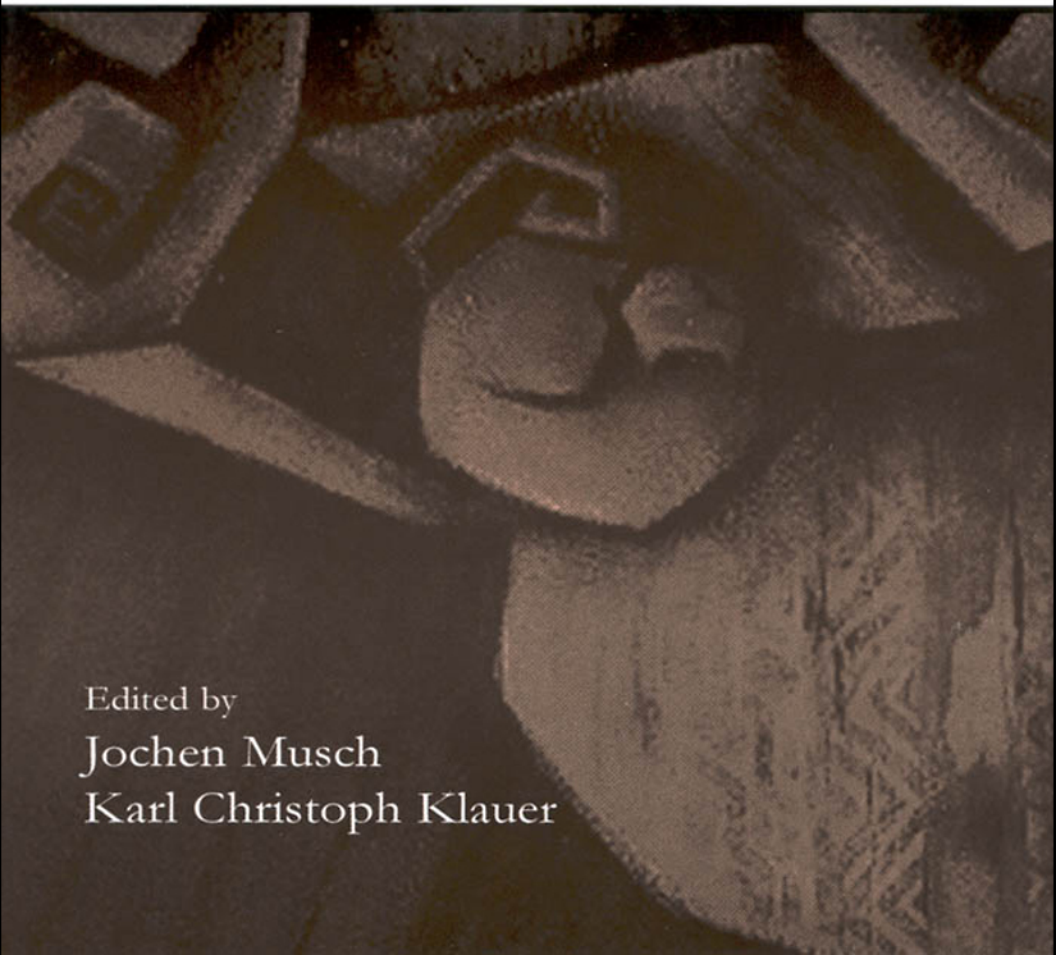
# The Psychology of Evaluation

*Affective Processes in Cognition and Emotion*



Edited by
Jochen Musch
Karl Christoph Klauer

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LAWRENCE ERLBAUM ASSOCIATES, PUBLISHERS
2003 Mahwah, New Jersey London

This edition published in the Taylor & Francis e-Library, 2008.



Lawrence Erlbaum Associates, Inc., Publishers
10 Industrial Avenue
Mahwah, New Jersey 07430

Cover design by Kathryn Houghtaling Lacey

**Library of Congress Cataloging-in-Publication Data**

The psychology of evaluation: affective processes in cognition and emotion,
edited by Jochen Musch and Karl Christoph Klauer.
Includes bibliographical references and indexes.
ISBN 0-8058-4047-8 (c)

Copyright information for this volume can be obtained by contacting the Library of Congress.

ISBN 1-4106-0685-6 Master e-book ISBN

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# *Chapter* **1**
# The Psychology of Evaluation: An Introduction

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Evaluative and affective information processing in individuals has long been a fundamental issue in social and cognitive psychology. The concepts *affect, valence,* and *attitude* are all fundamentally linked to the most basic psychological dimensions of good versus bad, positive versus negative, approach versus avoidance. The processing of stimulus valence, that is, the act of determining the location of a stimulus on the affective dimension, is at the heart of most current theories in cognition and emotion. Accordingly, there has been a dramatic increase in interest in evaluative processes in the late 20th century. Research on the nature of evaluative processes is now one of the most rapidly growing endeavours of psychology and provides a unifying focus for researchers working in a variety of disciplines such as social, cognitive, and personality psychology.

Of particular interest has been the question whether evaluations are elicited automatically, without intent, effort, and conscious awareness, and how these evaluations influence subsequent information processing. Much of this research has been conducted in the framework of the affective priming paradigm and has sought to identify conditions under which evaluations are processed automatically. Another major concern has been the consequences of the activated evaluations on the perceiver's judgments and behaviors. In addition, theoretical progress has revealed a number of surprising parallels and connections between affective priming and other paradigms such as evaluative conditioning, Stroop-analogous tasks, the Simon task, and the mere exposure paradigm, to name just a few. Finally, these in-sights have been used to develop unobtrusive measures of implicit attitudes such as the Implicit Association Test (IAT) and other tasks based on the affective priming paradigm, Out of this work, a common theoretical foundation for evaluative information processing is beginning to emerge. The present book seeks to provide an informative, scholarly, yet readable overview of what we know today about the nature of evaluation and affective processes in cognition and emotion. It summarizes all

recent advances in the field, based on invited contributions from an eminent group of investigators.

However, this is not simply an edited book in the usual sense. Rather, it is the result of an ongoing discussion between a number of researchers united by a joint and continued interest in the psychology of evaluation. Accordingly, the idea for this book evolved in a number of interconnected forums and is the result of extensive and fruitful theoretical exchanges that took place on various occasions. In particular, from 1994 to 2000, several research projects within the research program "Information processing in its social context", which was initiated by Klaus Fiedler and Fritz Strack and implemented by the German Research Foundation DFG, dealt with affective and emotional processes. In June 1997, many of the contributors to the present volume met in Konstanz at a symposium on affective priming hosted by the social psychology division of the German Psychological Society. In 1998, a special issue of the German *Zeitschrift für Experimentelle Psychologie* was devoted to affective priming. In December 1998, Jan De Houwer and Dirk Hermans organized a workshop on affective processing in Leuven, as a part of the Scientific Research Network "Acquisition and representation of evaluative judgments and emotions". In June 1999, a symposium on affective priming took place in Kassel at the occasion of the biannual meeting of the German social psychologists. Finally, in March 2001, a special issue of *Cognition and Emotion* dealt with the psychology of evaluation, and in May 2001, another workshop supported by the Fund for Scientific Research (Flanders, Belgium) was being held in Le Lignely.

The book is organised into four main sections. The first section deals with the mechanisms, boundary conditions, and theories of automatic evaluation processes. In a comprehensive review of findings obtained in the affective priming paradigm, Klauer and Musch examine the evidence for different mechanisms that have been proposed to underlie automatic evaluation effects. Their review is structured around the impacts of the major procedural variables: Prime variables, target variables, variables related to the prime-target pairs, list-context variables, and task-related variables. Major explanations of affective priming effects and their respective empirical support are explored. The chapter concludes with a model of the evaluative system that comprises a process of automatic evaluation activation and two mechanisms, assumed to operate in parallel, that mediate the effects of activated evaluations on subsequent evaluative and nonevaluative processing.

In chapter 3, Wentura and Rothermund discuss consequences of the automatic processing of valence that go beyond temporarily increasing the accessibility of associated concepts. Because of its global relevance, they argue, the automatic processing of valence is strongly tied to response processes and is therefore likely to interrupt ongoing behavior by modifying the probability of responses and redirecting behavior. Wentura and Rothermund make a strong case for this power of positive and negative stimuli to *meddle* with ongoing

processes of behavior formation, and present a theoretical framework in which this *meddling-in* of valent stimuli is seen as the common ground to several automatic evaluation phenomena, including affective priming, Simon, and Stroop effects.

In chapter 4, dealing with boundary conditions of automatic evaluation processes, Glaser suggests that the automatic evaluative response is more complex than a simple binary orientation. Specifically, he argues that automatic evaluative responses can be automatically overridden when the priming stimulus is obtrusive and when accuracy motivation is high. Such findings have implications for the important debate on the conditionality of automatic evaluation. Glaser suggests that positions holding that automatic evaluation will occur only for those stimuli toward which a reasonably strong attitude is held, and positions holding that automatic evaluation is unconditional and will occur with equal facility for strong and weak attitude objects, may represent a false dichotomy. According to Glaser, all stimuli can elicit an automatic evaluative response, but the strength of the attitude will moderate the magnitude of the response.

In a thought-provoking chapter that concludes the more theoretically oriented first section of the book (chapter 5), Fiedler points to hidden vicissitudes of the priming paradigm in evaluative judgment research in a review that integrates findings from different priming paradigms ranging from simple perception and word-recognition experiments to more complex measures of decision making, manifest action, and goal orientation. Fiedler outlines an enriched framework for studying priming effects on evaluative judgments. Within this framework, he argues for the separation of the evaluative judgment domain from the original paradigm of priming in associative memory and highlights the distinction between afferent and efferent process components.

The second section of the book investigates how evaluations are acquired and how evaluative judgments are arrived at. Hermans, Baeyens, and Eelen (chapter 6) highlight parallels between evaluative learning and affective priming research and demonstrate the relevance of the study of evaluative conditioning for a better understanding of the processes that are involved in the cycle that encompasses the acquisition, the representation, and the activation of evaluative information in memory. In particular, they show that associative acquisition procedures are capable of inducing evaluative changes that can be assessed by indirect measures of stimulus valence such as the IAT and the affective priming procedure.

Ferguson and Bargh (chapter 7) argue against the assumption that an evaluation consists of a single, affective representation associated in memory with the object. Studies showing that participants are able to automatically evaluate novel, unfamiliar objects for which there are no previously stored, corresponding representations, are consistent with the claim that an evaluation represents a combination of numerous evaluations of various features of the

object. In addition, these studies suggest that automatic evaluations can be spontaneously and immediately constructed on the spot, rather than being dependent on previous experience with, and conscious appraisal of, the objects.

Winkielman, Schwarz, Fazendeiro, and Reber (chapter 8) propose that one particular source of relevant information for the assessment of valence is the fluency with which information about the target can be processed. They propose that high fluency is associated with more favorable evaluations and present empirical evidence consistent with their proposal. Subsequently, they explore possible reasons for the link between fluency and affective reactions and discuss boundary conditions of the fluency-affect link.

The third section of the book considers indirect measures of individual differences in the evaluation of social objects. In his structural analysis of different indirect measures, De Houwer (chapter 9) focuses on four reaction time tasks that provide potential ways to measure attitudes indirectly: affective priming tasks, the emotional Stroop task, the Implicit Association Test, and the affective Simon task. De Houwer presents a taxonomy of these indirect measures of attitudes that reveals the essential similarities and differences between them, as well as their relation to existing compatibility tasks. He concludes by discussing the implications of this structural analysis for the measurement of attitudes.

In chapter 10, Banse presents the results of his research on unobtrusive measures of relationship quality. In an overview of experimental methods that have been used in relationship research, it is shown how attachment theories can be tested using indirect measures based on implicit associations and automatic evaluations that are not distorted by self-presentation concerns. However, problems and limitations of the priming approach to the investigation of the mental representation of relationships are also considered.

Robinson, Vargas, and Crawford (chapter 11) explore individual differences in evaluative processing. These differences in, for example, the speed to recognize rewards or threats have the potential to influence emotional behavior and experience. The authors therefore recommend to supplement self-report measures of personality traits by evaluative processing paradigms in order to develop a more complete understanding of how and why people differ in their emotional reactions. An agenda is set for future evaluative processing research in which individual differences play a central role.

The relationship between evaluations on one hand and mood, emotion and behavior on the other hand is explored in the fourth section of the book. Niedenthal, Rohmann, and Dalle (chapter 12) review the research on the automatic activation of evaluative responses and emotional states and discuss the theoretical distinction between evaluations and emotional responses. They report experimental evidence suggesting that the experience of emotional feelings and the activation of emotion concepts do not have the same consequences for subsequent information processing. They argue that a

powerful theory of conceptual representation and processing is required in order to understand the conditions under which the processing of emotional words and concepts will result in the reexperience of some affect.

Clore and Colcombe (chapter 13) discuss the mood-like effects that sometimes occur when evaluative concepts are unconsciously primed. They propose that moods and primed evaluative concepts have parallel effects, because affective feelings and affective meaning obey the same rules. Both, affective feelings engendered by mood states, as well as unconsciously primed affective meaning can exert broad influence, because the implied evaluation is not tied to a particular source. Moreover, they argue that the information from affective mood and the information from affective priming share an important phenomenological quality that make them both especially compelling: in the absence of a salient, external source, they are experienced as internally generated.

In the concluding chapter, Neumann, Förster, and Strack (chapter 14) discuss how emotions and attitudes serve adaptive functions in preparing individuals to act in accordance with their needs and the requirements of their environment. In their view, evaluative processes underlying emotions and attitudes are directly linked to motor representations of either approach or avoidance responses. Approach or avoidance behavior is facilitated whenever compatible evaluative contents are processed. This link between evaluation and behavioral dispositions seems to be bidirectional in nature, however, in the sense that the execution of approach or avoidance behavior facilitates compatible evaluative processes. From this perspective, approach and avoidance behavior is not only a consequence, but also a cause of evaluative processes.

# I:
# Mechanisms, Boundary Conditions, and Theories of Automatic Evaluation

# *Chapter* **2**
# Affective Priming: Findings and Theories

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Environmental events directly and automatically activate three interactive but distinct psychological systems, responsible, respectively, for perceptual, evaluative, and motivational analysis according to a model proposed by Bargh (1997). These systems' automatic reactions to environmental events influence perceptual interpretations of other people's behavior, they color the evaluations of perceived objects and persons, and they inhibit or energize behavioral responses. Automaticity of a social phenomenon is a powerful finding because it implies that a person is not in conscious control of the behavior or perception in question, cannot escape the automatic processing once it is elicited by appropriate trigger stimuli, and ultimately cannot be held fully responsible for the ensuing biases in perceptions, judgments, and behavior (Bargh, 1999; Greenwald & Banaji, 1995).

Bargh (1997) distinguished preconscious from postconscious and goaldependent forms of automaticity. Preconscious effects require only the presence of the triggering environmental event. They do not depend on a prepared or receptively tuned cognitive state. In contrast, postconscious and goal-dependent effects require special mental states in addition to the mere presence of triggering objects or events. For example, goal-dependent automaticity is conditioned on the individual intending to perform the mental function, but given this intention, the processing occurs immediately and autonomously in the presence of the triggering stimulus (e.g., Pendry & Macrae, 1996).

The evaluative system comprises a process of automatic activation of evaluations that is triggered by the mere presence of an object in one's field of perception. A major tenet is therefore that the process of evaluation activation is preconscious. A second postulate is that the evaluative system is functionally dissociable from the perceptual and the motivational system. The evidence for both assumptions stems in large part from the affective priming paradigm.

Affective priming refers to the phenomenon that processing of an evaluatively polarized target word (e.g., love) is facilitated, that is, proceeds faster and more accurately, when it is preceded by an evaluatively consistent

prime word (e.g., sunshine) rather than an evaluatively inconsistent prime word (e.g., death). Since the seminal demonstrations by Fazio, Sanbonmatsu, Powell, and Kardes (1986), more than 80 studies have been conducted in that paradigm extending it in many ways and probing deeply into the dynamics and mechanisms of evaluative processing. An overview of the studies reviewed in this chapter is given in the appendix. Affective priming effects contrast evaluatively consistent and inconsistent prime-target pairs: They are defined by the interaction of prime and target valence. Both evaluatively consistent and inconsistent prime-target pairs comprise positive and negative words and thus, affective priming can be expected to provide a relatively pure measure of evaluative processing uncontaminated by nonevaluative differences between the sets of positive and negative stimuli in, for example, familiarity, informational diagnosticity, concreteness, and others. In recent years, the paradigm has also received attention as providing an unobtrusive measure for assessing evaluations (Banse, chap. 10, this volume; De Houwer, chap. 9, this volume; Fazio, Jackson, Dunton, & Williams, 1995; Hermans, Baeyens, & Eelen, chap. 6, this volume; Hermans, Vansteenwegen, Crombez, Baeyens, & Eelen, in press; Otten & Wentura, 1999).

The present chapter is organized as follows. We begin with a review of findings obtained in the affective priming paradigm. The review is structured around the impacts of the major procedural variables: Prime variables, target variables, variables related to the prime-target pairs, list-context variables, and task-related variables. The next section introduces the major explanations of affective priming effects and explores their respective empirical support vis a vis the just-reviewed findings. The chapter concludes with a model of the evaluative system that comprises a process of automatic evaluation activation and two mechanisms, assumed to operate in parallel, that mediate the effects of activated evaluations on subsequent evaluative and nonevaluative processing.

## AFFECTIVE PRIMING: FINDINGS

In Fazio's (1989) attitude theory, attitudes are seen as object-evaluation associations stored in memory. The strength of the association determines the likelihood that the evaluation will be activated on encountering the attitude object. The associative strength is termed *attitude accessibility,* and it is measured by the speed with which attitude objects can be evaluated.

In Fazio et al.'s (1986) seminal demonstrations of affective priming, there were two experimental phases. In the first phase, attitude accessibilities of a number of attitude objects were assessed, and attitude objects high and low in accessibility were selected for each participant to serve as primes in the second phase of the experiment. In the second phase, evaluatively consistent and inconsistent prime-target pairs as well as pairs with neutral primes were

presented. The participants' task was to classify the target word as good or bad as fast as possible; a task that we will refer to as the evaluative decision task. Targets were 10 clearly positive and 10 clearly negative adjectives. Primes were nouns that referred to attitude objects. There was also a baseline condition, in which primes were presumably neutral letter strings such as BBB.

In Experiment 1, prime-target onset asynchrony (SOA) was 300 ms. A priming effect emerged for primes high in attitude accessibility as assessed and selected in the first phase, but not for primes low in attitude accessibility. This effect was replicated in Experiment 2. A new condition realized a long SOA of 1000 ms and revealed an absence of affective priming effects both for low-accessibility as well as for high-accessibility primes. In Experiment 3, attitude accessibility was manipulated experimentally in the first phase in which participants evaluated some attitude objects repeatedly, thereby momentarily increasing these objects' attitude accessibility. Affective priming occurred at the short SOA (300 ms), but not at the long SOA, and it was stronger for the primes with heightened attitude accessibility.

## Generality of Affective Priming

Subsequent research confirmed and extended many of the original findings. For example, whereas Fazio et al. (1986) asked participants to memorize the prime word and to recite it aloud after they had evaluated the target, many subsequent studies showed that the affective priming effect is not dependent on this requirement. In fact, in the majority of studies reviewed below participants were simply asked to ignore the prime word. In Hermans, Van den Broeck, and Eelen's (1998) Experiment 4 as well as in Bargh, Chaiken, Govender, and Pratto's (1992) Experiment 3, one group of participants was required to memorize and recite the prime word, whereas no such requirement was given for the participants of a second group. In both experiments, affective priming effects were not affected by the memory instruction. In a related experiment, Hermans, Crombez, and Eelen (2000) found that affective priming effects were not moderated by the requirement to hold a number of digits in memory for the duration of each priming trial.

Similarly, the effect can be obtained when there is no first phase of accessibility assessment or manipulation and when primes are instead selected from evaluation norms as having strong affective connotations. In fact, affective priming effects have now been obtained with a variety of positively and negatively evaluated stimuli as primes: With color slides of objects, persons, and animals (which were also used as targets; Hermans, De Houwer, & Eelen, 1994, Exp. 1); with photographs of self, significant others, and disliked persons (Banse, 2000); with black-and-white line drawings (Giner-Sorolla, Garcia, & Bargh, 1999); with non-words that were presented as Turkish translations of positive or negative words before the priming trials (De Houwer, Hermans, &

Eelen, 1998); with positive and negative odors (Hermans, Baeyens, & Eelen, 1998). Finally, the effect does not appear to depend on the number of letters of prime and target words. Musch, Elze, and Klauer (1998) compared priming by short and long primes crossed with either short or long targets and found no moderating effect of prime and target length on the affective priming effect.

In a related paradigm that is also often called an affective-priming paradigm, Murphy and Zajonc (1993) presented smiling and scowling faces for either 4 ms or 1000 ms followed immediately by Chinese ideographs. Liking and evaluative ratings of Chinese ideographs were found to be assimilated to the affect displayed by the prime face under the brief, but not the long presentation duration. Similarities and differences between affective priming sensu Fazio et al. (1986) and related priming paradigms are discussed by Fiedler (chap. 5, this volume).

A recent innovation in procedure is the response window technique proposed by Greenwald, Draine, and Abrams (1996). The response window technique pushes participants toward responding within a narrow time frame after the presentation of the target. As Greenwald et al. (1996) pointed out, it has the major benefit of controlling for speed-accuracy tradeoff problems by forcing all response latencies to be relatively similar, thereby avoiding the dilution of the priming effect amongst both response latency and accuracy. The dependent variable with this procedure is the percentage of correct responses, and the technique typically leads to a large increase in the size of accuracy priming. It has been used extensively by Abrams and Greenwald (2000), Klauer and Musch (in press), Klinger, Burton, and Pitts (2000), Musch (2000), and Musch and Klauer (2001) to secure affective priming effects under a wide range of conditions.

## Prime Strength

An early debate concerned the question of whether affective priming is found only for strongly accessible primes (Glaser, chap. 4, this volume). Fazio et al. (1986) consistently found stronger effects for strongly accessible than for weakly accessible primes given a short SOA of 300 ms. These effects were replicated by Bargh et al. (1992; Exp. 1). Interestingly, strong affective priming effects also emerged for primes selected for consistency in evaluations across participants rather than for strong accessibility (Bargh et al., 1992; Exps. 1 & 2). Moreover, when the first phase of accessibility assessment was separated from the priming trials by two days, the moderation by accessibility was eliminated (Exp. 2), as further supported by a study by Chaiken and Bargh (1993). Thus, it appears to make a difference whether prime accessibility is assessed two days in advance of, or immediately before, the priming trials. A parsimonious explanation might be that the evaluation latencies used to assess accessibility are themselves only moderately stable over a period of 2 days. If so, a regression

effect would work to attenuate the accessibility manipulation and any effects associated with it over that period.

De Houwer et al. (1998) had participants learn translations of ostensibly Turkish words that were unknown to the participants. The translations were strongly positive or negative words. In three experiments with the evaluative decision task and an SOA of 300 ms, the Turkish words engendered affective priming effects when used as primes after the learning phase. When their evaluation latencies, the measure of attitude accessibility, were assessed in a separate study (Exp. 5), the Turkish words' evaluations were found to be less accessible than those associated with strongly and even with only moderately positive and negative words. It was concluded that affective priming can also be obtained even when attitude accessibility is low.

Just as attitude objects can differ in the strength of the object-evaluation association, people may differ in the chronic accessibility of evaluations. Building on this idea, Hermans, De Houwer, and Eelen (2001; Exp. 3) used the Need to Evaluate Scale (NES) by Jarvis and Petty (1996) to form two groups that differed in their disposition to engage in evaluative responding. Under an SOA of 300 ms, affective priming emerged in evaluative decisions of the group with high NES scores, but not in the group with low NES scores.

Although the strength of the object-evaluation association is logically independent of the extremity of the evaluation itself, accessibility and evaluation extremity tend to be correlated and therefore, studies that have manipulated the extremity of prime evaluations are also relevant to this debate. Giner-Sorolla et al. (1999) used line drawings that were either strongly or weakly polarized in normative evaluations and found a tendency for affective priming to be stronger for strong rather than weak primes in their Experiment 1. A number of studies have used the pronunciation task, in which participants are asked to name the target as quickly as possible, and manipulated prime accessibility and/or extremity to obtain weak, moderate, and strong primes. Bargh, Charken, Raymond, and Hymes (1996) consistently found equivalent affective priming effects for weak and strong primes in naming latencies as did Giner-Sorolla et al. (1999) in their Experiment 2. Glaser and Banaji (1999), on the other hand, obtained *reversed* affective priming effects with extreme primes (i.e. faster responses for inconsistent rather than consistent prime-target pairs), and normal or no affective priming effects for trials based on moderately evaluated primes. Using Bargh et al.'s (1996) procedures and stimuli, Glaser (chap. 4, this volume) in contrast finds a weak normal effect for both weak and strong primes. Finally, in an attempt to replicate the Bargh, et al. (1996) findings, Klauer and Musch (2000; Exp. 3) did not obtain affective priming effects in the pronunciation task irrespective of prime strength.

To summarize, there is some evidence that affective priming in the evaluative decision task is moderated by attitude accessibility and related indicators of prime strength. However, affective priming can also be obtained with primes

low in accessibility and strength. Based on their findings with the pronunciation task, Bargh et al. (1996) have argued that the impact of accessibility and extremity is modulated by the presence of a goal to evaluate. Such a goal is clearly present in the evaluative decision task, where accessibility effects are typically found, and presumably absent in the pronunciation task, where accessibility effects are often not found. The pattern of findings obtained with the pronunciation task is however complex and will be discussed further in subsequent sections.

## Prime Presentation Parameters: Masked Priming

In this section, studies of two kinds are considered. The first kind is given by studies that seek to establish the existence of affective priming effects when primes are rendered invisble by suitable masks. The second class of studies aim at demonstrating functional dissociations between visible and masked priming effects by showing that they are differentially affected by experimental manipulations.

***Does Subliminal Affective Priming Occur?*** Studies demonstrating affective priming when primes are rendered invisible by suitable masks provide strong support for a role of automatic processes. Greenwald, Klinger, and Liu (1989) report three experiments in which primes were masked dichoptically by presentation of a random letter-fragment pattern to the dominant eye, either rapidly following the prime (Exp. 1) or presented simultaneously with the prime (Exps. 2 and 3). The effectiveness of the masking procedure was demonstrated by participants' inability to discriminate the left versus right position of a test series of words viewed under the same masking conditions as the prime stimuli. In each experiment, there were additional trials in which the prime words were presented without masks and thus were clearly visible. In all three experiments, significant masked priming effects were obtained with the chosen SOA of 500 ms, whereas affective priming by visible primes was not obtained in Experiment 2.

Studies of unconscious cognition typically compare direct and indirect measures of stimulus effects. Indirect effects are uninstructed influences of the task stimuli on behavior. Direct effects measure instructed influences of the relevant stimuli. In the Greenwald et al. (1989) studies, for example, indirect effects were the priming effects, and direct effects of prime words were measured by the position discrimination task. Under the assumption that the sensitivity of the direct measure for conscious stimulus effects is at least as great as that of the indirect measure (Reingold & Merikle, 1988), an indirect-without-direct effect pattern provides evidence for unconscious stimulus processing.

Greenwald, Klinger, and Schuh (1995) proposed a regression method to secure the desired indirect-without-direct effect pattern. In that technique, an indirect measure is regressed on an appropriate direct measure. It is tested

whether the intercept of this regression function is significantly larger than zero, implying indirect effects in the absence of a direct effect. The new method has instigated considerable debate (Dosher, 1998; Greenwald & Draine, 1998; Klauer, Greenwald, & Draine, 1998; Klauer & Greenwald, 2000; Merikle & Reingold, 1998; Miller, 2000), and refinements of the method were proposed by Klauer, Draine, and Greenwald (1998). Using the new method, Greenwald et al. (1995) compared visible and masked priming over an impressive series of experiments. With SOAs between 250 ms and 300 ms, there was no priming by visible primes and only weak evidence for some amount of priming in the masked condition that was present to the extent to which there was also evidence for direct effects (i.e., zero intercept, but positive slope of the regression function relating indirect and direct measure). These results thus provide little evidence for subliminal affective priming.

Recent research has tended to use so-called sandwich masks rather than dichoptical masking. In sandwich masking, the prime word is preceded by a meaningless letter string (forward mask), and is followed by another meaningless letter string (backward mask). Combining sandwich masking with the response window technique, Draine and Greenwald (1998; cf. Greenwald et al., 1996) studied affective priming for masked primes. Direct effects were assessed by participants' ability to discriminate between prime words and letter strings of alternating Xs and Gs viewed under the same masking conditions as were used in the priming trials (Exps. 1 to 3). In Experiment 4, another direct measure was also realized, namely to make evaluative decisions on the masked prime words. With SOAs between 34 ms and 67 ms and masked primes presented for 17 ms, 33 ms, or 50 ms, intercepts significantly larger than zero were reliably obtained for the larger presentation durations of 33 ms and 50 ms in four experiments. An analysis of the aggregated data revealed the desired indirect-without-direct pattern also for the 17 ms prime duration (cf. also Klauer et al., 1998).

Thus, affective priming effects can be obtained with primes rendered invisible by suitable masks. Extending this work, Abrams and Greenwald (2000) investigated which aspects of prime words were crucial for these masked effects and found that letter strings composed of subword fragments of earlier-viewed targets functioned as effective evaluative primes. For example, after repeated evaluation of the targets *angle* and *warm,* the nonword *anrm* acted as an evaluatively positive prime (Exp. 1), and there were indications that when fragments were combined to yield words with evaluations that were the opposite of the parent words, the evaluation of the parent words prevailed in priming effects (Exp. 2). Thus, *smile* worked as an evaluatively negative prime after repeated classification of the targets *smut* and *bile*. In addition, priming was obtained only when primes did contain parts of earlier targets (Exp. 3), a finding that is further discussed in the section on open questions.

***Functional Dissociations Between Masked and Visible Affective Priming.*** **A** number of studies have compared visible and masked priming and found that both kinds of priming effects were affected differently by experimental manipulations. Musch (2000) used the response window technique and sandwich masking to compare the so-called consistency proportion effect for masked and visible primes. The consistency proportion effect refers to the observation that affective priming effects tend to increase as the proportion of evaluatively consistent prime-target pairs increases relative to the proportion of inconsistent pairs (Klauer, Roβnagel, & Musch, 1997). With an SOA of 71 ms, Musch (2000; Exp. 5) obtained the consistency proportion effect for visible primes, thereby replicating findings of his previous experiments in this series. However, when primes were masked, the effect did not show although a substantial priming effect was found, and this difference in the consistency proportion effects for masked and visible primes was significant.

Greenwald et al. (1996) contrasted visible and masked priming as a function of SOA using the response window technique and sandwich masks. They found a rapid decline in masked priming for SOAs exceeding 100 ms, whereas priming by visible primes was undiminished over SOAs varying from 100 ms to 400 ms. A dissociation between visible and masked priming was also demonstrated with respect to a so-called sequential effect in the studies summarized by Greenwald et al. (1996). When the trial preceding the current trial had presented an evaluatively inconsistent rather than consistent prime-target pair, affective priming was diminished in the current trial. This effect occurred with visible primes and an SOA of 150 ms, but was absent when primes were masked by sandwich masks and SOA was 67 ms in experiments that employed the response window procedure.

Another interesting dissociation has recently been reported by Banse (2000; Exp. 2). Comparing priming engendered by pictures and names of a liked person (Charlie Chaplin), a disliked person (Saddam Hussein), and a neutral stranger, normal priming was found when primes were visible whereas *reversed* effects emerged when primes were masked (SOA 42 ms; evaluative decision task). Similarly, Hermans (1996), obtained indications of reversed effects in masked priming in two of three studies under conditions that led to normal priming effects when primes were visible (Hermans et al., 1994, Exp. 1).

To summarize, indirect without direct effects of prime words can be reliably produced when short SOAs and the response window technique are used. In addition, local sequential effects and consistency proportion effects occur for visible, but not for masked primes.

## Target Presentation Parameters

Only a few studies have looked at effects of target variables. Musch and Klauer (2001) presented primes and targets simultaneously at different locations on the

screen. For half of the participants, the location of the upcoming target was signalled by an advance cue appearing 600 ms and 150 ms before target onset in Experiments 1 and 2, respectively; for the other half, the advance cue was uninformative with respect to target location. In both experiments, affective priming was observed only in the latter group (i.e. under locational uncertainty), but not when participants could prepare for the target's location.

While prime and target were always shown in different locations in these experiments, Hermans et al. (2001; Exp. 3) compared centered versus uncentered presentation of prime and target. In centered trials, primes and targets were presented at the same central location on the screen with an SOA of 300 ms. In uncentered trials, primes and targets were written on different adjacent lines, one above the other. Affective priming was obtained for the centered, but not for the uncentered trials. It appears from these studies that affective priming effects are weakened when a perceptual and/or attentional separation of primes and targets is supported by the manner of presentation.

In an experiment by De Houwer, Hermans, and Spruyt (2001), half of the participants were presented targets in a degraded fashion (e.g., %U%G%L%Y%) and the other half saw undegraded targets (e.g., UGLY). Using the pronunciation task and an SOA of 250 ms, affective priming effects were found in the degraded condition, but not in the standard undegraded condition.

## SOA: The Time Course of Affective Priming

Stimulus-onset asynchrony is an important moderator of affective priming effects as already indicated by the original Fazio et al. (1986) studies. Klauer, Roßnagel, and Musch (1997; Exp. 1) varied SOA in six steps (−100 ms, 0 ms, 100 ms, 200 ms, 600 ms, and 1200 ms) in a between-participants design. SOA had a significant effect, and individually significant priming effects were found at SOAs 0 ms and 100 ms, but not at the other SO As. These findings were corroborated in a study by Hermans et al. (2001; Exp. 1) using a within-participants design and five levels of SOA (−150 ms, 0 ms, 150 ms, 300 ms, 450 ms). Individually significant priming effects emerged at the short SOAs of 0 ms and 150 ms and were absent at the other SOA levels. Using the pronunciation task and SOAs of 150 ms, 300 ms, and 1000 ms in a second experiment, an individually significant priming effect was obtained at the SOA 150 ms, but not at the longer SOAs. Taken together with the above-reviewed findings by Greenwald et al. (1996; section on masked priming), these different findings indicate that affective priming effects are obtained most robustly for short SOAs well below 300 ms. Thus, the activation of prime evaluations appears to be quite short-lived.

## List Context Effects

Is affective priming a local phenomenon that depends only on the characteristics of the current trial, or is it modulated by the wider context in which the prime-target pair is placed? As already explained, sequential effects of the trial preceding the current one were in fact found with visible primes in the experiments by Greenwald et al. (1996). Wentura (1999) also demonstrated that responses to the target of a given trial are influenced by characteristics of the preceding trial in the evaluative decision task. Specifically, when the prime in the preceding trial matched the current target in valence, responses were inhibited in two experiments with SOA 300 ms; a pattern of results that is known as negative priming (e.g., Fox, 1995).

Klauer et al. (1997) manipulated the proportion of evaluatively consistent prime-target pairs presented in the evaluative decision task. In a between-participants design, three proportions were realized in their Experiment 2:25%, 50%, and 75%. A second between-participants factor was SOA (0 ms, 200 ms, and 1000 ms). As already explained, a consistency proportion (CP) effect is given if affective priming increases as a function of consistency proportion. A CP effect was found in the latency data for the 0 ms SOA and in the error data for the 200 ms SOA, but not at the long SOA of 1000 ms. Musch and Klauer (1997) replicated the CP effect at SOA 0 ms.

In a series of experiments employing the response window procedure and the evaluative decision task with SOA 71 ms, Musch (2000) further explored the CP effect. In a first experiment, the CP effect was again replicated. The second experiment addressed the question whether local sequential contingencies were responsible for the effect. It has been argued that participants can shift the weight given to the prime information on a trial-by-trial basis. Specifically, they might rely more strongly on the prime information when it has just been seen to provide valid information regarding the target valence in the last trial, that is, when that trial presented an evaluatively consistent prime-target pair, as is indeed suggested by the sequential effect observed by Greenwald et al. (1996; cf. Greenwald & Rosenberg, 1978). In lists with a high CP, trials are frequently preceded by trials with evaluatively consistent prime-target pairs, simply because such pairs are generally more frequent when CP is high. Therefore, the CP effect could reflect a trial-by-trial adjustment of the weight given to the prime information. In Experiment 2, CP was manipulated in three steps (25%, 50%, and 75%) between participants. A subset of trials was, however, balanced with respect to evaluative consistency versus inconsistency of the preceding prime-target pair in each CP condition. Nevertheless, the CP effect emerged in full strength even when only the balanced subset of trials was considered. The notion that the CP effect reflects context-dependencies that extend over a wider range than just the preceding trial was further supported by Experiment 3, in which a final block of trials realized a 50% CP regardless of the CP that was given in the previous five blocks (either 25%, 50%, and 75%). The CP effect

was found to be as strong in this last block as in the ones preceding it. Because the actual CP was 50% in this block, a local explanation of the effect is ruled out. In a fourth experiment, only inconsistent prime-target pairs and pairs with neutral letter string primes were employed to explore the extent to which the CP effect might eliminate affective priming. Although the CP was 0% in this study, a residual affective priming effect was nevertheless found. In a final experiment (Exp. 5), masked and visible primes were compared in a between-participants design that also varied CP. The usual CP effect emerged for visible primes, but was absent in the masked priming groups, and this difference was reliable. To summarize, the CP effect moderates affective priming, but cannot override it. In addition, it appears to rely on learning processes that extend over a wider range of trials and require prime visibility to occur.

It can be concluded that visible affective priming in the evaluative decision task is modulated both by the local trial-by-trial context in which a given trial is placed and by the global list context in which the trials are embedded.

## Task

Another kind of context-dependency is given by task-dependence. The pattern of findings differs pronouncedly between tasks. It is helpful to categorize tasks in three groups: Tasks requiring the identification of certain target attributes, tasks that require affirmative and negative responses, and the pronunciation task.

***Identifying Target Attributes.*** Most of the studies have relied on the original evaluative decision task in which the prime valence has a direct relationship to the required response. When targets had to be classified with respect to nonevaluative features, however, affective priming usually did not occur. For example, Hermans, Van den Broeck, and Eelen (1998; Exp. 3) contrasted evaluative decisions with a color-naming task. Targets appeared in one of four colors, and in the color naming trials, participants were to name the color in which the target was written. Affective priming effects were found for the evaluative decision task, but not in the color naming task, and this difference between the two kinds of trials was significant. Previous experiments in this series had used only the color-naming task and did not obtain affective priming as was the case in two experiments conducted by Rothermund and Wentura (1998) with the color-naming task.

In a related study, De Houwer, Hermans, Rothermund, and Wentura (2000; Exp. 2) contrasted two groups. In the first group, participants categorized targets as persons versus animals (semantic classification); in the second group, participants were required to make evaluative decisions on these same targets. An affective priming effect was found for the evaluative decision task, but not for the semantic-classification task. This difference between tasks in the pattern of priming effects was significant. Similarly, Klinger et al. (2000; Exp. 2) had

members of different groups either classify targets as denoting living versus nonliving things (animacy decisions) or make evaluative decisions on targets. Affective priming effects were found in evaluative decisions, but not in the animacy decisions. Conversely, the animacy category of the prime elicited congruency effects in the animacy decision task, but not in the evaluative decision task. That is, deciding whether a target denoted a living versus nonliving thing was facilitated when prime and target were congruent (both living versus both nonliving) rather than incongruent (one living, the other nonliving) in this respect; this kind of congruency had no effect on evaluative decisions, however.

Double dissociations of this kind constitute strong evidence for the taskdependence of affective priming. In four experiments by Klauer and Musch (in press), primes and targets could vary orthogonally with respect to their valence and with respect to their values on a second dimension. The second dimension was spanned, respectively, by two presentation locations of prime and target stimuli (an upper vs. a lower line; Exp. 1), by two colors in which prime and target were presented (blue vs. brown; Exp. 2), by letter case (small vs. capital letters; Exp. 3), and by grammatical category (adjective vs. noun; Exp. 4). In each experiment, one group was asked to make evaluative decisions on targets, whereas members of the second group were required to decide which of the two values of the second dimension was realized by a given target. In each experiment, affective priming effects were found in evaluative decisions, but not for the group making decisions on nonevaluative target features. Conversely, equivalent nonevaluative congruency effects engendered by the prime value on the second dimension were found in the group making decisions with respect to that dimension, but not in the group making evaluative decisions across all four experiments.

***Tasks Requiring Affirmative and Negative Responses.*** Thus, affective priming effects were reliably found only when the task itself was focused on evaluations. An exception to this rule may, however, be given by tasks that require affirmative and negative responses as in yes/no decisions. For example, in the lexical decision task, targets can be words or meaningless letter strings. Participants are asked to decide whether or not the target is a word and to respond "yes, word" in the first case and "no, not a word" in the second case. In trials in which primes and targets are words, evaluative consistency of prime and target can be manipulated to test for affective priming effects. Klinger et al. (2000, Exp. 2) used masked primes and found no evidence for affective priming in the lexical decision task. With visible primes, however, Wentura (1998, 2000) reported effects of affective priming in that task. In addition, priming was moderated by the assignment of "yes" and "no" responses to words and nonwords, respectively. In the usual "word-yes" condition, Wentura (1998, 2000) obtained affective priming effects in three experiments. These effects

were however reversed in tendency (Wentura, 1998) and significantly (Wentura, 2000; Exp. 2) when participants were required to respond "no" if the target was a word and "yes" if it was a nonword. A similar reversal of affective priming effects from trials requiring yes-responses to those requiring no-responses was reported by Klauer and Stern (1992) in an early study based on grammatical classifications of prime-target pairs.

In Experiments 5 to 8 by Klauer and Musch (in press), primes and targets varied with respect to evaluations and orthogonally with respect to the same nonevaluative second dimensions used in Experiment 1 to 4, respectively, as just detailed previously. Participants were required to compare primes and targets with respect to valence (first group) or with respect to their values on the second dimension realized in each experiment (second group) and to respond "yes, same" in the case of a match and "no, different" in the case of a mismatch. Pervasive affective priming effects (i.e. facilitatory effects of a match of prime and target valence), were found in the group making nonevaluative comparisons for trials requiring "yes, same" responses. The affective priming effects were eliminated or reversed in tendency for the "no, different" response, Equivalent congruency effects of matches versus mismatches on the second, nonevaluative dimension were not found in the group making evaluative comparisons. In a ninth study, participants made decisions on the grammatical category of the target and were required to respond "yes" for one category (e.g., in the case of a noun) and "no" for the other category of targets (e.g., in the case of an adjective). Again, affective priming was found for trials requiring "yes" responses, and the effect was reversed in tendency for trials requiring "no" responses. This is a remarkable finding as there were no effects of the irrelevant evaluations in a previous study in this series (Exp. 4) that used exactly the same task with the only difference that the responses were directly labelled *adjective* and *noun,* respectively. Taken together, there is some evidence that the affective match (mismatch) of prime and target can bias nonevaluative "yes" ("no") responses.

***The Naming Task.*** Finally, a number of studies have employed the pronunciation task to study affective priming. Hermans et al. (1994; Exp. 2) found an affective priming effect using that task and an SOA of 300 ms. As already mentioned, Hermans et al. (2001; Exp. 2) manipulated SOA in three levels (150 ms, 300 ms, 1000 ms) in a study that found no overall affective priming effect and no main effect of SOA. An individually significant effect emerged at the short SOA, however. Bargh et al. (1996; Exps. 1 to 3) and Giner-Sorolla et al. (1999; Exp. 2) consistently observed affective priming effects in the pronunciation task for weak and strong primes using SOAs between 250 ms and 300 ms. Klauer and Musch (2001) ran five statistically powerful experiments with the pronunciation task that varied primeset size (10 primes vs. infinite set size) and target-set size (2, 10, infinite; SOA 200 ms; Exp. 1a and

1b), SOA (0 ms, 50 ms, 100 ms; Exp. 2), prime strength (weak vs. strong; SOA 300 ms; Exp. 3) and language of primes and targets (English vs. German; SOA 300 ms; Exp. 4) and did not observe affective priming in any of these experiments although traditional semantic priming (Neely, 1991) was obtained. De Houwer, Hermans, and Spruyt (2001) found affective priming when targets were presented in a degraded manner, but not under the standard undegraded presentation mode with SOAs of 250 ms. Similarly, De Houwer et al. (1998; Exp. 2) did not obtain an affective priming effects for stimuli that were associated with positively and negatively valenced words in the experimental context although these stimuli engendered priming effects in evaluative decisions (Exps. 1, 3, and 4). Finally, in a series of five experiments with SOA 150 ms and the pronunciation task, Glaser and Banaji (1999) found reversed affective priming effects by strong primes (Exps. 1 to 5), and normal (Exps. 2 and 3) or no (Exps. 4 and 5) affective priming effects for moderately strong primes. Using stimuli and procedures more similar to the Bargh et al. (1996) experiments, Glaser (chap. 4, this volume) in contrast finds a weak normal priming effect for both weak and strong primes. There are also many unpublished studies that failed to obtain an affective priming effect in the pronunciation task (e.g., Hermans, 1996). We are not aware of published studies that have compared the pronunciation task to other tasks within one experiment.

This review of the effects of task settings supports the following conclusions:

- When targets have to be classified into a small number of categories, there are priming effects engendered by task-relevant prime categories, but prime categories that are not task-relevant do not give rise to priming effects. There are no differences between evaluative and nonevaluative classifications in this respect.
- When the task requires affirmative or negative responses, affective priming effects occur for trials requiring affirmative responses, and they tend to be eliminated or reversed for trials requiring negative responses.
- The pattern of findings obtained with the naming task is mixed and complex, and there appear to be as yet unidentified factors determining whether normal priming effects, reversed effects, or no effects are obtained.

## AFFECTIVE PRIMING: EXPLANATIONS

Several mechanisms have been considered as underlying affective priming effects (cf. De Houwer, chap. 9, this volume; Fiedler, chap. 5, this volume; Wentura & Rothermund, chap. 3, this volume). The most prominent are (1) a mechanism based on an analogy with the semantic priming paradigm (Neely,

1991) and the notion of spreading activation, (2) a mechanism based on an analogy with the Stroop paradigm (MacLeod, 1991) and the notions of selective attention and response competition (Klauer, 1998; Klauer, Roβnagel, & Musch, 1997; Musch, 2000; Rothermund & Wentura, 1998), and (3) an affective-matching hypothesis proposed by Klauer (1991; Klauer, 1998; Klauer & Stern, 1992). In the account by spreading activation, primes exert an influence by preactivating related target nodes in a lexical or semantic network. In the Stroop mechanism, irrelevant evaluations exert an effect by virtue of the observed response having an evaluative component. In the affective-matching mechanism, irrelevant evaluations exert an effect by virtue of biasing yes/no-responses.

## The Account by Spreading Activation

An early explanation of affective priming drew an analogy between affective priming and semantic priming (Neely, 1991) using the concept of spreading activation. Roughly, perceiving the prime is assumed to activate its representing node in a lexical or semantic network (Bower, 1991; Fazio et al., 1986), and the activation then spreads to nodes of evaluatively consistent targets, but not of inconsistent targets, thereby facilitating processing of the target whenever prime and target are evaluatively consistent. Spreading activation can thereby account for affective priming effects.

Yet, there are many findings that are difficult to reconcile with the notion of spreading activation. According to the account by spreading activation, pervasive and context-independent facilitation of target processing should be a consequence of evaluative consistency of prime and target at least when lexical processing of the target is required. This expectation is not borne out by the findings of strong task-dependence (e.g., De Houwer et al., 2000; Klauer & Musch, in press; Klinger et al., 2000; Rothermund & Wentura, 1998) reviewed earlier. Nor does it agree well with the finding that in tasks with affirmative and negative responses, the effects of evaluative consistency are less pronounced and in tendency *reversed* when negative responses are required (Klauer & Musch, in press; Klauer & Stern, 1992; Wentura, 1998, 2000).

Similarly, list-context effects are also difficult to explain from the perspective of a spread of activation. Thus, the sequential effects observed by Wentura (1999) and Greenwald et al. (1996) as well as the CP effects found by Klauer et al. (1997; Musch, 2000; Musch & Klauer, 1997) at short SOAs cannot be accounted for by this mechanism. For these and other, more theoretical reasons (e.g., Bargh, 1997; Klauer & Musch, 2001), the account by spreading activation has been abandoned by most researchers in the field. Hermans et al. (1998) proposed an affective-motivational account of affective priming according to which evaluative inconsistency, but not evaluative consistency, of two incoming stimuli delays any kind of cognitive processing, irrespective of the participants' current goals. This mechanism also leads one to expect affective priming effects

on target processing regardless of the nature of the task that participants are required to perform on the target word, and it encounters the same difficulties as the account by spreading activation.

Spreading activation is, however, still relevant as a methodological caveat. Spreading activation is often argued to underlie the reliable and largely task-independent priming effects observed for strongly associated primes and targets (e.g., bread and butter; Neely, 1991). Many researchers have therefore taken explicit measures to control for associative relatedness in prime-target pairs used in affective priming studies. In our own research, we prepare large and diverse pools of positive and negative words, from which each participant's list is randomly sampled. This is to ensure that evaluative consistent and inconsistent word pairs do not differ systematically and substantially within and across participants in associative relatedness. Another possibility is to look at each list of prime-target pairs and to screen out associatively related pairs before presentation (e.g., Rothermund & Wentura, 1998). In some circumstances, a third possibility is to analyze the data by items rather than by participants. If an affective priming effect goes back to a few targets that by accident are paired with highly associated primes for all participants, then the effect should not generalize over targets although it might generalize over participants. That is, instead of computing an affective priming effect for each participant by averaging over items, the analysis by items computes the effect for each target by averaging over participants (Clark, 1973; for examples in the context of affective priming, see Wentura, 2000). The target-wise priming effects are then subjected to an analysis of variance with targets taking the role of participants to see whether the effects generalize over items or are concentrated on a few unusual, or unusually paired, targets.

## The Stroop Mechanism

In the classical Stroop task, words are presented in different colors. Naming the color is delayed when the word itself denotes a color that differs from the one that the word is written in (MacLeod, 1991). There are many variants of the task, some of which are structurally similar to the evaluative decision task in affective priming research. The so-called flanker task in particular works with two sets of stimuli (e.g., the letters H and K versus S and C), which are assigned different responses (e.g., pressing the left key for H and K, and pressing the right key for S and C). Irrelevant letters from the wrong response set interfere with the response to the target (Eriksen & Eriksen, 1974) when they flank the target letter. Flanker effects are also found with words from different categories (Shaffer & LaBerge, 1979) and the task to categorize the target word (e.g., as a piece of furniture vs. a metal). When primes are identified with flankers, affective priming in the evaluative decision task can thus be seen as an instance

of flanker effects (cf. De Houwer, chap. 9, this volume; Klauer et al., 1997; Rothermund & Wentura, 1998; Wentura & Rothermund, chap. 3, this volume).

Adapting a prominent model of Stroop effects (Logan & Zbrodoff, 1979) to the present case, Musch (2000) assumed that both prime and target evaluations are activated and integrated in a random-walk process on a decision dimension related to the responses. Two response thresholds are located on the decision dimension, and a response is made as soon as the accumulated evidence falls outside the interval spanned by the two thresholds. At each point in time, the available evidence is given by a weighted sum of the accrued prime information and the accrued target information. The weights themselves are sums of automatic and strategic components. An automatic component of the prime weight is positive and reflects the automatic influence of irrelevant prime evaluations as found in masked priming. The prime weight also has a strategic component that reflects strategies of attention allocation, requiring some amount of strategic, conscious processing, as occurs in contexts where the prime information is generally valid and helpful (Cheesman & Merikle, 1986). The integration of prime and target evaluations proceeds in a random-walk process in which the impacts of prime and target are accrued in proportion to their weights.

The Stroop mechanism thereby explains visible and masked affective priming in evaluative decisions, and its time course agrees well with analogous findings from other Stroop-like tasks (MacLeod, 1991). In addition, consistency proportion effects and sequential effects of the Greenwald et al. (1996) variety can be explained through learning-induced, strategic shifts in prime weights that require visibility of the irrelevant prime stimulus (Cheesman & Merikle, 1986; cf. Musch, 2000). Similarly, separating prime and target location, and allowing participants to prepare for the target location supports a strategy of attention allocation in which to-be-ignored prime information is given a small weight because it can be more effectively ignored when perceivers can prepare for the location of the target (Musch & Klauer, 2001). On the other hand, presenting prime and target at the same rather than different locations is likely to hinder the strategic screening out of prime information, thereby explaining larger priming in the former condition (Hermans et al., 2001). Furthermore, negative priming effects as demonstrated by Wentura (1999) for affective priming are generally found in Stroop-like tasks and thus fall under the scope of effects that can be explained by the set of mechanisms that underlie findings in Stroop tasks. Effects of prime strength follow naturally from Musch's (2000) model in which prime and target evaluations are integrated in the form of a weighted sum. Effects of prime accessibility follow from the temporal dynamics of this random-walk model, in which evaluations that are available quickly are likely to exert a greater influence.

Finally, the mechanism is easily reconciled with the absence of affective priming in tasks that require nonevaluative classification of target stimuli (cf. section on task-dependence), because only response-relevant prime information

is integrated. But for the same reason, it cannot explain affective priming in nonevaluative tasks that require affirmative or negative re-spouses such as the lexical decision task. Nor can it account for affective priming in the pronunciation task for which task the pattern of findings is, however, complex and mixed. To summarize, the Stroop mechanism integrates the results obtained with the evaluative decision task, but fares less well in accounting for affective priming in nonevaluative tasks.

### The Affective-Matching Mechanism

A mechanism that predicts a broader range of effects of irrelevant evaluations is the affective-matching mechanism. It was originally proposed to account for tendencies toward evaluative consistency in social judgments (e.g., Abelson & Rosenberg, 1958; Cooper, 1981; cf. Klauer, 1991; Klauer & Stern, 1992; Nisbett & Wilson, 1977) and is adapted from so-called postlexical mechanisms as discussed in the context of semantic priming (e.g., de Groot, 1984; Neely, Keefe, & Ross, 1989).

The affective-matching model makes three assumptions:

1. It is assumed that the evaluations of both prime and target are activated automatically and are spontaneously compared for evaluative consistency regardless of the perceiver's current goals or tasks.
2. Evaluative consistency of two words (e.g., sunshine, friendly) gives rise to a feeling of plausibility, evaluative inconsistency (e.g., sunshine, sick) engenders a feeling of implausibility,
3. A spontaneous feeling of plausibility facilitates making *affirmative* responses, whereas a spontaneous feeling of implausibility inhibits such responses. Conversely, a spontaneous feeling of implausibility facilitates making *negative* responses, whereas a spontaneous feeling of plausibility inhibits such responses. That is, a feeling of plausibility biases affirmative responses and a feeling of implausibility biases negative responses.

An effect of evaluative consistency is predicted by this mechanism whenever affirmative or negative responses are required with respect to both evaluatively consistent as well as inconsistent word pairs. Consider, for example, the case of lexical decisions. In the lexical decision task, participants decide whether target letter strings constitute words or not. When prime and target are evaluatively consistent words, the "yes, word" response is facilitated, via a feeling of plausibility, according to the affective-matching model. The "yes" response is inhibited, via a feeling of implausibility, when prime and target are evaluatively inconsistent words. As a result, an affective priming effect is predicted for word targets although the evaluations of prime and target are irrelevant in the lexical decision task.

Wentura (1998, 2000) has used the lexical decision task to perform tests of this model. As just explained, affective priming effects for word targets are expected and were in fact obtained. The crucial test of the model consisted of a condition in which the assignment of "yes" responses and "no" responses to words and nonwords, respectively, was reversed. Because of Assumption 3, the affective-matching model predicts a reversal of priming effects as a consequence of this manipulation. For the original "word=yes" condition, the affective priming effect emerged, whereas the data pattern was in fact reversed for the "word=no" condition. That is, "no" responses to word targets preceded by evaluatively inconsistent rather than consistent primes were now made faster. The model predicts this reversal because evaluative inconsistency is expected to facilitate negative responses via a feeling of implausibility, whereas evaluative consistency should inhibit negative responses. Analogous reversals of the effects of irrelevant evaluations were reported by Klauer and Stern (1992) and using a different task by Klauer and Musch (in press).

Applying the mechanism to the evaluative decision task is somewhat complicated. The response *good* or *positive* for positive words can be classified as affirmative, the response *bad* or *negative* for negative words is negative. A priming effect is therefore expected for positive targets, and a *reversed* priming effect is expected for negative targets. The priming effect is expected to be reversed for negative targets, because the required response *negative* is negative, and negative responses are facilitated by evaluative inconsistency and inhibited by evaluative consistency under the affectivematching model. Overall, the net priming effect, averaged over positive and negative targets, should be zero. In addition, it is not easy to test the prediction of reversed priming effects for positive versus negative targets in the evaluative decision task. Any difference between priming for positive targets and priming for negative targets is perfectly confounded with the main effect of prime valence as is not difficult to see. It is therefore impossible to disentangle possible effects of prime valence from differences caused by affective matching. Even the absence of a difference between priming for positive targets and priming for negative targets cannot be interpreted unambiguously because of this confounding.

To summarize, the affective-matching model predicts affective priming in tasks requiring responses that can be classified as affirmative or negative, the paradigmatic case being binary "yes/no" decisions, and it explains the reversal of affective priming from trials requiring "yes" responses to those requiring "no" responses. The affective-matching mechanism is thereby less task-dependent than the Stroop mechanism in the sense that it does not presuppose an intention to evaluate the stimuli themselves as good or bad. It cannot, however, account for the pattern of findings obtained with the evaluative decision task.

## A MODEL OF THE EVALUATIVE SYSTEM

A large portion of the research is integrated by a model of the evaluative system that has at its core a process of preconscious evaluation activation. The evaluations, once activated, exert their influence on subsequent processes through mediating mechanisms. We assume that there are at least two such mechanisms that were termed the *Stroop mechanism* and the *affectivematching mechanism*. Both are assumed to operate simultaneously and in parallel. By their properties they determine the scope and generality of observable priming effects.

As already discussed, the Stroop mechanism explains most of the findings obtained with the evaluative decision task, but because of its strong task-dependence it fails to account for affective priming in tasks without a strong evaluative component. Neumann (1984) reviewed findings on goal dependence obtained in classical Stroop paradigms and concluded that "to a large degree, a distractor causes interference not because of its intrinsic properties but because it is related to the intended action" (p. 269). At this point, the affective-matching model comes into play to explain affective priming in wider contexts. As detailed above, the affective-matching mechanism is not expected to contribute to affective priming in the evaluative decision task itself. However, it complements the Stroop mechanism to account for affective priming in tasks that require nonevaluative affirmative and negative responses, the paradigmatic case being binary yes/no decisions. Considerable evidence for its operation has by now accrued in the form of the telltale pattern of a reversal of priming effects from trials requiring an affirmative response to those requiring a negative response.

This model, comprising a preconscious process of evaluation activation and two mediating mechanisms, offers differentiated answers to two issues of considerable debate: (a) The extent to which the effects of irrelevant evaluations are goal-dependent, and (b) whether the processing of evaluative information must be assumed to differ from cognitive processing.

### Goal Dependence of Affective Priming

Turning first to the issue of goal dependence, Holender (1992) has pointed out that a necessary condition for Stroop-like congruity effects such as flanker effects is an overlap between the ensemble of task-relevant attributes of the target stimuli or the required responses on the one hand and the attributes of the irrelevant primes on the other hand. The overlap endows irrelevant primes with the power to prime a response from the set of responses, either the same response as that required by the target or a different one, thereby facilitating or inhibiting, respectively, the task-appropriate response. The Stroop mechanism (i.e., the mechanisms that under-lie Stroop-like congruity effects) can thereby explain affective priming in *evaluative* responses, but is goal-dependent and

fails to account for affective priming in nonevaluative tasks such as the lexical decision task. When the evaluations of targets are not relevant for the task at hand and when there is no implicit or explicit evaluative component in the required responses, irrelevant evaluations are not expected to exert an influence under this mechanism.

The Stroop mechanism readily explains affective priming in the evaluative decision task, but it also accounts for effects of irrelevant evaluations in a number of situations that at first hand appear to demonstrate goal independence. For example, in Experiment 2 by Chen and Bargh (1999), participants were required to move a lever as soon as an evaluatively polarized word was presented in what was presented as a reaction time test. In half of the trials, participants were to move the lever toward them and in the other half, they moved the lever away from themselves. It was found that the lever was pulled faster for positive than negative words, and that it was pushed faster for negative than positive words. Following Chen and Bargh's (1999) interpretation that pushing is part of an appetitive system linked to positive evaluations and pulling is part of an aversive system linked to negative evaluations (e.g., Lang, 1995; Neumann, Förster & Strack, chap. 14, this volume), the Stroop mechanism naturally applies to explain these effects as Stroop-like congruity effects. Similarly, effects of irrelevant evaluations in De Houwer and Eelen's (1998) affective Simon paradigm (De Houwer, chap. 9, this volume) fall under the range of this mechanism. In that paradigm, participants identify nonevaluative attributes of words such as their grammatical category, but respond with evaluative labels. For example, nouns might be mapped onto the response *good* and adjectives might be mapped onto the response *bad*. Again, the irrelevant evaluations of the stimuli interfere with the responses: Responding *good* is easier for positive than negative words, irrespective of grammatical category, and vice versa for the response *bad* (De Houwer & Eelen, 1998).

Another set of effects that have been argued to demonstrate goal independence can be explained by the affective-matching model. According to that model, irrelevant evaluations exert an influence by virtue of biasing yes/no-responses. As explained earlier, affective priming in the lexical decision task can be accounted for by the affective-matching model, and Wentura (1998, 2000) provided direct evidence for the role of affective matching in the lexical decision task. Likewise, Klauer and Stern (1992) and Klauer and Musch (in press) demonstrated affective priming effects in situations in which there was no goal to evaluate, but affirmative and negative responses were required for both evaluatively congruent and incongruent stimulus combinations.

More importantly, the present framework integrates *failures* to obtain affective priming in other nonevaluative tasks. When there is no evaluative component in the required response and when affirmative or negative responses are not required, neither the Stroop mechanism nor the affectivematching model predict effects of irrelevant evaluations. Many findings have demonstrated an

absence of affective priming effects in such tasks, often in the form of strong double dissociations as a function of task, as reviewed in the above section on the role of the participants' task. Thus, the present framework can account for the mixed pattern of findings on goal dependence in a principled manner.

### Dissociation of Evaluative and Cognitive Processing

Like for the issue of goal dependence, the present view of the evaluative system offers a differentiated answer to the question of whether evaluative processes can be dissociated from cognitive processes. The answer is no for the Stroop mechanism and yes for the affective-matching model.

The Stroop mechanism accepts evaluative information just like any other kind of information. All that is required is some amount of overlap between task-relevant features of targets and/or responses on the one hand and features of irrelevant distractors on the other hand. Whether taskrelevant overlap is given by an evaluative component shared by primes and targets, or by nonevaluative features of primes and targets makes no difference whatsoever for the pattern of results (cf. section on Task). It appears then that the Stroop mechanism is a general-purpose mechanism that is part of a general system of attention allocation and response selection and that can be recruited by the evaluative system as well as by any other system under the conditions just outlined.

A different story is related by the findings for the affective-matching model. For example, Klauer and Musch (in press) required participants to make yes/no decisions on prime-target pairs that varied with respect to valence or gender as well as a second orthogonal dimension across five experiments. Evidence for a spontaneous comparison of stimulus pairs was found only with respect to evaluating the affective match of prime and target, but not with respect to any other dimension. This finding contrasts with the just-mentioned findings for the Stroop mechanism in which these other dimensions were just as influential as irrelevant evaluations were. In the present instance, yes/no-decisions based on nonevaluative features of the word pairs were biased by the irrelevant affective match of prime and target, but there was never any evidence for an analogous effect of prime-target matches on other dimensions such as gender. It can be concluded that affective matching is an integral component of only the evaluative system and that a dissociation with the cognitive processes comprising Bargh's (1997) perceptual system has been identified.

## OPEN QUESTIONS

We conclude this chapter by briefly discussing two open issues. The first concerns the locus at which Stroop-like congruity effects operate in evaluative decisions, the second the pattern of findings obtained with the pronunciation task.

## Locus of Affective Priming Effects

An open question is whether affective priming in the evaluative decision task reflects synergy and conflict of *response tendencies* triggered by primes and targets, or whether synergy and conflict at a more central level of *categorizing stimuli* as good or bad are also involved. Klinger et al. (2000) strongly argued for a peripheral locus of the effect (i.e., for response synergy and conflict), although their data are really silent with respect to this issue. Musch (2000; Exp. 8) attempted to assess peripheral and central components of affective priming effects separately. He presented first names and evaluatively polarized adjectives as primes and targets. Participants were required to make gender decisions if the target was a first name, and evaluative decisions on adjectives. Each response key was assigned one gender and one evaluation; for example, female first names and positive adjectives were mapped onto the right response key and male first names and negative adjectives on the left response key. Some of the trials thereby presented primes (e.g., a first name) and targets (e.g., an adjective) that had diminished potential of interfering with each other at a central level of categorization, but could still trigger the same or different responses. Other trials shared this potential for peripheral synergy and conflict, but also had the potential for eliciting central synergy and conflict in categorization (both prime and target first names, or both adjectives). Contrasting the different kinds of trials, it was found that a major component of priming effects was due to peripheral response congruency, but there was also a significant and substantial component going back to central facilitation engendered by prime and target sharing the same evaluation or gender.

A related point was recently made by Abrams, Klinger, and Greenwald (in press). As discussed previously, Abrams and Greenwald (2000) obtained stronger affective priming effects in a study on masked affective priming when primes were composed of sub word parts of previously evaluated targets than when the primes, nor any parts of them, had not been seen before. Abrams et al. (in press) built on this work and aim at testing whether the effect of previous evaluations goes back to an automatic activation of a practiced stimulus-response mapping (peripheral locus) or to a facilitation of the unconscious classification of the prime (central locus). Abrams et al. (in press) had participants practice classifying visible targets as *pleasant* or *unpleasant,* before these targets were used as subliminal primes in a second phase of the experiment. Of importance, the association of response keys with valences was reversed from practice to test phase. Nevertheless, the subliminal primes engendered normal priming effects indicating that the practice effect has a central rather than peripheral locus. In Fazio et al's (1986) words, the practice effect might thus be seen as an instance of an accessibility effect.

## The Puzzle of the Naming Task

A second open question is given by the pattern of findings in the pronunciation task (Glaser, chap. 4, this volume; Wentura & Rothermund, chap. 3, this volume). As reviewed earlier, some authors consistently found affective priming in that task irrespective of prime strength and accessibility. Others did not observe any priming effect whether strong or weak primes were used. Still others found reversed priming engendered by extreme primes. What could be the cause of this contradictory set of findings? One point of departure could be the recent finding by De Houwer et al. (2001) according to which affective priming effects were obtained in the naming task when targets were presented in a degraded manner, but not under the standard presentation condition. This result suggests that priming in the naming task is augmented if the phase of target identification is made more difficult. This points to a possible post-lexical origin of the effect in which prime and candidate targets are considered as a pair and in which their relationship *biases the decision* on target identification. For example, the affective-matching model postulates that evaluatively consistent prime-target pairs elicit a spontaneous feeling of plausibility, whereas inconsistent pairs engender a feeling of implausibility. If so, the decision that an internally represented candidate target is indeed the correct target to be named might be facilitated under evaluative consistency and inhibited by evaluative inconsistency. This mechanism is likely to exert an impact in naming to the extent to which identification constitutes a real decision problem, rather than an automatic and unconditional response, explaining the stronger effects obtained under degraded conditions and the frequent absence of the effect under standard presentation conditions (Klauer & Musch, 2001). Another classical way to manipulate the difficulty of the naming task is to contrast word-naming (highly over-learned and automatic) with picture-naming (less well-practiced and automatic; e.g., MacLeod, 1991), and it is interesting to note that Spruyt, Hermans, De Houwer, and Eelen (2001) have recently demonstrated replicable normal affective priming effects in picture naming.

However, this account still leaves open the puzzling findings of reversed priming for extreme primes that were documented by Glaser and Banaji (1999). One possibility is that list context and/or instructions in these experiments made it salient that targets differ pronouncedly from primes and thereby made participants focus on detecting differences between primes and target. As argued previously, the decision about whether the target has been correctly identified might again be supported by a routine similarity check of primes and targets. In this situation, participants would however proceed to naming the target as soon as the similarity hypothesis had to be rejected for a given prime-target pair. For "no, different" judgments, however, the affective-matching model predicts facilitation by evaluative mismatches rather than matches and thereby a reversal of priming effects.

Clearly, these considerations are speculative at this point, and other principled accounts for the pattern of findings in the naming task are proposed by Glaser (chap. 4, this volume) and Rothermund and Wentura (chap. 3, this volume). Future research in this very active field is likely to bring as much light to the puzzle of the naming task as has already been brought to the evaluative decision task. It seems likely that the present model of the evaluative system will have to be enriched by additional mechanisms as a consequence of this research.

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