evidence that the critical person identity effects were due to an activation of person schemata and not to other features of the primes.

The dissociation between masked and unmasked priming provides also strong evidence for the efficiency of the backward masking procedure. If masked primes had yielded a qualitatively similar effect as unmasked primes, this could have been explained by some participants recognising the masked primes. However, as suggested by Cheesman and Merikle (1986), a qualitative difference caused by masking under otherwise identical experimental conditions

indicates that the masking procedure was successful. Moreover, the results of the post-experimental interview provided independent evidence that participants were unaware of masked priming. Although explicitly asked, no participant suspected that the alleged control stimuli (the masks) were hiding anything else.

Individual differences in priming effects. The individual priming effects tended to be less reliable than in Experiment 1 (see Table 1), a finding which could be due to the lower familiarity and emotional valence of stimuli. As one might expect given the low reliabilities of the priming measures, few significant regression coefficients were found. Again, the effects were not consistent across name and face prime conditions. Interestingly enough, out of three significant regression coefficients in Experiment 1 that could be conceptually replicated in Experiment 2, two did in fact replicate: Anxious attachment was related to more positive priming effects of the marginally visible face of Hussein (Exp. 1: b = 46.7, $p < .01$; Exp. 2: $b = 28.1$, $p < .05$), and dismissing attachment was related to the more positive priming effects of the clearly visible faces of the relationship partner in the first ($b = 28.0$, $p < .05$), and of the clearly visible face of Charlie Chaplin in the second experiment ($b = 29.4$, $p < .01$).

GENERAL DISCUSSION

Both experiments clearly confirmed the prediction that unmasked primes related to liked persons facilitated the evaluation of positive as compared to negative target words, and primes related to disliked persons facilitated the evaluation of negative as compared to positive target words. In both experiments, priming effects were very consistent across names and faces, thus indicating that person identity effects can be confidently attributed to an activation of person schemata and not to corollary features of the used primes. The relative strong effects in the unmasked priming conditions may be partly due to the fact that priming stimuli were more meaningful for the participants and perhaps also more valenced than the word material used in most affective priming studies.

The standard affective priming paradigm (Fazio et al., 1986) is generally considered to preclude an influence of conscious or controlled processes on priming effects (Klauer, 1998). In the present study, a very short prime-target SOA of 42 ms was used, and an experimental condition was included that constrained the conscious awareness of primes by backward masking. The assumption that affective priming is independent from the degree of conscious identification of primes would have been supported if marginally visible primes had caused qualitatively similar effects as clearly visible primes. However, this was not the case. In both experiments, a clear dissociation between masked and unmasked priming was observed. In Experiment 1, a reverse priming effect was obtained for the disliked person but not for the extremely familiar (and positive) significant other stimuli. In Experiment 2, a liked person of comparable

familiarity as the disliked person was used. Now a clear incongruency or reverse priming pattern emerged for both the liked and the disliked person.

The literature on affective priming offers little to explain the reverse priming effect. The two most prominent theories explain affective priming effects either by automatic spreading activation analogue to semantic priming (e.g., Fazio et al. 1986, 1995), or by response interference analogue to the Stroop effect (e.g., Klauer et al., 1997; Musch, 1999; Wentura, 2000). In both theoretical frameworks it is difficult to explain how negative primes can facilitate the evaluation of positive targets and vice versa. Because the reverse priming effect is difficult to integrate into current theorising it may be tempting to discard it as an anomalous result. However, indications for reverse priming effects were not only found and replicated in the present study but appeared repeatedly in other affective priming paradigms (Glaser, & Banaji, 1999; Murphy & Zajonc, 1993), and in the evaluation task (Hermans, 1996; Klauer et al., 1997; Wentura, 1999). Some of the explanations offered in these studies focus on specific features of the respective studies (e.g., speed vs. accuracy instructions, long SOAs) that are clearly not relevant to the present study.

A reverse priming effect that may be more akin to the results of the present study was found by Eimer and Schlaghecken (1998) in a study on subliminal priming of motor responses. Using evidence from the lateralised readiness potential (LRP) the authors could demonstrate that masked primes (arrows pointing to the left or to the right) did elicit prime-congruent motor responses (a button press with the left vs. right hand). However, this initial response was immediately inhibited and replaced by a contralateral activation when the mask interrupted the sensory input provided by the prime. This inhibition process led then to an overcorrection that was responsible for delayed responses if the subsequent target required the same reaction, and for faster responses if the subsequent target required a reaction in the opposite direction. It seems unlikely, however, that exactly the same process can account for the reverse priming effect found in the present study. When manipulating the stimulus-mask interval, Schlaghecken and Eimer (1997) found reverse priming effects for SOAs of 96 ms and 128 ms, but congruency priming or no effect for shorter SOAs (0 ms, 32 ms, and 64 ms), which are comparable to the SOAs used in the present study. It remains therefore surprising that here the masking of primes after 10.5 ms had such dramatic effects given that also in unmasked trials the primes were in fact masked (i.e., replaced) by the targets after 41 ms. Another open question concerns the effects of masked names and faces of the relationship partners. For these stimuli, no reverse priming effects were found. Although the results of the second experiment are compatible with the view that the high familiarity of these stimuli influenced the results, it is not clear whether the masking was just less effective for these stimuli or whether the masking of very familiar primes has different consequences than the masking of less familiar primes. In any case, these questions merit further investigation in future research.

Individual differences in priming effects

Whereas priming effects of liked and disliked persons replicated almost perfectly across name primes and face primes at the group level, no such consistency was found in the analysis of individual differences, the few significant effects were all found for face primes. Somewhat surprisingly, out of three effects of Experiment 1, two were in fact replicated in Experiment 2. Anxious attachment was related to a more positive implicit evaluation of the marginally visible face of Hussein, and dismissing attachment to a more positive implicit evaluation of the visible face of the liked person. Although these findings seem suggestive, the sign of correlations was in any case opposite to what was expected by adult attachment theory (Bartholomew, 1990), and current accounts of affective priming (Fazio et al., 1995; Klauer et al., 1997; Musch, 1999), according to which positive person schemata should facilitate the evaluation of positive as compared to negative target words. Because the results were unexpected it seems advisable to refrain from *post-hoc* speculation and take these surprising findings rather as a starting point for further investigation.

However, the results concerning individual differences have an obvious methodological implication: Future studies of individual differences in priming effects require an improvement of the psychometric quality of affective priming indices. Three measures could improve reliability substantially. First, the number of trials per condition should be increased. Second, in the priming paradigm used by Fazio et al. (1986, 1995) experimental effects are shared between reaction latencies and error frequencies. Greenwald (1995; cf. Musch, 1999) has developed an adaptive ''response window technique'' which forces participants to react extremely quickly. This approach has been found to provide larger and more robust effects than the standard procedure (e.g., Draine & Greenwald, 1998; Musch, 1999; Otten & Wentura, 1999). Third, experimental standard techniques such as trial order randomisation and counterbalancing across subjects are *not* optimal for the analysis of individual differences. To optimise the reliability of person effects, all experimental conditions should be kept constant across subjects in the same way as the order of items in a questionnaire are kept constant. One has to decide whether to optimise the design of the affective priming experiment for the analysis of treatment effects or for the analysis of individual differences, one cannot have it both ways.

How to measure implicit relationship schemata, or should we?

The present research offers a preliminary answer. The finding that liked and disliked persons produced fairly large, robust, and consistent affective priming effects is encouraging for the further development and refinement of the standard affective priming paradigm as a tool in social relationship research. However, the

dissociation between effects of visible and marginally visible primes emphasises that the underlying cognitive processes of affective priming are not yet sufficiently understood. In exploring individual differences in affective priming effects, some unexpected but replicable relations between implicit and explicit evaluations of liked and disliked persons provide suggestive evidence that after resolving the reliability problem, and after achieving a better understanding of the boundary conditions of reverse priming, this method has the potential to provide new insights into the cognitive representation of relationships.

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