

The Effects of Diffuse and Distinct Affect

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In a series of suboptimal priming studies, it was shown that both affective and nonaffective reactions to a stimulus may occur without awareness. Moreover, it was demonstrated that affective information is detected earlier than nonaffective information. Therefore, early reactions to an affect-laden stimulus (e.g., a smiling man) are cognitively unappraised and thus diffuse (e.g., “positive”), whereas later affective reactions can be more specific and distinct (e.g., “a smiling man”). Through variations of prime exposure (extremely short, moderately short) the impact of early diffuse and late distinct affect on judgment was investigated. Findings show that distinctness (and prime–target similarity) is an essential determinant of whether the effect of affect is null, assimilation, or contrast. Furthermore, whether affect priming activates diffuse or distinct reactions is a matter of a fraction of seconds.

“I wish you wouldn’t keep appearing and vanishing so suddenly: you make me quite giddy.”

“All right,” said the Cat; and this time it vanished quite slowly, beginning with the end of the tail, and ending with the grin, which remained some time after the rest of it had gone.

“Well, I’ve often seen a cat without a grin,” thought Alice; “but a grin without a cat! It’s the most curious thing I ever saw in all my life!”

—Lewis Carroll, *Alice in Wonderland*

This is the age of automaticity research. The findings of recent automaticity research are so compelling that they inspired some to claim that all—or at least 99.44%—of people’s psychological reactions are triggered automatically (Bargh, 1997, p. 243). Automatic processes are often defined as those processes that occur outside awareness, as processes that people fail to detect. Because of the insights provided by automaticity research, there is now no doubt that environmental stimuli processed outside of awareness can have important consequences for a person’s understanding of his or her world. Emotions, attitudes, stereotypes, prejudices, dis-

positional inferences, self-views, and social comparisons all may be activated and operate outside of conscious awareness (for reviews, see Bargh, 1997; Greenwald & Banaji, 1995). It not entirely clear, however, what the contents of automatic perception are and, perhaps more important, how these contents may shape subsequent cognition and behavior. That is, *what do we see when we perceive without awareness?* What features determine the consequences of this type of seeing? Zajonc’s (1980, 2000) theory of affective primacy suggests some answers to these questions.

The Theory of Affective Primacy

The theory of affective primacy holds that affective reactions are basic, automatic, and autonomous, occurring prior to and separate from cognitive responses. One aspect of the theory is that the affective system, concerned with stimulus *evaluation* (e.g., “Is this positive or negative?”), is separate and partially independent from the cognitive system, which is concerned with stimulus *description* (e.g., “Is this a woman or a man?”). This independence hypothesis is now supported by psychological as well as neurophysiological evidence (see Damasio, 1994; Zajonc, 2000).¹

Another aspect of the theory of affective primacy is the hypothesis that affective reactions (e.g., positive–negative classifications) occur prior to nonaffective reactions (more descriptive responses, e.g., big–small classifications). Indeed, several lines of research indicate that mere detection of a stimulus by the perceiver’s sensory apparatus is sufficient to classify this stimulus as positive or as negative, whereas automatic, nonevaluative classifications need longer exposure times. For example, in a series of studies,

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¹ Similar to previous treatments of the affective primacy hypothesis (e.g., Edwards, 1990; Krosnick et al., 1992; Murphy & Zajonc, 1993), in the present article we use the terms *affect* and *evaluation* interchangeably when they concern the relevant features of affect-laden stimuli. It is important to note, however, that whereas *affect* denotes hot cognition and is likely to elicit positively or negatively tinged feelings (see Study 2), *evaluation* denotes cold cognition and refers to valence that may or may not activate affective feelings.

Murphy and Zajonc (1993) found that very brief exposure to smiling (positive) versus frowning (negative) faces influenced participants' subsequent evaluations of novel, ambiguous stimuli (Chinese ideographs), whereas very brief exposure to geometric shapes (e.g., circles) varying on nonevaluative, more descriptive dimensions (e.g., size) had no impact on participants' judgments. However, at longer (optimal, supraliminal) exposure times, these nonevaluative primes did influence participants' judgments (see also Murphy, Monahan, & Zajonc, 1995)

These and other studies (e.g., Bargh, Litt, Pratto, & Spielman, 1989; Edwards, 1990; Hermans, De Houwer, & Eelen, 1996; Klauer, 1998; Krosnick, Betz, Jussim, & Lynn, 1992; Kunst-Wilson & Zajonc, 1980; Niedenthal, 1990; Winkielman, Zajonc, & Schwarz, 1997) support Zajonc's (1980, 2000) hypothesis that the affective qualities of stimuli are processed more readily than are their nonaffective attributes. It is important to note, however, that although these studies corroborate the idea that evaluative information is picked up prior to nonevaluative information, there is no reason to conclude from these findings that nonevaluative information cannot be perceived without awareness, as some have suggested (see Zajonc, 2000). Several studies have demonstrated effectively the impact of suboptimally presented, evaluatively neutral information on judgment and behavior (e.g., Erdley & D'Agostino, 1988; see Stapel & Koomen, 2000b).

Varieties of Unaware Affect

Thus, there may be varieties of unaware affect (cf. James, 1902/1979). *What we see when we see without awareness* depends (at least partly) on the exposure duration of the presented information. At very short exposures, affective influences might take place, giving rise to gross affective reactions. These early affective reactions are unencumbered by more descriptive, nonevaluative reactions (also referred to as *cognitive appraisals*; see Zajonc, 2000) that may require fuller access if the stimuli are to be fully encoded. At longer exposures, stimuli are likely to also activate more complex networks of associations, allowing for feature identification and recognition (see Bargh et al., 1989; Murphy & Zajonc, 1993). Thus, when one is exposed to a smiling, young, dark-haired, female face (see Figure 1A), exposure time is an important determinant of what one actually perceives. At very short exposures, only the valence of the facial expression should be detected (e.g., positive; see Figure 1G). At longer exposure, however, information about other features of the picture, such as hair color or gender, become available (e.g., a smiling, dark-haired woman), filling in one's initial affective reaction with more descriptive appraisals.

According to Zajonc's (1980, 2000) theory of affective primacy, an important difference between early and late reactions to stimuli possessing affective as well as nonaffective features is that, by definition, affective information that is activated early is more diffuse (e.g., positive vs. negative) than is affective information that is activated late (e.g., happy dark-haired woman vs. angry blond man). It is surprising that, to date, this notion has been given little attention in research. In the present research we hope to fill this void by assessing the impact of early (diffuse) and late (distinct) affect on subsequent judgments.

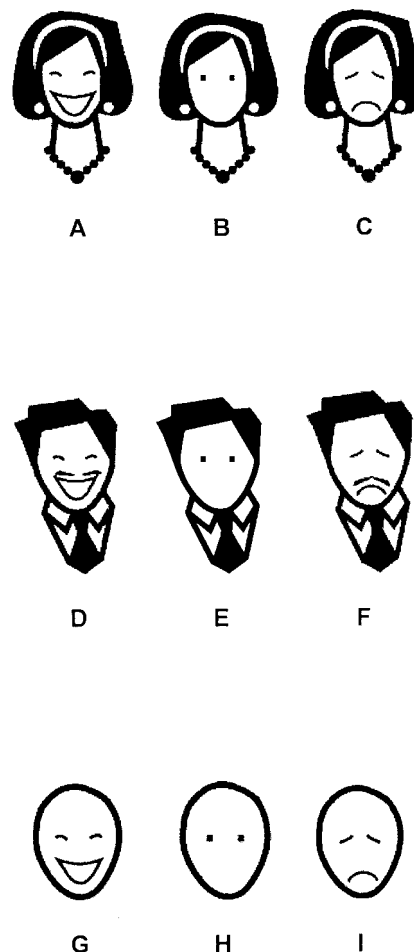


Figure 1. Examples of Tilanus drawings used in Studies 1–5. A = happy female face: affective and nonaffective (gender-specific) features; B = neutral female face: only nonaffective (gender-specific) features; C = sad female face: affective and nonaffective (gender-specific) features; D = happy male face: affective and nonaffective (gender-specific) features; E = neutral male face: only nonaffective (gender-specific) features; F = sad male face: affective and nonaffective (gender-specific) features; G = happy face: only affective, no nonaffective (gender-specific) features; H = neutral face: no affective, no nonaffective (gender-specific) features; I = sad face: only affective, no nonaffective (gender-specific) features.

Early (Diffuse) Versus Late (Distinct) Affect

According to the theory of affective primacy, early affective reactions are by definition diffuse and unspecified because they are cognitively unappraised. Early affect is “free-floating” and “undecided” (Murphy & Zajonc, 1993, p. 591; Zajonc, 2000, p. 48). Later in the information-processing chain (but still without awareness), these diffuse, gross, affective appraisals may become enriched by more descriptive appraisals. Thus, when people are presented with an affect-eliciting stimulus that represents a distinct, separate entity with clear object boundaries (e.g., an unhappy, young, dark-haired male face; see Figure 1F), first diffuse affective information is activated (e.g., negative; see Figure 1I). Next, this initial, diffuse affective reaction is filled in with nonaffective stimulus features (e.g., gender-specific cues, e.g., mous-

tache). This filling-in process may result in the activation of specific affect-infused information; that is, in the activation of a distinct exemplar (e.g., Figure 1F). In other words, even within the domain of affect-infused reactions to suboptimally presented stimuli (but see Zajonc, 2000),² one may distinguish early, affect-only reactions that are relatively gross and diffuse and late, affect + cognition reactions that may result in the activation of affect-infused exemplar information that is relatively specific and distinct.

We posit that this distinction between *diffuse affect* and *distinct affect* is essential when it concerns the question “What features of suboptimally presented information determine its effects on subsequent evaluations and actions?” Specifically, we argue that whether suboptimal priming activates information that is diffuse or distinct is an important determinant of the impact of these stimuli on subsequent judgment.

Distinctness, Interpretation, Comparison

Why should distinctness matter for the impact of suboptimally activated information? In earlier studies (see Stapel & Koomen, 2001a, 2001b), we tested the hypothesis that distinctness is important for the direction of supraliminal priming effects. The reasoning behind these investigations was as follows: Many impression formation models assume (either implicitly or explicitly) a direct relation between the direction of the impact of activated information on judgment (assimilation or contrast) and the component of the impression-formation process on which such information mainly exerts its influence (interpretation or judgment; see, for extensive reviews, Stapel & Koomen, 2001a, 2001b). That is, activated information should be more likely to yield assimilation when it is used during encoding or interpretation, whereas contrast is more likely when this information serves as a comparison standard during judgment. But what determines whether accessible knowledge predominantly serves as an interpretation frame or as a comparison standard?

In earlier studies, we showed that one important determinant of the direction of accessibility effects is the distinctness of the activated information. Whereas diffuse information is more likely to be used as an interpretation frame during the encoding of a stimulus and to result in assimilation, distinct information is more likely to be used as a comparison standard in the judgment stage and to result in contrast (see Stapel & Koomen, 2001a). Distinct information constitutes a separate entity with clear object boundaries (e.g., a person exemplar, a sad, dark-haired woman) and is therefore more likely to be used as a specific comparison standard in the construction of judgments than is diffuse information (e.g., an abstract construct, positive). When information is diffuse, assimilation is likely to occur. As Murphy and Zajonc (1993) put it in their discussion of the impact of diffuse affect, such affect “can ‘spill over’ onto unrelated stimuli” (p. 736; see, for a similar line of reasoning, Schwarz & Clore, 1996).

There are now several empirical studies that support the distinctness hypothesis in domains as diverse as person perception, self-perception, advertising effects, and organizational decision making (see Stapel & Koomen, 2001a). For example, we (Stapel & Koomen, 2001a) found that when the task is to judge a target person, priming diffuse trait information (hostile vs. friendly) before a target person (vaguely hostile Mike) has to be judged

results in assimilative interpretation effects, whereas priming distinct person information (Dracula vs. Mandela) yields contrastive comparison effects. The present analysis takes this previous research one crucial step further by implying that distinctness may be an important determinant not only of the impact of optimally presented stimuli (as reviewed in Stapel & Koomen, 2001a) but also of the effect of suboptimally exposed stimuli. The idea that in the impression-formation chain one can distinguish the activation of affective information that occurs early and is diffuse and activation that occurs late and may be distinct suggests that automatic effects of (affect-laden) information may be diametrically opposite (assimilative vs. contrastive), depending on how many milliseconds have ticked by.

Putting Previous Studies of Affect Priming in the Present Perspective

The present perspective provides us with a novel, more stringent, and more direct test of our distinctness hypothesis. In previous research (see Stapel & Koomen, 2001a), we tested the distinctness hypothesis mainly by varying the kind of stimuli (e.g., traits vs. exemplars) that were used as primes. However, the difference between trait and person priming may not only be a matter of distinctness. Person information (e.g., Hitler) may often be perceived as more vivid, memorable, and extreme than trait information (e.g., aggressive), which thus introduces alternative explanations for trait versus person priming effects. The central notion of the present perspective—that one can distinguish early–diffuse and late–distinct reactions to the same affect-laden stimulus—allows us to test the distinctness hypothesis not by varying the priming stimuli participants are exposed to but by manipulating only the exposure duration of such stimuli.

An important implication of this perspective is that it suggests that the impact of suboptimally presented, affect-laden stimuli (positive vs. negative faces) on evaluative judgments of neutral target stimuli may be contrastive as well as assimilative. Specifically, suboptimal exposure to a distinct, specific emotion face (e.g., Figures 1A, 1C, 1D, 1F) results in assimilation when this face is flashed very quickly, such that only affective features can be detected and diffuse information is activated (e.g., Figures 1G, 1I). Contrast occurs when this emotion face is flashed for somewhat longer, such that affective as well as nonaffective features can be detected and a distinct face exemplar is activated.

To date, previous investigations of the impact of automatic affective reactions on subsequent evaluations have demonstrated assimilation but no contrast effects (for reviews see Forgas, 1995; Zajonc, 2000). Why, then, should we persist in predicting that affect can yield automatic assimilation as well as automatic contrast?

² We prefer to interpret Zajonc’s (1980) theory of affective primacy as meaning that diffuse affective reactions to affect-laden stimuli come prior to cognitively appraised affective reactions, whereas both these types of affective reactions can occur without awareness. Thus, both diffuse and distinct affect can be nonconscious. This is different from Zajonc (2000), who wrote that “all nonconscious affect has this quality of being diffuse, unaddressed, and undedicated” (p. 48).

Suboptimal Versus Optimal Exposure

In their well-cited series of studies on affect priming, Murphy and Zajonc (1993) varied the exposure time of affect primes. Indeed—as our present perspective suggests—they found that at very short exposures (e.g., 4 ms),³ priming emotion faces resulted in assimilation. However, contrary to our analysis, Murphy and Zajonc found that at longer exposures (e.g., 1,000 ms), priming emotion faces did not yield contrast. At such exposures, priming had no effect at all. How can we remedy the discrepancy between these findings and the present analysis?

One way to answer this question is by pointing to the fact that, strictly speaking, Murphy and Zajonc's (1993) studies are irrelevant to the present proposal. In those studies, the difference between short and long exposure conditions was such that, effectively, the impact of suboptimal stimulus exposures (below individuals' conscious thresholds) was compared with that of optimal exposures (above individuals' conscious thresholds). The present proposal concerns the impact of suboptimal exposure to affect-laden stimuli. We posit that even within the category of suboptimal presentation, one can distinguish (early) diffuse and (late) distinct affective reactions that may have diametrically opposite effects on subsequent judgments.

The problem with optimal priming is that this technique may introduce ambiguity as to what may have caused its effects (see Martin, 1986; Schwarz & Bless, 1992; Strack, 1992; Wegener & Petty, 1995; Wilson & Brekke, 1994). Priming emotion faces above people's conscious threshold not only may lead to more descriptively appraised, more distinct affective reactions (see Stapel & Koomen, 2001a, 2001b) but may also make participants aware of the potentially contaminating impact of the primed faces on judgment. As Petty and Wegener (1998) contended when discussing Murphy and Zajonc's (1993) finding that affective priming led to assimilation when primes were presented outside of conscious awareness but not when primes were presented visibly, "one possible reason for such an effect might be that visibly presented priming stimuli are noticed as obviously irrelevant to perceptions of the targets. Therefore, this 'blatant priming' might instigate an avoidance of the perceived effects of the emotional primes" (p. 338). In fact, the typical explanation of the findings of Murphy and Zajonc's studies is in terms of the extent to which their participants were aware of the influence of the emotion faces rather than in terms of the distinctness of the information these faces activated (see Bargh, 1997, p. 25; Chaiken, Wood, & Eagly, 1996, p. 719; Murphy et al., 1995, p. 591; Schwarz & Clore, 1996, p. 440; Zajonc, 2000, p. 48). In the present studies, we avoid the ambiguity surrounding the interpretation of contrast effects after optimal exposure (is it correction contrast or comparison contrast?) by examining the impact of early–diffuse and late–distinct affect within a suboptimal priming paradigm. Thus, we hope to provide the first direct and unconfounded test of the early–diffuse/late–distinct hypothesis.

The Similarity Criterion

A second explanation of the lack of comparison contrast findings in previous studies of affect priming effects may be found in the notion that for primed information to result in contrastive comparison effects, distinctness is not the only criterion. A distinct

prime yields comparison contrast, given that there is categorical overlap between the prime and target stimuli. Stimuli that belong to the same category (e.g., two persons, two apples) more readily invite comparison processes than do stimuli that belong to dissimilar categories (e.g., persons and animals, apples and oranges). In recent empirical tests of this similarity criterion, we found that primed friendly or hostile animals (e.g., puppy vs. shark) are not used as a comparison standard when people judge an ambiguous (friendly/hostile) human target stimulus, whereas priming friendly or hostile persons (e.g., Gandhi vs. Hitler) does result in contrastive comparison effects (see further, Stapel & Koomen, 2001a).

In previous studies of affect priming, the categorical overlap between priming and target stimuli was typically quite low. For example, Murphy and Zajonc (1993) examined the impact of priming specific emotion faces on the perception of Chinese ideographs. Because a human face is unlikely to be used as a comparison standard when people are constructing a judgment of a Chinese ideograph, it is perhaps not surprising that Murphy and Zajonc (1993) did not find contrast (see also our Study 5).⁴

In the present studies, we vary the categorical overlap between priming and target stimuli. Following earlier studies that investigated the impact of optimally primed stimuli (see Stapel & Koomen, 2000a, 2000b), we hypothesize that suboptimal exposure to a specific emotion face is most likely to yield contrast when such a facial expression is perceived as distinct (i.e., prime exposure is sufficiently long) and when prime and target stimuli belong to the same category: The prime is a face, and the target is a face, not a Chinese ideograph. Thus, the present studies provide a first test of the similarity criterion using a suboptimal priming paradigm. The inclusion of prime–target similarity as an important determinant of the impact of suboptimally presented emotion faces on judgments of unrelated target stimuli attests to the importance of using socially meaningful stimuli in investigations of the impact of primed affect on social perception. The similarity criterion suggests that primed emotion faces are used differently when people construct judgments of unfamiliar words, geometric shapes, or Chinese ideographs than when they form an impression of a person.

Summary and Research Overview

To summarize our line of reasoning, we posit that both evaluative and nonevaluative reactions to stimuli can occur without

³ Although Murphy and Zajonc (1993) reported that in their suboptimal exposure conditions, pictures were exposed for 4 ms, Winkielman et al. (1997) noted that in Murphy and Zajonc's studies, the effective exposure time in the suboptimal conditions was actually 10 ms.

⁴ It is important to note that the focus of previous studies of affect priming was not on examining the impact of unconscious affect or on differentiating conditions under which this impact could be assimilative or contrastive. Previous research efforts were interested primarily in demonstrating the existence of unconscious affect (e.g., Niedenthal, 1990) and in testing the hypothesis that affect-laden stimuli more readily yield affective reactions than they instigate cognitive appraisals (e.g., Edwards, 1990; Murphy et al., 1997; Murphy & Zajonc, 1993; Winkielman et al., 1997). Because of this emphasis, less attention was given to factors influencing affect-to-judgment effects, such as the distinctness and similarity criteria that play a prominent role in the present investigation.

awareness. However, in the information-processing chain, evaluative reactions to affect-laden stimuli occur prior to descriptive appraisals of such stimuli. Because of this, exposure to a specific emotion face first activates affective information that is free floating and relatively diffuse. Later in the information-processing chain, the face's nonaffective, more distinct features may be detected. The distinction between early and diffuse affect and late and distinct affect + cognition has implications for the impact of affect-laden stimuli on subsequent judgments. When an affect-laden stimulus elicits diffuse information, assimilative interpretation effects may occur. When such a stimulus activates distinct information, contrastive comparison is more likely—given that the priming and target stimuli are perceived as belonging to the same category (e.g., prime is a smiling face, target is a neutral face).

We test this line of reasoning in a series of studies. In all these studies, the same basic suboptimal priming paradigm was used. First, participants were suboptimally exposed to pictures of facial expressions. Next, they were asked to make target judgments. In each of these studies, we compare the impact on target judgments of extremely short exposures with the impact of slightly longer (but still suboptimal) exposures. In doing so, we may empirically distinguish diffuse and distinct reactions to the primed faces and examine their impact on target judgments. By varying the extent to which priming and target stimuli overlap categorically, we investigate the importance of the similarity criterion for the impact of suboptimally presented primes on target judgments. In Studies 1–5, we used face drawings as priming stimuli, whereas target stimuli were face drawings and Chinese ideographs. Using drawings instead of pictures of real faces allowed us to easily manipulate the salience of evaluative and nonevaluative features of priming and target stimuli (see Figure 1). To make sure that our main hypotheses also hold when real faces are used as priming and target stimuli, in Study 6 we assess the impact of pictures of real faces expressing positive and negative emotions.

Study 1

In Study 1 we test the following hypotheses: (a) Both evaluative and nonevaluative stimulus features may be picked up outside of conscious awareness. (b) In the earliest stages of impression formation, exposure to an emotion face activates information that is pure affect: unspecified, diffuse, and likely to yield interpretative assimilation effects. (c) In later stages of the impression-formation chain, this initial diffuse affective reaction is cognitively appraised and thus likely to activate affect + cognition, a distinct stimulus representation. This opens the road to contrastive comparison effects—given that priming and target stimuli are categorically similar. To test these hypotheses, we conducted a study in which extremely short versus moderately short suboptimal exposure to drawings of positive or negative male faces preceded participants' evaluations of a drawing of a neutral male face.

Method

Participants and design. Participants ($N = 61$) were undergraduates who participated in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: moderately short, extremely short) \times 2 (prime valence: positive, negative) between-subjects design.

Overview. On arrival, participants were shown into one of eight cubicles in the experimental room and seated in front of a computer. Participants were told that they would participate in a series of unrelated studies. First, they performed a parafoveal vigilance task (modeled after Chartrand & Bargh, 1996) in which the emotion faces were presented outside of awareness. We explained to participants that very short flashes would appear on the screen at unpredictable places and times and that their task was to decide as quickly and accurately as possible whether the flash appeared on the left or right side of the screen. After having completed the vigilance task, participants were instructed to complete the perception questionnaire from the folder that was on their desk. On the first page of this questionnaire, participants were presented with a drawing of a neutral male face (see Figure 1E) and were asked to rate this face on a sad–happy dimension. The next pages of the questionnaire consisted of filler items and questions irrelevant to the hypotheses tested here. Next, participants received a funnel debriefing procedure, in which they were probed for awareness of the priming stimuli, awareness of the influence of the priming task on later judgments, and general suspicion concerning the goal of the study (see Chartrand & Bargh, 1996; Stapel & Koomen, 2000a, 2000b). Finally, they were thanked and debriefed.

Materials and dependent measure. Black-and-white line drawings of male faces were used as priming and target stimuli (see Figure 1). These drawings were chosen from the large collection of Tilanus drawings that were drawn especially for the present investigation. Tilanus drawings are drawings of faces that differ in the number of facial features they possess (e.g., eyes, nose, mouth, hair), the number of gender-stereotypic features they possess (e.g., moustache, necklace, tie), and the extremity of the emotion they express (e.g., neutral, moderately positive, extremely positive). In a pretest ($n = 20$), a large number of Tilanus drawings (including all the drawings used in the present studies) were tested on a number of evaluative (e.g., negative–positive, sad–happy) and nonevaluative (e.g., female–male, young–old) rating dimensions.⁵ For the present study, as priming stimuli we selected a male face that was pretested as clearly expressing sadness (Figure 1F; $M = 2.16$ on a 7-point sad–happy dimension) and a male face that clearly expressed happiness (Figure 1D; $M = 5.97$). We selected a drawing of a neutral male face (Figure 1E; $M = 3.87$) as the target stimulus (all relevant $ps < .05$).

Participants were asked to indicate to what extent they thought the neutral male target stimulus was sad or happy. They were given a bipolar rating scale that was anchored by the labels *sad* (1) and *happy* (7).

Priming procedure. The priming task was modeled after Chartrand and Bargh's (1996) parafoveal priming task. Once participants were seated in front of their (iMac) computer, the experimenter explained the vigilance task, first verbally and then through instructions on the computer screen. Participants were seated so that the distance between their eyes and the computer screen was 80–100 cm when they sat erect on the chair, as they were instructed to do. This ensured that the priming stimuli were presented outside of participants' perceptual field (for details, see Chartrand & Bargh, 1996). The experimenter instructed participants to place their index fingers on the two labeled keys of the keyboard and to press the left key, labeled *L*, if a flash appeared on the left side of the screen and the right key, labeled *R*, if a flash appeared on the right side of the screen. A fixation point consisting of one X was presented continually in the center of the screen. The experimenter emphasized that because of the unpredictable timing and location of the flashes, the best way to detect all of them quickly was for participants to keep their eyes on the fixation point at all times. Participants were given 10 practice trials to become familiar with the procedure and to ensure that they understood it. After answering any questions, the experimenter began the 60 experimental trials of the vigilance task, which took participants approximately 8 min to complete.

⁵ More information about the collection of Tilanus drawings is available from Diederik A. Stapel.

All pictures (see Figure 1) presented on the computer screen were 180 mm high and appeared as black on a white background. The pictures that were flashed in the 10 practice trials and in 45 of the experimental trials were pictures of Chinese characters and geometrical shapes (see also Murphy & Zajonc, 1993; Winkielman et al., 1997). In the remaining 15 experimental trials, either the positive male face or the negative male face was flashed. The order in which pictures were flashed was random. In the moderately short conditions, (practice, experimental, and filler) pictures were flashed for 100 ms. In the extremely short conditions, pictures were flashed for 30 ms. In all conditions, these pictures were immediately followed by a 100-ms masking picture of black and gray dots and squares.

The stimulus picture and mask appeared at one of four parafoveal locations on the screen, such that the stimuli were within the parafoveal visual field and outside the foveal visual field associated with conscious awareness (for details see Chartrand & Bargh, 1996). The amount of time between stimulus presentations varied from 2 to 7 s. The sequence of time intervals was random, and therefore it was impossible for participants to learn or predict the length of time between stimulus presentations.

Awareness and suspicion. Previous suboptimal priming studies have shown that the paradigm used here (brief stimulus presentation, immediate masking, parafoveal presentation, random delays between trials) provides sufficient safeguards to prevent participants from becoming aware of the priming stimuli (e.g., Chartrand & Bargh, 1996; Erdley & D'Agostino, 1988). However, to ensure that in both our moderately short and our extremely short priming conditions, participants were not aware of the priming stimuli, we used an extensive funnel debriefing procedure in which participants were asked increasingly specific questions about the study. They were asked what they thought the purpose of the study had been, whether they thought any of the tasks they had performed had been related, whether they thought their performance on one task may have affected their performance on the next task, whether anything about the study seemed strange or suspicious to them, and what they thought the content of the flashes had been during the task. If participants indicated knowledge that the flashes consisted of pictures, they were further probed for general or specific content of these pictures. Next, participants were given the priming stimuli used in this experiment (the positive male face and the negative male face) and were told that at some of the trials one of these pictures was flashed. Participants were then asked to choose (i.e., guess) which picture was flashed.

All participants reported that they had seen flashes. Although some reported to have seen pictures, no participant could report on the general or specific contents of the primes. Furthermore, participants' guesses of which of the two pictures they had seen did not exceed chance, nor did they differ between conditions ($F_s < 1$). Finally, there were no participants who thought the vigilance and evaluation tasks were related. Thus, we can safely conclude that we were successful in presenting our priming stimuli outside of awareness and in not alerting participants to the actual relation between the vigilance and evaluation tasks.

Results and Discussion

Participants' judgments of the neutral male target stimulus were analyzed with a Prime Exposure \times Prime Valence analysis of variance (ANOVA). The expected interaction was significant, $F(1, 57) = 10.88, p < .05$, whereas neither of the main effects reached significance ($F_s < 1$). Table 1 presents mean target judgments as a function of prime exposure and valence. As can be seen in this table, in the extremely short exposure conditions, exposure to positive male faces yielded more positive target judgments ($M = 4.27$) than did exposure to negative male faces ($M = 3.50$), $F(1, 57) = 4.16, p < .05$, which is an assimilation effect. In the moderately short exposure conditions, however, this pattern was reversed. Exposure to positive male faces yielded fewer positive

Table 1
Mean Sad–Happy Ratings of a Neutral, Male Target Face Drawing as a Function of Prime Exposure and Prime Valence, Using Male Faces as Priming Stimuli

Prime exposure	Prime valence			
	Positive		Negative	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Extremely short	4.27	0.97	3.50	1.03
Moderately short	3.46	1.20	4.41	0.87

Note. Scale range is from 1 (*sad*) to 7 (*happy*).

target judgments ($M = 3.46$) than did exposure to negative male faces ($M = 4.41$), $F(1, 57) = 6.42, p < .05$, a contrast effect.

These findings both replicate and extend previous studies by Murphy and Zajonc (1993; see also Edwards, 1990; Murphy et al., 1995; Winkielman et al., 1997). We say *replicate* because Murphy and Zajonc also demonstrated that suboptimal exposure to emotion faces may result in assimilation; we say *extend* because in the present study, we used a parafoveal instead of a foveal priming paradigm, the target stimulus was a neutral face instead of Chinese ideographs, and we predicted and found not only assimilation but also contrast effects of the primed emotion faces. This supports our contention that the lack of contrast effects in Murphy and Zajonc's studies is not due to the fact that such effects cannot be obtained in principle.

Study 2

The findings of Study 1 confirm our expectations that emotion faces of which people are unaware may lead to assimilation when exposure to these faces is extremely short and to contrast when exposure is moderately short. In the present study, we expand the design of Study 1 to more directly test the early–diffuse–assimilation versus late–distinct–contrast logic that constitutes the cornerstone of the present investigation. Following Zajonc (1980), our line of reasoning is that extremely short exposure to a specific emotion face (e.g., Figure 1A, a smiling, young, dark-haired female) activates mainly the (diffuse) affective tone of this face (positive), whereas at slightly longer exposure times, cognitive features (dark-haired, female) may be picked up, and, thus, a distinct representation of the emotion face is activated (a smiling, dark-haired female). This suggests that when people are exposed to an emotion face that is pure affect, that possesses no nonaffective features (e.g., no hair, no moustache, no necklace, no earrings, no tie, no eyebrows; see Figure 1G), exposure time should become less of an issue. When the priming stimulus itself is relatively diffuse, longer exposure time is unlikely to make it a distinct, specific entity that could serve as a comparison standard in judgments of a particular target stimulus. Thus, similar to the way priming diffuse trait information (e.g., *intelligent*) yields assimilation, whereas priming distinct person information (e.g., Einstein) yields contrast (see Stapel & Koomen, 2000a), by presenting participants with smiling or happy emotion faces that are diffuse by nature, we can test the hypothesis that diffuse information is

more likely to yield assimilation within the present paradigm in yet another way.

Method

Participants and design. Participants ($N = 124$) were undergraduates who participated in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime type: affect–no cognition, affect and cognition) \times 2 (prime exposure: moderately short, extremely short) \times 2 (prime valence: positive, negative) between-subjects design.

Procedures, materials, and measures. The procedure was similar to the one used in Study 1. As in Study 1, the funnel debriefing procedure again indicated that we were successful in presenting our priming stimuli outside of awareness and in not alerting participants to the actual relation between the vigilance and evaluation tasks.

In the affect-and-cognition conditions, we used the same priming stimuli as in Study 1. In the affect–no-cognition conditions, we selected Tilanus drawings that were identical to the emotion faces selected earlier, except that they were stripped of all stereotypically male features (e.g., moustache, hair, tie). These drawings thus consisted of facial contours with eyes and a happy or sad mouth (see Figures 1G and 1I). The positive affect–no-cognition face was pretested as clearly expressing happiness ($M = 6.12$) and thus as similar to the happy affect-and-cognition face ($M = 5.97$). The negative face was pretested as clearly expressing sadness ($M = 1.98$) and thus as similar to the sad affect-and-cognition face ($M = 2.16$; happy–sad comparisons, $ps < .05$; see Study 1). Similar to Study 1, we used a drawing of a neutral male face as the target stimulus. Participants were presented with this face drawing and were asked one simple question: They had to indicate to what extent they thought the face was *sad* (1) or *happy* (7).

Results and Discussion

Participants' judgments of the neutral male target stimulus were analyzed with a Prime Type \times Prime Exposure \times Prime Valence ANOVA. The expected three-way interaction was significant, $F(1,116) = 5.07$, $p < .05$. Furthermore, the Valence \times Exposure effect was significant, $F(1,116) = 11.32$, $p < .05$, as was the Type \times Exposure interaction, $F(1, 116) = 8.49$, $p < .05$, and the main effect of valence, $F(1,116) = 7.79$, $p < .05$ (other F s < 1). Table 2 presents mean target judgments as a function of prime type, exposure, and valence. As can be seen in this table, when affect-and-cognition faces were primed, the pattern of results of Study 1 was replicated. In the extremely short exposure conditions, exposure to positive male faces yielded more positive target judgments ($M = 4.13$) than did exposure to negative male faces ($M = 3.18$), $F(1, 116) = 6.67$, $p < .05$, an assimilation effect. In the

moderately short exposure conditions, however, this pattern was reversed. Exposure to positive male faces yielded fewer positive target judgments ($M = 3.07$) than did exposure to negative male faces ($M = 4.07$), $F(1, 116) = 6.92$, $p < .05$, a contrast effect.

When diffuse, affect–no-cognition faces were primed, assimilation occurred, independent of exposure time. Exposure to positive faces yielded more positive target judgments ($M = 4.09$) than did exposure to negative faces ($M = 3.10$), $F(1, 116) = 15.01$, $p < .05$.

These findings nicely replicate the findings of Study 1. Exposure time is an important determinant of whether suboptimal priming of emotion faces results in assimilation or contrast. More important, these findings show that moderately short (but not extremely short) exposure to emotion stimuli results in contrast when these faces are distinct and possess affective as well as nonaffective, gender-specific features (e.g., Figures 1D, 1F) but in assimilation when they possess mainly affective features. Thus, our findings provide further support for the early–diffuse–assimilation versus late–distinct–contrast logic: Priming diffuse, affect–no-cognition faces yielded assimilation, independent of exposure time. Priming affect-and-cognition faces also yielded assimilation, but only when exposure time was sufficiently short to avoid the detection of the cognitive features of these stimuli. At longer exposure, contrast occurred, suggesting that cognitive features were picked up and a more distinct representation of the face was activated. In showing that (extremely or moderately short) exposure to diffuse stimuli (affect–no-cognition faces) yields assimilation effects that are similar to those yielded by extremely (but not moderately) short exposure to affect-and-cognition faces, these findings also give more credence to the claim that the latter effect is best understood in terms of the diffuse quality of the so activated information.

Study 3

In Study 3, we set out to obtain further direct evidence for the assertion that the evaluative features of affect-laden stimuli can be detected earlier than can their nonevaluative counterparts. If the nonevaluative features of priming stimuli (e.g., gender-classifying cues) are detected when primes are flashed moderately briefly but not when they are flashed extremely briefly, then target judgments that concern these nonevaluative features (e.g., “Is this a man or a woman?”) should be influenced when prime exposure is moderately short but not when it is extremely short. To test this hypothesis, we again used face drawings as prime and target stimuli. However, in contrast to our previous studies, this time both the priming and the target stimuli were drawings of affectively bland, neutral facial expressions (cf. Murphy & Zajonc, 1993, Studies 3 and 4). The primed faces differed not on an evaluative but on a nonevaluative dimension: We exposed participants to either a neutral male face (Figure 1E) or a neutral female face (Figure 1B). Furthermore, the target face was evaluation- as well as gender-neutral. The target represented an evaluatively neutral face that possessed no gender-specific cues (see Figure 1H). The hypothesis was that these primes of neutral male and female faces do not affect evaluative judgments of the target face. More important, when exposure of the male versus female primes is moderately short and gender-specific cues can be detected, these primes may affect the extent to which the nongendered target is perceived as

Table 2
Mean Sad–Happy Ratings of a Neutral, Male Target Face Drawing as a Function of Prime Type, Prime Exposure, and Prime Valence

	Affect–no-cognition				Affect + cognition			
	Positive		Negative		Positive		Negative	
Prime exposure	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Extremely short	4.19	0.98	3.00	0.66	4.13	0.92	3.18	1.13
Moderately short	4.00	0.97	3.20	0.78	3.07	1.22	4.07	0.96

Note. Scale range is from 1 (*sad*) to 7 (*happy*).

male or female. Such a nonevaluative categorization effect is unlikely to occur when prime exposure is extremely short (and nonevaluative features are unlikely to be detected).⁶

How should moderately extreme exposure to a male face versus a female face affect the extent to which a gender-neutral target is perceived as male or female? On the one hand, one could argue that the same effect should occur as when the dependent measure is an evaluative judgment (see Studies 1 and 2). Moderately extreme exposure of face primes activates distinct information, and distinct information is more easily used as a comparison standard during judgment. This line of reasoning suggests that, when a person is deciding on the masculinity or femininity of a gender-unspecific face, priming a specific, distinct face should instigate comparison processes and yield contrast. Thus, male primes should make the target look more female, and vice versa. On the other hand, one could argue that this comparison logic does not apply when one is defining rather than evaluating the target stimulus. When category membership of the target is unclear and one's focus is on the determination of this category membership (e.g., "Is this a man or a woman?"), it is more likely that one uses accessible information to define and categorize rather than to compare the target. Indeed, previous research suggests that whether primed information (e.g., a female face) is used to define a stimulus (e.g., "What is this?") and results in categorization or whether it is used to evaluate a stimulus on a more subordinate level (e.g., "How feminine is this woman?") depends partly on the mindset with which one approaches the judgment task as well as on the ambiguity of the target. That is, activated information is more likely to yield assimilative interpretation effects when one's mind is set on categorization or when the target is relatively ambiguous, whereas contrast effects are more likely when a comparison mindset is activated or when the target is relatively unambiguous (see, for reviews, Schwarz & Bless, 1992; Stapel & Koomen, 2000a, 2001a, 2001b).

Method

Participants and design. Participants ($N = 61$) were undergraduates who participated in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: moderately short, extremely short) \times 2 (prime category: female, male) between-subjects design.

Procedures, materials, and measures. The procedure was similar to the one used in Studies 1 and 2. Participants participated in a series of unrelated studies. The priming stimuli were activated in a parafoveal vigilance task. Target judgments were assessed in a general perception questionnaire. All participants received our extensive funnel debriefing procedure, which checked for awareness of the primes and of the influence of the primes on the target. This procedure again indicated that we were successful in presenting our priming stimuli outside of awareness and in not alerting participants to the actual relation between the vigilance and evaluation tasks.

For the present study, we selected Tilanus drawings with a number of stereotypically male features (e.g., moustache, tie, short hair) or female features (e.g., earrings, necklace, hair band, long hair) that were pretested (relevant $F_s < 1$) to be evaluatively neutral and similar (male $M = 4.22$, Figure 1E; female $M = 4.05$, Figure 1B) as the priming stimuli and a neutral ($M = 3.92$) face drawing with no gender-relevant cues (a face contour with eyes; Figure 1H) as the target stimulus. Participants were asked two questions: They were asked to what extent they thought the

target face was *sad* (1) or *happy* (7) and to what extent they thought the target face looked *female* (1) or *male* (7).

Results and Discussion

Participants' judgments of the evaluation- and gender-neutral target stimulus were analyzed with a Prime Exposure \times Prime Category ANOVA. As expected, no effects were found on evaluative target judgments ($F_s < 1$). Priming neutral female or male faces did not affect the extent to which participants thought the target was sad or happy. As expected, an interaction effect was found on judgments of the gender of the target, $F(1, 57) = 4.03$, $p < .05$. Neither of the main effects reached significance ($ps > .14$). Table 3 presents mean target judgments as a function of prime exposure and category. As can be seen in this table, in the extremely short exposure conditions, priming male versus female faces did not affect judgments of the target's gender ($F < 1$). In the moderately short exposure conditions, the target was perceived as more female ($M = 3.18$) when female faces were primed than when male faces were primed ($M = 3.92$), $F(1, 57) = 5.54$, $p < .05$.

Perceptions of the extent to which a nongendered face was male or female were thus influenced by neutral male versus female face primes, but only when prime exposure was moderately short and not when prime exposure was extremely short. The direction of this effect is in accordance with the hypothesis that when a stimulus is ambiguous with regard to the target dimension and possesses relatively few features that are relevant to a specific judgment, accessible information is used to define and categorize a stimulus: Participants perceived the nongendered target as more female when primed with female rather than male faces.

Study 4

To provide further support for our hypothesis that early-affective reactions to specific emotion faces yield assimilation because such reactions are diffuse and unappraised, whereas late-affective reactions may result in contrast because such reactions are more likely to be appraised and thus distinct, in Study 4 we examined the impact of happy versus sad female faces (cf. Studies 1 and 2) on both evaluative (sad-happy) and nonevaluative (female-male) judgments of an evaluatively neutral, nongendered target face (cf. Study 3). Our analysis of the theory of affective primacy suggests that with this configuration of priming and target stimuli, the logic behind our early-unappraised-diffuse-assimilation versus late-appraised-distinct-contrast reasoning would manifest itself in the following ways.

Evaluative judgments should be influenced by the affective features of the priming stimuli. When prime exposure is extremely

⁶ It is important to note that the evaluative-nonvaluative dichotomy we use here is not as straightforward as it seems. Many evaluation-based dimensions also differ on descriptive features, and many description-based dimensions also differ by evaluation (for a discussion of this issue, see Stapel & Koomen, 2000b). In the present investigation, we use the term *evaluative* for features and dimensions that clearly discriminate more on evaluative dimensions (e.g., negative-positive) than on descriptive dimensions. We use the term *nonevaluative* for features and dimensions that clearly discriminate more on descriptive dimensions (e.g., female-male) than on evaluative dimensions.

Table 3
Mean Sad–Happy and Female–Male Ratings of a Neutral Target Face Drawing With no Gender-Relevant Cues as a Function of Prime Exposure and Prime Category

Prime exposure	Prime category			
	Female		Male	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Extremely short exposure				
Sad–happy	4.27	0.96	4.13	0.89
Female–male	3.80	0.86	4.00	0.63
Moderately short exposure				
Sad–happy	4.31	0.63	4.18	0.81
Female–male	3.18	1.19	3.92	0.95

Note. Scale ranges are from 1 (*sad* or *female*) to 7 (*happy* or *male*).

short, these features will be unappraised and thus diffuse, leading to assimilation. When prime exposure is moderately short, affective as well as cognitive features will be detected, activating distinct affect-laden information. Given that the so activated information is not only distinct but also belongs to the same category as the target (recall the similarity criterion), contrast may occur.

Nonevaluative judgments of the target's gender should be affected mainly by relevant, nonevaluative features of the priming stimuli. When prime exposure is extremely short, these features will not be detected and thus will have no impact. When prime exposure is moderately short, however, these cognitive, descriptive features (signaling the prime's gender) can be detected and will affect nonevaluative judgments of the target's gender (i.e., increasing the extent to which the target is perceived as female rather than male; cf. Study 3).

Method

Participants and design. Participants ($N = 81$) were undergraduates who participated in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: moderately short, extremely short) \times 2 (prime valence: positive, negative) between-subjects design.

Procedures, materials, and measures. The procedure was identical to the one used in Studies 1–3. As in these previous studies, the funnel debriefing procedure again indicated that we were successful in presenting our priming stimuli outside of awareness and in not alerting participants to the actual relation between the vigilance and evaluation tasks.

For the present study, as priming stimuli we selected Tilanus drawings with a number of stereotypically female features (e.g., earrings, necklace, hair band, long hair). The positive face was pretested as clearly expressing happiness ($M = 6.04$; Figure 1A). The negative face was pretested as clearly expressing sadness ($M = 2.21$; Figure 1C; $p < .05$; see Study 1). As a target stimulus, we selected the evaluation- and gender-neutral face drawing used in Study 3 (Figure 1H).

Similar to Study 3, participants were asked to indicate to what extent they thought the target face was *sad* (1) or *happy* (7). We also asked participants to indicate to what extent they thought the target face looked *female* (1) or *male* (7). The order of these two questions was counterbalanced. No main or interaction effects of order were found on either target judgment ($F_s < 1$).

Results and Discussion

Participants' judgments of the evaluation-and gender-neutral target stimulus were analyzed with a Prime Exposure \times Prime Valence ANOVA. Table 4 presents mean target judgments as a function of prime exposure and valence.

For the evaluative judgments, the expected interaction was significant, $F(1, 78) = 9.09$, $p < .05$, whereas neither of the main effects reached significance ($F_s < 1$). In the extremely short exposure conditions, exposure to positive female faces yielded more positive target judgments ($M = 4.68$) than did exposure to negative female faces ($M = 4.05$), $F(1, 78) = 4.84$, $p < .05$, an assimilation effect. In the moderately short exposure conditions, this pattern was reversed. Exposure to positive female faces yielded fewer positive target judgments ($M = 4.00$) than did exposure to negative female faces ($M = 4.78$), $F(1, 78) = 3.99$, $p < .05$, a contrast effect.

For judgments of the target's gender, the expected main effect of prime exposure was found, $F(1, 78) = 6.07$, $p < .05$ (other effects, $F_s < 1$). In the moderately short exposure conditions, the target was perceived more as belonging to the prime's gender category (female, $M = 3.16$) than in the extremely short exposure conditions ($M = 3.79$).

These findings again provide evidence for the hypothesis that nonevaluative features are picked up in a later stage of the information-processing chain because categorical judgments of the target face's gender were more akin to the primed face's gender in the moderately extreme than in the extremely short exposure conditions. The present findings also provide further support for our early–diffuse–assimilation versus late–distinct–contrast logic because, again, evaluative target judgments showed assimilation in the extremely short exposure conditions and contrast in the moderately short exposure conditions.

An intriguing feature of the present findings is that they show that the use of primed information in the construction of judgments may depend largely on the dimension on which one is judging a stimulus. That is, in the moderately short conditions, we found that evaluative, sad–happy judgments were contrasted with the evaluative tone of the primes, whereas in these same conditions, nonevaluative, female–male judgments showed a categorization effect

Table 4
Mean Sad–Happy and Female–Male Ratings of a Neutral Target Face Drawing With no Gender-Relevant Cues as a Function of Prime Exposure and Prime Valence, Using Female Faces as Priming Stimuli

Prime exposure	Prime valence			
	Positive		Negative	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Extremely short exposure				
Sad–happy	4.68	1.13	4.05	0.95
Female–male	3.77	1.27	3.82	1.01
Moderately short exposure				
Sad–happy	4.00	1.34	4.78	1.22
Female–male	3.15	1.09	3.17	1.30

Note. Scale ranges are from 1 (*sad* or *female*) to 7 (*happy* or *male*).

(see also Study 3; Mussweiler & Strack, 2000; Stapel & Koomen, 2001a). We think this difference is due to the fact that the target stimulus possessed no features relevant to gender categorization, thus making it more likely that the gender of the primes would be used to define and categorize the target's gender. No such superordinate categorization was needed to indicate whether the neutral facial expression of the (genderless) target indicated sadness or happiness. Therefore, for this judgment, the priming stimuli were used as a comparison standard rather than a categorization tool (cf. Mussweiler & Strack, 2000).

To test this conjecture, we performed a study in which we presented participants with a large number of Tilanus faces, Chinese characters, drawings of all kinds of objects, and geometrical shapes. Participants ($N = 20$) indicated for each stimulus on a 9-point (*easy–difficult*) scale how easy they thought it was to determine its gender (male–female) and valence (happy–sad). Participants thought it was easier to define the valence ($M = 5.20$) than the gender ($M = 6.75$) of the gender-neutral target face (Figure 1H), $t(19) = 7.34, p < .05$. Thus, participants thought that determining the target face's (neutral) affective tone took less interpretative, definitional effort than did dissecting its (androgynous) gender. This is in line with our suggestion that, in the current study, the prime was probably used as a categorization tool when participants defined the target's gender (see also Study 3), whereas the prime was used as a comparison standard when they evaluated the target's emotional expression.⁷

Study 5

One question the findings of our studies raises concerns the relation between our findings and those reported by Murphy and Zajonc (1993). Murphy and Zajonc found that very brief exposure to emotion faces led to assimilation. However, they found no effects of emotion faces when these faces were flashed under optimal priming conditions. In Studies 1, 2, and 5, we found that priming emotion faces may yield contrast as well as assimilation, depending on exposure duration. As we noted in the introduction, we may explain this discrepancy by pointing to the differences between the target stimuli used in our studies and those used in Murphy and Zajonc's studies. Specifically, we used face drawings as our target stimuli, whereas Murphy and Zajonc used Chinese ideographs. One could argue that human faces differ from Chinese ideographs on too many dimensions to be used as relevant comparison standards in judgments of such ideographs (recall the similarity criterion). Therefore, we think it is not surprising that Murphy and Zajonc did not find contrast, whereas we did. It is possible, however, that the difference between the present results and those of Murphy and Zajonc's studies is a matter of priming procedure (Murphy and Zajonc used foveal priming; we used parafoveal priming) rather than a matter of prime–target relations.

To examine this possibility, we replicated Study 4 with the modification that we asked participants to make judgments of a Chinese ideograph instead of a face drawing. We predicted that when exposure to emotion faces was extremely short, the primed faces would activate diffuse, affective reactions that should spill over onto evaluations of the Chinese ideograph. However, when exposure to emotion faces was slightly longer, the distinctness of the so activated information should prevent this assimilation effect.

Furthermore, because human faces and Chinese ideographs are dissimilar, comparison contrast should not occur, either.

Method

Participants and design. Participants ($N = 49$) were undergraduates who participated in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: moderately short, extremely short) \times 2 (prime valence: positive, negative) between-subjects design.

Procedures, materials, and measures. The procedure was similar to the one used in Studies 1–4. As in these previous studies, the funnel debriefing procedure again indicated that we were successful in presenting our priming stimuli outside of awareness and in not alerting participants to the actual relation between the vigilance and evaluation tasks.

For the present study, we selected the same happy and sad drawings of female faces that we used in Study 4. As the target stimulus we selected a picture of a Chinese ideograph (cf. Murphy & Zajonc, 1993). Similar to Study 4, participants were given a one-page questionnaire consisting of two questions. We asked participants to indicate to what extent they thought the ideograph represented a *sad* (1) or *happy* (7) object. We also asked them to indicate to what extent they thought the ideograph was more likely to refer to a *female object* (1) than to a *male object* (7). The order of these two questions was counterbalanced. No main or interaction effects of order were found on either target judgment ($F_s < 1$).

Results and Discussion

Participants' judgments of the Chinese ideograph were analyzed with a Prime Exposure \times Prime Valence ANOVA. Table 5 presents mean target judgments as a function of prime exposure and valence.

The results of this study replicate Murphy and Zajonc's (1993) findings, thus indicating that the contrast effects we found in Studies 1, 2, and 4 were not an artifact of the kind of (parafoveal) priming technique we used. Participants' evaluative (sad–happy) judgments of the ideograph showed an interaction effect of prime valence and exposure, $F(1, 45) = 4.44, p < .05$ (other $F_s < 1$). In the moderately short exposure conditions, affect priming had no impact on evaluative judgments of the ideograph ($F < 1$). In the extremely short conditions, however, the ideograph was evaluated more positively when positive emotion faces were flashed ($M = 4.31$) than when negative faces were flashed ($M = 3.33$), $F(1, 45) = 7.69, p < .05$.

Judgments of the ideographs' femininity revealed a main effect of exposure, $F(1, 45) = 5.18, p < .05$ (other $F_s < 1$). Similar to Studies 4 and 5, participants thought the ideograph was more likely to refer to a female than to a male object when priming was moderately short ($M = 4.04$) than when it was extremely short ($M = 4.58$), indicating that only in the moderately short exposure

⁷ It is interesting that this study on the perceived ease of gender and valence categorizations for a large number of stimuli furthermore revealed that for the happy and sad gender-specific priming stimuli we used in Studies 1, 2, 3, 5, and 6, participants thought that it was somewhat easier to determine the prime's gender ($M = 1.44$) than the prime's valence ($M = 2.13$), $t(19) = 2.10, p < .05$. Thus, even though the gender-specific features of these primes were quite salient (see Figure 1A, 1C, 1D, 1F), perhaps even more salient than their affective features, the results of our main studies suggest that these nonaffective features are generally detected relatively late.

Table 5
Mean Sad–Happy and Female–Male Ratings of a Chinese Ideograph as a Function of Prime Exposure and Prime Valence, Using Female Faces as Priming Stimuli

Prime exposure	Prime valence			
	Positive		Negative	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Extremely short exposure				
Sad–happy	4.31	1.03	3.33	0.99
Female–male	4.55	0.69	4.62	0.65
Moderately short exposure				
Sad–happy	3.82	0.75	3.92	0.76
Female–male	4.00	0.58	4.08	1.24

Note. Scale ranges are from 1 (*sad* or *female*) to 7 (*happy* or *male*).

conditions were the female features of the primed faces detected and used in subsequent nonevaluative judgments.⁸

This replication of Murphy and Zajonc's (1993) findings points to the importance of the categorical relation between priming and target stimuli, particularly when prime exposure is sufficiently long for affective as well as nonaffective features to be activated. Together with the previous findings reported here, these results suggest that prime–target similarity is an important determinant of the direction of affect priming effects. Whereas evaluative judgments of a Chinese ideograph are affected by primed emotion faces only when priming exposure is extremely short, similar evaluations of a neutral face are affected both when priming exposure is extremely short and when it is moderately short.

Study 6

In Studies 1–5, we used drawings of happy, sad, and neutral facial expressions that consisted of more or less gender-specific features to provide empirical evidence for our analysis of Zajonc's (1980) theory of affective primacy. Using face drawings allowed us to systematically control and manipulate both the evaluative and the nonevaluative features of our priming and target stimuli. To ensure that the effects we found in the previous studies were not an artifact of the fact that we used drawings instead of facial expressions of real people, in the present study we replicated the design of Study 1, but now we used photographs of real facial expressions as priming and target stimuli.

Following the predictions and findings of Study 1, we expected that the impact of suboptimally exposed positive and negative male faces on the perception of a neutral male face would switch from assimilation to contrast depending on whether these primes were flashed for an extremely short or a moderately short time.

Method

Participants and design. Participants ($N = 65$) were undergraduates who participated in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: moderately short, extremely short) \times 2 (prime valence: positive, negative) between-subjects design.

Procedures, materials, and measures. The procedure was identical to the one used in the other studies reported here. As in these previous studies,

the funnel debriefing procedure again indicated that we were successful in presenting our priming stimuli outside of awareness and in not alerting participants to the actual relation between the vigilance and evaluation tasks.

For Study 6, male faces expressing happiness and anger were selected as priming stimuli. The positive face was pretested ($n = 12$) as clearly expressing happiness. The negative face was pretested as clearly expressing sadness ($M = 5.87$ and $M = 2.26$, respectively, on a 7-point sad–happy rating dimension; cf. our Study 1 and Murphy & Zajonc, 1993, p. 724). A picture of a different male face with a neutral expression ($M = 3.98$, all relevant $ps < .05$) was selected as the target stimulus. Thus, the person on the priming pictures was different from the person on the target picture. This was to make sure that the hypothesized effect does not only occur when identical prime and target persons are used (as was the case with the face drawings used in the previous studies). Participants were given a one-page questionnaire with a picture of the target stimulus and were asked one question: They had to indicate to what extent they thought the target face was *sad* (1) or *happy* (7).

Results and Discussion

Participants' judgments of the target stimulus were analyzed with a Prime Exposure \times Prime Valence ANOVA. Table 6 presents mean target judgments as a function of prime exposure and valence. The expected interaction was significant, $F(1, 61) = 12.26$, $p < .05$, whereas neither of the main effects reached significance ($Fs < 1$). As can be seen in Table 6, in the extremely short exposure conditions, exposure to the positive male face yielded more positive target judgments ($M = 4.06$) than did exposure to the negative male face ($M = 3.19$), $F(1, 61) = 5.41$, $p < .05$, an assimilation effect. In the moderately short exposure conditions, however, this pattern was reversed. Exposure to positive male faces yielded fewer positive target judgments ($M = 3.13$) than did exposure to negative male faces ($M = 4.06$), $F(1, 61) = 6.18$, $p < .05$, a contrast effect.

These findings provide support for our analysis of the theory of affective primacy, using ecologically more valid stimulus material (photographs of real facial expressions rather than drawings of faces). Thus, they further strengthen the case for the early–diffuse–assimilation versus late–appraised–distinct–contrast hypothesis that is the focus of this and the previous experiments.

General Discussion

Environmental stimuli processed outside of awareness can have important consequences for a person's understanding of his or her world. As the present studies of the impact of suboptimal exposure to several types of priming stimuli clearly show, both affective and nonaffective reactions to such stimuli can occur automatically (i.e., without awareness). In each of the studies reported here, we used a parafoveal priming paradigm in which the time participants were exposed to the priming stimuli was sufficiently short to prevent

⁸ Similar to Study 4, it is interesting to note that in the moderately short conditions, we found that sad–happy judgments showed contrast, whereas male–female judgments showed assimilation. Our study of the perceived ease of categorizing (see Study 4) suggests that this difference is probably due to the interpretative effort that is needed to judge the target stimulus. This study reveals that participants thought it was easier to judge the Chinese character on the sad–happy dimension ($M = 5.15$) than on the male–female dimension ($M = 6.55$), $t(19) = 8.30$, $p < .05$.

Table 6
Mean Sad–Happy Ratings of Pictures of a Neutral, Male Target Face as a Function of Prime Exposure and Prime Valence, Using Male Faces as Priming Stimuli

Prime exposure	Prime valence			
	Positive		Negative	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Extremely short	4.06	1.39	3.19	0.98
Moderately short	3.13	0.89	4.06	0.83

Note. Scale range is from 1 (*sad*) to 7 (*happy*).

them from becoming aware of the priming stimuli (see present studies and Chartrand & Bargh, 1996). Within this paradigm, we exposed participants to photographs and drawings of human faces possessing solely affective features (e.g., a smile stripped from other facial features; Figure 1G), solely nonaffective features (e.g., a female face with a neutral expression; Figure 1B), or both (e.g., a smiling, female face; Figure 1A). Our findings reveal that both affective and nonaffective features of stimuli may be detected automatically. Neither affective nor descriptive reactions need awareness to be elicited (see also Bargh et al., 1989; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Wentura, Rothermund, & Bak, 2000; but see Lazarus, 1982; and Zajonc, 1980, 2000).

Our findings further attest to the claim that—within the realm of unaware information processing— affective features of stimuli are picked up earlier in the processing chain than are nonaffective features, thus supporting the theory of affective primacy (Zajonc, 1980, 2000) and corroborating earlier tests of this theory (see Edwards, 1990; Murphy et al., 1995; Murphy & Zajonc, 1993; Niedenthal, 1990; Winkielman et al., 1997).

More important, our findings not only show the priority of affective over nonaffective reactions but also provide empirical support for an aspect of the theory of affective primacy that to date has received little to no attention. The theory of affective primacy suggests that because early affective reactions to a priming stimulus are by definition cognitively unappraised, the kind of information activated is diffuse (undecided, free floating). The longer the exposure time to an affect-laden stimulus becomes, the more affect becomes enriched with cognitive appraisals and the more distinct and specific the activated information becomes. Thus, when one is exposed to a happy, dark-haired female face in the earliest stages of impression formation, diffuse affect is activated. Later in the impression-formation chain, a distinct, specific representation of the primed stimulus may enter the mind. One of the novel aspects of our research is that we demonstrate that this distinction between early–diffuse and late–distinct affect has important implications for the impact of these reactions on subsequent judgments (cf. Murphy & Zajonc, 1993). In fact, our findings suggest that the impact of unaware exposure to a picture of a happy or sad person may be diametrically opposite, depending on whether exposure of this (parafoveally primed) picture was extremely short (30 ms) or moderately short (100 ms). Let us be more specific.

When an emotion face elicits diffuse affective information, assimilation is more likely to be the result. Our findings show that

there are at least two conditions under which an emotion face may activate diffuse information: (a) when the emotion face is diffuse by nature; that is, when the stimulus has mainly affective features (e.g., a smile; see Figure 1G) or (b) when the emotion face possesses nonaffective as well as affective features (e.g., a smiling female face; see Figure 1A) and exposure time is short enough to prevent the nonaffective features from being activated. Given that suboptimal exposure to an affect-laden stimulus activates diffuse information, this information may spill over onto and assimilate with the perception of neutral facial expressions as well as Chinese characters (cf. the mood-as-information model; Schwarz & Clore, 1996). Thus, categorical prime–target similarity does not seem to be an issue when primed information is diffuse. The similarity criterion is important, however, when emotion stimuli activate distinct affective information.

An emotion face activates a distinct representation when (a) the emotion face is distinct by nature—that is, when the stimulus has affective as well as nonaffective features (e.g., a smiling female face) and (b) when exposure time is sufficiently long for nonaffective features to be activated. Our findings indicate that when suboptimal exposure to an affect-laden stimulus activates distinct information, this information may be used as a comparison standard and result in contrast, given that there is categorical prime–target similarity. Specifically, priming a distinct emotion face may result in comparison contrast when the target stimulus is a face but not when it is a Chinese ideograph. Furthermore, for comparison contrast to occur, the perceiver’s mind should be set on evaluating, not on defining or categorizing, the target stimulus. That is, when category membership of the target is unclear (e.g., “Is it a woman or a man?”) and one’s focus is on the determination of this category membership, it is more likely that one uses accessible information to define and categorize rather than to compare the target (see Schwarz & Bless, 1992; Stapel & Koomen, 2001a).

In sum, what *we perceive when we perceive without awareness* depends on the characteristics of the stimulus (i.e., affective features, nonaffective features, both affective and nonaffective features) and the time this stimulus is exposed (e.g., extremely short, moderately short). Important determinants of the impact (null, assimilation, contrast) of what people perceive without awareness on more conscious thoughts, evaluations, and actions are characteristics of the target stimulus (similar, dissimilar to the primed information) and the focus of the judgment task (categorical or evaluative).

Together, these findings are in line with the interpretation/comparison model of knowledge accessibility effects (Stapel & Koomen, 2001a, 2001b). One of this model’s main hypotheses is that whereas diffuse information is more likely to be used as an interpretation frame during the encoding of a stimulus and to result in assimilation, distinct information is more likely to be used as a comparison standard and to result in contrast (cf. Devine, 1989; Gilbert, 1989; Schwarz & Bless, 1992; Trope, 1986; see further Stapel & Koomen, 2001a). To date, empirical support for the interpretation/comparison model was based mainly on studies of the effects of supraliminally presented information on subsequent judgment and behavior. Furthermore, researchers tested the hypothesis that diffuse information should yield assimilative interpretation effects, whereas distinct information may yield contrastive comparison effects, mainly by varying the kind of priming stimuli (e.g., diffuse trait vs. distinct person information), thus

introducing a variety of alternative explanations (person information is more vivid, memorable, and extreme than is trait information). The early–diffuse–assimilation versus late–distinct–contrast logic of the present perspective reveals that one can distinguish early–diffuse and late–distinct reactions to the same affect-laden stimulus and allows us to test our distinctness hypothesis not by varying the type of priming stimuli participants were exposed to but by manipulating the exposure duration of such stimuli.

When one views the present arguments and findings in light of previous investigations of affect priming that are relevant to the present research (e.g., most notably, the well-known and oft-cited Murphy & Zajonc, 1993, studies), it is important to note that the present research not only demonstrates the primacy of affect over cognition using a different methodology (suboptimal, parafoveal priming in an unrelated task paradigm) and socially meaningful, ecologically more valid target stimuli (human faces rather than Chinese ideographs or geometrical figures) but also extends previous affect priming studies both empirically and theoretically.

First, Murphy and Zajonc (1993) found that affect primes only led to assimilation effects when prime exposure was extremely short. This has led some to conclude that it is impossible for affect-driven assimilation to obtain when prime exposure is not extremely short (see Zajonc, 2000). One of the present research's contributions is that it suggests that (similar to the effects of trait—e.g., intelligent vs. stupid—priming; see Stapel & Koomen, 2000a), assimilation may occur independently of prime exposure, given that priming stimuli have mainly nonspecific, affective features. Nonaffective features increase the likelihood that a distinct representation is activated when prime exposure is sufficiently long. If an affect-laden stimulus is pure-affect and thus diffuse and nonspecific by nature, then longer prime exposure times are unlikely to make this stimulus distinct. In previous affect priming studies (e.g., Edwards, 1990; Murphy & Zajonc, 1993), participants were exposed to pictures of emotion faces that had affective features (e.g., smiling) as well as nonaffective features (e.g., moustache, earrings, hair, tie, necklace). This may explain why those previous studies did not find assimilation when prime exposure was relatively long.

Second, in the present studies we examined the impact of early–diffuse and late–distinct affective reactions to affect-laden stimuli within a suboptimal priming paradigm, whereas in Murphy and Zajonc's (1993) studies, suboptimal priming effects were compared with the impact of optimal (supraliminal) priming. Comparisons of suboptimal versus optimal priming cannot be interpreted as proper tests of the early–diffuse, late–distinct hypothesis because presenting stimuli under optimal exposure conditions may confound the activation of cognitively appraised, distinct information with the instigation of suspicion. The present studies provide the first direct and unconfounded test of the impact of early–diffuse and late–distinct affective reactions to affect-laden stimuli because all primes were presented suboptimally.

Third, because we used a suboptimal rather than an optimal priming paradigm to test the early–diffuse/late–distinct hypothesis, models that explain the impact of affect priming in terms of the extent to which individuals are aware (of the source) of the primed information are difficult to apply to the present findings. Such models are typically used to understand previous affect-priming studies (see Bargh, 1997; Chaiken et al., 1996; Murphy et al., 1995; Schwarz & Clore, 1996; Zajonc, 2000). However, it is

difficult to use constructs such as conscious recall, source recognition, misattribution, or correction to explain the impact of suboptimal priming (cf. Martin, 1986; Murphy & Zajonc, 1993; Newman & Uleman, 1990; Schwarz & Clore, 1983), explanations that have been suggested to understand previous affect-priming studies.

Our findings thus indicate that the cognitive appraisal of primed information should not be equated with awareness of its (potentially contaminating) influence on cognition and judgment, as some have suggested (see Chaiken et al., 1996; Murphy et al., 1995; Schwarz & Clore, 1996; Zajonc, 2000). Furthermore, our findings are difficult to reconcile with perspectives that concur that differences between assimilation and contrast effects arise because assimilation is governed by a relatively automatic, affective, and unintentional processing mode, whereas contrast effects are governed by an effortful, intentional, and conscious processing mode (Smith & DeCoster, 2000, pp. 112–113; see also Ford & Thompson, 2000, pp. 332–333). Both assimilation and contrast can occur automatically—that is, without awareness (see also Fiedler, 2000; Glaser & Banaji, 1999).

Fourth, the present studies are among the first to attest to the importance of prime–target relations when explaining the impact of suboptimal affect priming stimuli on judgment. The impact of what is primed is dependent not only on what is primed (diffuse affect, distinct affect) but also on what is measured. Our studies show that categorical prime–target similarity determines the impact of affect primes on judgment. When a distinct emotion face is activated, contrast is likely to follow when the target stimulus is a neutral face but not when it is a Chinese character. In previous studies of affect priming, the categorical overlap between priming and target stimuli was typically very low. This explains why the present set of studies is the first to reliably predict and find contrast effects in a suboptimal affect priming paradigm.

Fifth and finally, our finding that the impact of an affect-laden stimulus may reverse depending on whether this stimulus activates information that is diffuse or distinct is in marked opposition to Murphy and Zajonc (1993), who argued that early affective reactions are likely to be diffuse, whereas late affective reactions are likely to be distinct (a conjecture that inspired the present research program) but who did not relate this distinction between early–diffuse affect and late–distinct affect to the direction of its impact. Murphy and Zajonc argued that the impact of emotion faces may differ not depending on whether the activated information is diffuse or distinct but depending on whether the evaluative and nonevaluative features are consistent with each other.

When one relates the present findings to previous affect-priming studies, it is important to note that such studies have often been portrayed as being more relevant to the (nonaffective) automatic evaluation literature than to studies of mood and emotion effects (see Clore & Ketelaar, 1997; Schwarz & Clore, 1996). According to these critics, for a study showing the automatic impact of affect-laden primes (e.g., emotion faces) to be defined as a study of the impact of affective reactions, the study should demonstrate the influence of these primes on actual affective experiences. Or, as Schwarz and Clore (1996) wrote,

In the absence of experienced feelings, affective priming studies may indeed be better conceptualized as reflecting automatic evaluation processes . . . , which have been observed with materials unlikely to

elicit any feelings (e.g., Bargh, Litt, Pratto, & Spielman, 1989), rather than feeling-based inferences. (p. 440)

To address this potential criticism, we reran ($n = 59$) Study 1, but now with mood ("How positive or negative is your mood at this moment?" 1 = *negative*, 7 = *positive*) instead of face evaluation as the dependent variable of interest. This study demonstrated that the affect-priming methodology used in the present studies influences people's conscious mood judgments—main effect of prime valence, $F(1, 55) = 17.03, p < .05$. In the extremely as well as the moderately short conditions, priming positive emotion faces resulted in more positive affective experiences ($M = 4.39$) than did priming negative emotion faces ($M = 3.65$).⁹ This gives extra credence to the claim that the priming methodology as used in this paradigm indeed elicits felt rather than unfelt affective experiences and is thus relevant to the affective priming as well as to the automatic evaluation literature (cf. Schwarz & Clore, 1996).

According to Murphy and Zajonc (1993; Murphy et al., 1995; Zajonc, 2000), the evaluative implications of emotion faces may be diluted or nullified if (at longer exposure times) nonevaluative features are activated that are inconsistent with the valence of the facial expression. Imagine, for example, exposure to the smiling face of a well-known crook or criminal. When exposure is short, positive, diffuse information is activated. However, when exposure is longer, these initial positive reactions are likely to be canceled by the implication of the nonaffective information (e.g., "It is Al Capone!"). In the present studies, the nonevaluative features of the face drawings we used were designed and pretested (see Study 3) not to influence the affective impact of the face when combined with the evaluative features. When this is the case, Murphy and Zajonc (1993) argued, early and late reactions to affect-laden stimuli are likely to lead to similar effects: "To the extent that the primitive and gross early emotional effects are consistent with the subsequent cognitive appraisal (Lazarus, 1982), no pronounced differences between levels of exposure should be obtained" (p. 727). In the present research, we have shown that pronounced differences can be obtained between different exposure levels. A fraction of a split second is sufficient to reverse the impact of affect from assimilative to contrastive.

To conclude with the beginning: Alice's Cat with a grin vanished quite slowly, beginning with the end of the tail and ending with a grin, which remained some time after the rest had gone. The present analysis suggests that this Cat had probably appeared quite quickly, beginning with a grin, which remained some time before the rest arrived, and ending with the end of the tail.

⁹ More detailed information about this study is available from Diederik A. Stapel.

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