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How to Heat Up From the Cold: Examining the Preconditions for (Unconscious) Mood Effects

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What are the necessary preconditions to make people feel good or bad? In this research, the authors aimed to uncover the bare essentials of mood induction. Several induction techniques exist, and most of these techniques demand a relatively high amount of cognitive capacity. Moreover, to be effective, most techniques require conscious awareness. The authors proposed that the common and defining element in all effective mood induction techniques is the dominating salience of evaluative tone over descriptive meaning. This evaluative-tone hypothesis was tested in two paradigms in which the evaluative meaning of the "primed" concept was more salient than its descriptive meaning (i.e., when subliminal stimulus exposure was so short that mainly the evaluative meaning was activated [see D. A. Stapel, W. Koomen, & K. I. Ruys, 2002] and when the primed concepts were sufficiently extreme such that evaluative meaning always dominated descriptive meaning). Explicit and implicit mood measures showed that the activation of a dominating evaluative tone affected people's mood states. Implications of these findings for theories on unconscious mood induction are discussed.

Keywords: subliminal perception, priming, mood, affect, need for cognition

What makes people feel good or bad? What is needed to put someone in a positive or a negative mood? What does it take to influence people's affective states? A quick look at the relevant literature does not really suggest a simple answer to these questions. Past research has shown that there is a myriad of successful techniques to induce positive or negative mood states in people. Recollecting pleasant or unpleasant memories, listening to uplifting or depressing music, reading reports of happy or sad events, watching funny or sad film clips, receiving positive or negative performance feedback, imagining wonderful or horrible life events—all these manipulations can be and have been used successfully to influence how positive or negative individuals feel (Fiedler, 2001; Forgas, 1992; Isen, 1987; Schwarz, 1990).

But what do these techniques have in common? What makes them successful mood induction methods? First, it should be noted that all these techniques demand a relatively high amount of cognitive capacity. Furthermore, all these techniques require conscious awareness to be effective. It is the conscious recalling, listening, reading, watching, or imagining that induces a positive or negative mood. But are these characteristics really necessary to elicit an affective state in an individual? Can one's mood be affected only through the intensive and conscious experience (or recall) of real (or imagined) mood-eliciting stimuli? Are those the essential ingredients of the mood induction recipe? We think not.

We propose that the common and defining element in all effective mood induction techniques is a dominating salience of evaluative tone.[1] Thus, watching a fragment from "When Harry Met Sally" and looking at the local weather report forecasting sunny spells are similarly successful ways to induce a positive mood state, even though the descriptive content (i.e., falling in love vs. predicted hours of sun) of these mood inducers is very different. What these mood induction methods have in common is their strong, positive evaluative tone. What differs between these techniques is their specific descriptive content. Thus, the crucial ingredient for effective mood induction seems to be a strong evaluative meaning, rather than specific descriptive meaning.

One could argue in more technical terms that successful mood induction techniques cognitively activate ("prime") positive or negative evaluative meaning more strongly than specific descriptive information. It is not necessarily the specific descriptive content of the memories one recalls, the movie one watches, or the music one listens to that makes one feel good or bad. After all, a memory, movie, or piece of music cannot affect one's mood. Specific content does not matter: It is the global, diffuse, nonspecific, overall evaluative tone that is primed while one is recalling memories that produces mood effects. Taking this notion to its extreme, one could argue that whenever the evaluative features of cognitively activated ("primed") information strongly dominate the descriptive meaning, mood states are likely to be affected. When the evaluative meaning of primed information dominates the descriptive information, then mood states are likely to be affected.

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[1] See Hugenberg (2005) and Stapel and Koomen (2005) for a similar use of the term *evaluative tone*.

All that is needed to induce a mood state is the dominating activation of diffuse, nondescriptive, evaluative information. In short, all you need is evaluative tone. Thus, although intense, long, conscious exposure to or experience of mood-relevant stimuli may be a sufficient precondition for the production of mood effects, it is not a necessary precondition.

A Cold Recipe for Hot Mood Effects

A highly relevant question for defining the essential ingredients for producing mood effects is whether it is necessary to expose people to hot emotional material like music and movies or whether it is possible to elicit mood states by exposing people to cold semantic concepts. Some mood effects are easy to explain in terms of the activation of declarative knowledge (i.e., semantic priming). For instance, the retrieval of a positive experience can encourage the recollection of other positive autobiographical memories by semantic association. However, content-free mood effects such as the influence of Barber's "Adagio for Strings" on people's processing style are more difficult to explain without the assumption of a hot mood state.

To investigate the influence of hot states versus cold concepts, Innes-Ker and Niedenthal (2002) directly compared the effects of hot emotional states ("I feel happy" vs. "I feel sad") versus cold emotion concepts (happy vs. sad) on subsequent social judgments. In one study, those researchers showed that priming cold emotion concepts increased the cognitive accessibility of congruent emotion concepts but had no impact on the emotional state of the participants. Another study showed that priming an emotional state (induced by music) influenced self-reported feelings and produced emotion-congruent judgments of an ambiguous target person whose feelings could either be interpreted in terms of happiness or sadness. The priming of emotional concepts had no such effects.

Innes-Ker and Niedenthal (2002) took their results to mean that the mere activation of cold concepts is not sufficient to produce hot emotional states in the perceiver and that the presence of a hot emotional state is necessary to produce emotion-congruent judgments (see also Maringer & Stapel, 2007). Such an interpretation of their results is definitely warranted as well as intuitively appealing. It makes sense that mere priming of emotional concepts like "happy" and "uplifting" versus "sad" and "melancholy" is less likely to affect people's mood states than listening to happy, uplifting music or sad, depressing music.

The question remains, however, what exactly it is then that makes this hot mood induction procedure, in fact, "hot"? Applying the present evaluative-tone perspective, we propose that it is the global evaluative tone of information activated through so-called hot induction procedures versus activation of specific descriptive meaning of so-called cold induction procedures that makes the difference. We thus argue that movies or music are often more effectively used to induce mood effects because, with these techniques, global nonspecific evaluative information is more strongly activated than its concrete specific descriptive counterpart. Priming specific emotion concepts is probably less successful because it is likely that the descriptive meaning of the primed concepts will overshadow their evaluative tone. Thus, we argue, when evaluative as well as descriptive information is activated, mood effects are less likely than when merely or mainly evaluative information is activated. When evaluative as well as descriptive information is activated, the evaluative tone is no longer diffuse because in that case it becomes bound to the descriptive information.

Although one can use this *all-you-need-is-evaluative-tone* logic to explain the variable successfulness of hot versus cold priming techniques to produce actual changes in mood states, one should not take this to mean that it is impossible for cold priming techniques to produce mood effects. Rather, our logic suggests that it should be possible for cold concept priming to produce mood effects, given that the evaluative side of a stimulus or concept can be primed without activating its descriptive features. In other words, when exposure to cold concepts activates information that is cognitively unconstrained (i.e., without descriptive meaning, Clore & Colcombe, 2003), mood effects should be possible. Thus, when priming *honest* versus *dishonest* activates merely or mainly the cognitively unconstrained, evaluative meaning of these words (positive vs. negative) rather than their evaluative + descriptive meaning (friendly vs. aggressive), mood effects should occur.

The question is then, under what circumstances, does stimulus exposure result in a relatively strong activation of evaluative (rather than evaluative + descriptive) information? Affective primacy theory (Zajonc, 1980) provides a possible answer to this question because it holds that when people are exposed to a stimulus, affective reactions (i.e., reactions based on an evaluation of the stimulus) occur prior to nonaffective reactions (i.e., reactions based on descriptive stimulus features). This theory has received support from neurological research showing that independent systems exist for coarse evaluative processing and detailed perceptual processing (e.g., Adolphs, 2003; LeDoux, 1989; Zajonc, 2000). The primacy of affective processing was recently corroborated by researchers studying event-related brain potentials in response to emotional faces (Palermo & Rhodes, 2007). This work shows that crude affective categorization can often occur rapidly, whereas fine-grained processes necessary for recognition of the identity of a face or for discriminatation between basic emotional expressions typically need more time.

This suggests, as Stapel et al. (2002) have recently shown that even in the realm of subliminal perception, it is indeed possible to separate evaluation-based and description-based reactions to stimuli (see also Ruys & Stapel, in press–a, in press–b). Stapel and colleagues (2002) demonstrated that when a picture of a happy female face is primed subliminally, evaluative reactions ("positive") are typically triggered earlier than descriptive reactions ("female"), but neither type of reaction needs awareness to occur. Similarly, when primed with the words *honest* versus *dishonest*, people pick up the evaluative meaning of these words (positive vs. negative) prior to their descriptive meaning (honest vs. dishonest; see also Bargh, Litt, Pratto, & Spielman, 1989; Stapel & Koomen, 2005). Thus, both evaluative and descriptive stimulus cues can be detected without awareness, but evaluative cues are often detected earlier (Stapel, 2003).

The notion that descriptive meaning is picked up later than evaluative meaning has important consequences for the question of whether (unconsciously) primed cold concepts such as "happy," "friendly," and "honest" or "sad," "aggressive," and "dishonest" can affect mood states. As Zajonc's (1980) affective primacy hypothesis suggests and recent work on unconscious affect priming (Ruys & Stapel, in press–a, in press–b; Stapel et al., 2002; Stapel & Koomen, 2005, 2006) demonstrates, when one is subliminally priming concepts (e.g., honest vs. dishonest), exposure

time may determine what type of information is actually activated. At very short exposures, the evaluative meaning or tone of these concepts is activated (positive vs. negative). At longer exposures, however, both the descriptive and the evaluative meaning may become available (e.g., honest vs. dishonest). This implies that not only subliminally presented, emotionally charged primes (e.g., happy faces vs. sad faces) but also less emotional, colder primes (e.g., honest vs. dishonest) may affect mood judgments, given that these primes are flashed sufficiently quickly to activate mainly their evaluative tone (see Stapel et al., 2002).

In sum then, cold concept priming may produce mood effects when the evaluative meaning of these concepts is more salient and more strongly activated than their descriptive meaning. Zajonc's (1980) affective primacy theory suggests that one way to achieve this is by flashing concepts sufficiently quickly such that mainly their evaluative tone is activated (see Stapel & Koomen, 2005; Stapel et al., 2002). The increased activation of information that is merely or mainly evaluative and thus diffuse and cognitively unbounded may then spill over to people's moods (Zajonc, 1980, 2000). In the words of Clore and Colcombe (2003), "[R]epeated suboptimal presentation of positive or negative stimuli activates evaluative meaning. Being objectless, it may become attached to whatever comes to mind next" (p. 343). Thus, objectless evaluative meaning may also become attached to a person's mood. On a more general level, Bargh (1997, 2006) has noted and demonstrated repeatedly that the cognitive activation of semantic concepts is likely to simultaneously impact all kinds of psychological systems. Priming "aggressive" or "old" may influence perception, motivation, behavior, and evaluation. Interaction and exchange between the different psychological systems (Treisman, 1996) may further explain why the cognitive activation of evaluatively toned information may affect and color a person's mood state.

The Present Studies

In the present studies, we tested our all-you-need-is-evaluative-tone hypothesis, using the same subliminal priming paradigm that we have used in prior work (Stapel & Koomen, 2005, 2006; Stapel et al., 2002). As these recent studies on the affective primacy hypothesis have suggested, nondescriptive, nonspecific evaluative stimulus features are especially likely to be picked up when stimulus exposure is very short. Our logic thus suggests—perhaps somewhat counterintuitively—that mood effects from cold concept priming are especially likely when priming occurs unconsciously. However, the aim of the present research was not only to show that subliminally presented information may produce mood effects but also to test some of the boundary conditions of these effects. In accordance with Clore and Colcombe (2003) and Zajonc (1980; see also Stapel et al., 2002), we hypothesized that when priming activates information that has a strong evaluative tone and is cognitively unconstrained, people's moods may be affected. Because of this influence, even cold concept priming may induce mood effects, as long as the evaluative tone is sufficiently strong and salient.

We investigated our evaluative-tone hypothesis with a variety of mood measures: We examined several indicators of people's explicit mood judgments and information-processing styles. A multitude of mood measures is crucial to revealing the bare essentials of mood induction. However, central for the occurrence of a positive or negative affective state is the conscious experience of positive or negative feelings (e.g., Clore, Storbeck, Robinson, & Centerbar, 2005). Thus, in Study 1a and Study 1b, we started by examining explicit mood judgments and asking people how positive or negative their mood was at the current moment. In Studies 2-4, we turned to more indirect measures of mood, in addition to our explicit mood measure. A well-known indirect consequence of moods is that they may influence people's processing styles: When people feel good, they are more likely to rely on heuristic, easy, and global processing strategies, whereas when people feel bad, they tend to use more demanding, systematic, and local processing strategies (Fiedler, 1990, 1991; Forgas, 1995; Gaspar & Clore, 2002). Thus, in the present research, we also focused on people's processing styles as a measure of people's mood states.

Study 1

Study 1a

We started the investigation of our all-you-need-is-evaluative-tone hypothesis with a study of the impact of subliminally primed trait concepts on explicit mood judgments. We expected that when prime exposures were short, explicit mood judgments might be affected by the evaluative tone of the primes. However, when prime exposures were long, explicit mood judgments might not be affected because the activation of descriptive meaning could overshadow the evaluative tone. We measured mood immediately after the priming episode by asking people how positive or negative their mood was at that moment.

Method

Participants, design, priming stimuli, and measures. Participants ($N = 98$) were undergraduates who took part in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: long or short) $\times$ 2 (prime valence: positive or negative) between-participant design or to a control condition, in which participants were subliminally primed with neutral traits.

Overview. Upon arrival, participants were shown into one of eight cubicles in the experimental room and seated in front of a computer. They were then told that they would be involved in a series of unrelated studies. First, participants performed a parafoveal vigilance task (modeled after a task used by Stapel et al., 2002) in which trait concepts were presented outside of participants' awareness. Participants were told 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 thanked for their participation and given the next task. The experimenter told participants, "A colleague of mine, from another university, would like you to complete this simple questionnaire." Participants were then given a one-page one-question ("Rate how positive or negative your mood is at this moment") questionnaire that measured mood; they responded using a scale ranging from 1 (*negative*) to 7 (*positive*). 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 Stapel et al., 2002). Finally, participants were thanked and debriefed.

Priming. The priming task was modeled after Stapel et al.'s (2002) parafoveal priming task. Once participants were seated in front of their computer, the experimenter explained the vigilance task. Participants were seated so that the distance between their eyes and the computer screen was 80–100 cm. This distance ensured that the priming stimuli were presented outside of participants' perceptual field. The experimenter then instructed participants to place their index fingers on two 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. 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 10 min to complete.

Priming stimuli were trait concepts that were printed in black Times New Roman letters (12 point) printed on a white screen. The words that were flashed in the 10 practice trials and in 40 of the experimental trials were neutral words (e.g., "table," "chair," "tree"). In the remaining 20 experimental trials, in the positive priming conditions, the following words were each flashed five times: "confident," "persistent," "honest," "pleasant." In the negative priming conditions, the following words were each flashed five times: "arrogant," "stubborn," "dishonest," "wrong." The order in which these words were flashed was random. In the long conditions, words were flashed for 120 ms. In the short conditions, words were flashed for 40 ms. In all conditions, these words were immediately followed by a 120-ms mask (for details, see Stapel et al., 2002).

Awareness and suspicion. Previous subliminal priming studies have shown that the paradigm used here provides sufficient safeguards to prevent participants from becoming aware of the priming stimuli (see Chartrand & Bargh, 1996; Erdley & D'Agostino, 1988; Stapel et al., 2002). However, to ensure that 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 (see Stapel et al., 2002). Participants 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 might have affected their performance on a 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 words, they were further probed for general or specific meaning of these words. Next, in several multiple-choice trials, participants were given the priming stimuli used in this experiment (the positive words or the negative words) and were told that at some of the trials, one of those words was flashed. Participants were then asked to choose (guess) which word was flashed. All participants reported that they had seen flashes. Although some reported seeing "words," no participant could report on the contents of the primes. Furthermore, participants' guesses of which of the two words they had seen did not exceed chance, nor did they differ between conditions ($Fs < 1$). 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 judgment tasks. This was also true for the other studies presented here, in which we used the same paradigm as in the present study.

Results

A Prime Valence × Prime Exposure analysis of variance (ANOVA) on the mood measurement revealed the predicted interaction, $F(1, 76) = 3.94$, $p < .05$, $\eta^2 = .05$. The two main effects did not reach significance ($Fs < 1$). As can be seen in Table 1, the interaction effect reflects that, as expected, in the short exposure conditions, participants in the positive priming condition reported feeling more positive ($M = 5.60$, $SD = 1.05$) than participants in the negative priming condition ($M = 4.90$, $SD = 1.02$), $F(1, 76) = 4.43$, $p < .05$, $\eta^2 = .06$, whereas in the long exposure conditions, priming had no effect on experienced affect ($F < 1$). In those conditions, participants' mood judgments were similar to those in the control condition ($M = 5.28$, $SD = 1.13$).

In addition, to provide an overall test of the predicted pattern of results including the control condition, we performed a contrast analysis. On the basis of the predictions, we assigned weights of 1 to the cells that we expected not to differ (the long positive, long negative, and control conditions), a weight of 4 to the cell in which we expected the most positive mood (the short positive condition), and a weight of −7 to the cell in which we expected the most negative mood (the short negative condition). It should be noted that this a priori contrast reached significance, $t(93) = 2.01$, $p < .05$. We also performed two contrast analyses to directly compare the short exposure conditions with the control condition. Unfortunately, neither contrast—one comparing positive with control, $t(93) = 0.91$, $p = .37$, and one comparing negative with control, $t(93) = 1.08$, $p = .29$—reached significance. To test whether the conditions in which we did not expect mood changes to occur (the long exposure conditions) differed from the control condition, we performed two additional contrast analyses. As expected, neither contrast—one comparing positive with control, $t(93) = 0.48$, $p = .64$, and one comparing negative with control, $t(93) = 0.21$, $p = .84$—was significant.

The results of Study 1a showed that short subliminal exposures to valenced concepts are more likely to influence people's mood

Table 1
Means and Standard Deviations for Mood Judgments as a Function of Prime Exposure and Prime Valence (Study 1a)

	Prime exposure			
	Long		Short	
Prime valence	*M*	*SD*	*M*	*SD*
Positive	5.10	1.17	5.60	1.05
Negative	5.35	1.04	4.90	1.02

Note. Scale range is from 1 to 7. Higher scores indicate more positive judgments. Mean mood judgment in control condition was 5.28 ($SD = 1.13$).

states than long subliminal exposures to these concepts. This finding supported our hypothesis that a dominating positive or negative evaluative tone is sufficient to elicit a corresponding mood state. However, compared with our control condition, the obtained mood effects were not very strong. Therefore, we conducted Study 1b.

Study 1b

This study replicated Study 1a with a more extensive explicit mood measure, the Brief Mood Inspection Scale (BMIS; Mayer & Gaschke, 1988). In addition, we investigated whether our mood effects could be explained in terms of response mode effects. Therefore, participants also rated themselves and a good friend on specific trait dimensions. We expected that in contrast to the mood judgments, these self and other trait ratings would be unaffected by the subliminally presented trait terms because the judgments would be relatively specific and descriptive (see Keltner, Locke, & Audrain, 1993).

Method

Participants ($N = 65$) were undergraduates who took part in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: long or short) × 2 (prime valence: positive or negative) between-participant design or to a control condition, in which participants were subliminally primed with neutral traits.

The procedure was similar to that used in Study 1a. However, different dependent measures were used. Immediately after the priming procedure, participants completed a self-report measure of emotional state that consisted of selected items from the BMIS. This scale listed nine feeling states: five positive states ("happy," "content," "preppy," "lively," "active") and four negative states ("sad," "gloomy," "tired," "drowsy"). Participants indicated how much they were feeling each state using a scale ranging from 1 (*definitely do not feel*) to 9 (*definitely do feel*). After participants had completed this mood inspection scale, we asked them to rate themselves and a "good (same sex) friend" on the rating dimensions of "friendly," "smart," "physically attractive," and "athletic," using a scale ranging from 1 (*not at all applicable*) to 7 (*very applicable*). The order of the mood inspection scale on the one hand and the self and good friend ratings on the other hand were counterbalanced to control for possible order effects.

Results and Discussion

ANOVAs showed no main or interaction effects of the "order of measures" variable on any of the dependent measures ($Fs < 1$). ANOVAs also showed that there were no main or interaction effects of the primed information on participants' self-ratings or ratings of participants' friends ($Fs < 1$), indicating that self-ratings or other-ratings on specific trait dimensions (friendly, smart, physically attractive, athletic) were not affected by subliminally primed trait concepts, independent of whether prime exposure time was relatively short or long.

Reliability analyses of the nine items on the mood inspection scale were conducted (after reverse scoring the four negative items) to form a composite scale (Cronbach's $\alpha = .82$). A Prime Valence × Prime Exposure ANOVA on this measure revealed the predicted interaction, $F(1, 45) = 4.21$, $p < .05$, $\eta^2 = .09$. The two main effects did not reach significance ($ps > .17$). As can be seen in Table 2, the interaction effect reflects that, as expected, in the short exposure conditions, participants in the positive condition reported feeling more positive ($M = 7.00$, $SD = 0.74$) than participants in the negative condition ($M = 6.15$, $SD = 0.98$), $F(1, 47) = 6.18$, $p < .05$, $\eta^2 = .12$, whereas in the long exposure conditions, priming had no effect on experienced affect ($F < 1$). In those conditions, participants' mood judgments were similar to those of in the control condition ($M = 6.61$, $SD = 1.01$).

We performed a contrast analysis to provide an overall test of the predicted pattern of results. Using the same weights as in Study 1a, we found that the a priori contrast was significant, $t(60) = 2.13$, $p < .05$. In addition, we performed two contrast analyses to directly compare the short exposure conditions to the control condition. However, both contrasts—one comparing positive with control, $t(60) = 1.11$, $p = .27$, and one comparing negative with control, $t(60) = 1.36$, $p = .18$—did not reach significance. We also conducted two additional contrasts, testing the control condition against the long exposure conditions. As predicted these contrasts—one comparing positive with control, $t(60) = .56$, $p = .58$, and one comparing negative with control, $t(60) = 0.07$, $p = .94$—were not significant.

Together, the findings of Study 1a and Study 1b support the idea that a dominating positive or negative evaluative tone may elicit a corresponding mood state. Specifically, subliminal exposure to valenced (trait) information is most likely to affect mood judgments when prime exposures are sufficiently short to activate evaluative reactions that have no specific descriptive content. Thus, these two studies suggest that not all subliminal priming effects are created equal. They show that sometimes longer primes have less impact. The longer one is exposed to evaluatively toned trait information, the less likely it is that such traits may affect one's mood. The results of Study 1b suggest that such carryover effects are most likely to occur on relatively general and evaluative mood judgments but not on relatively specific descriptive self-judgments and other-person judgments. This suggests that subliminally activated affective information is most likely to spill over into conscious judgment when the target of this judgment is evaluatively ambiguous (see also Stapel et al., 2002).

In sum, Study 1a and Study 1b provide the first evidence for our all-you-need-is-evaluative-tone hypothesis. We showed that eval-

Table 2
Means and Standard Deviations of Scores for Items on Brief Mood Inspection Scale as a Function of Prime Exposure and Prime Valence (Study 1b)

	Prime exposure			
	Long		Short	
Prime valence	*M*	*SD*	*M*	*SD*
Positive	6.42	0.90	7.00	0.74
Negative	6.58	0.79	6.15	0.98

Note. Scale range is from 1 to 9. Higher scores indicate more positive judgments. Mean mood judgment in control condition was 6.61 ($SD = 1.01$).

uative tone was critical in influencing people's explicit mood judgments. However, we needed additional evidence for several reasons: First, the mood effects were not very strong (compared with control conditions) in either study. Second, to increase the generalizability of our hypothesis, we also needed to demonstrate these effects on indirect mood measures. Third, our mood effects could be explained in terms of semantic priming. The exposure to positive (or negative) concepts during the priming episode could have activated other related positive (or negative) concepts in memory, for instance, concepts representing positive (or negative) affective states. This might have increased the tendency for participants to agree with experiencing these positive (or negative) states. To address these three issues, we performed Study 2.

Study 2

An interesting consequence of moods is their impact on people's processing styles. Several studies have shown that people who feel good tend to rely on heuristic, easy, and global processing strategies, whereas people who feel bad are more likely to use demanding, systematic, and local processing strategies (Fiedler, 1990, 1991; Forgas, 1995; Gaspar & Clore, 2002). Thus, for example, people dining out in a restaurant tend to choose the "surprise of the chef" when they are in a good mood but tend to scrutinize the menu and analyze the ingredients of each course in detail before making a choice when they are in a bad mood. Fiedler (2001) has aptly explained the differences between the two processing styles in his adaptive learning viewpoint, which assumes that the processing styles associated with positive and negative moods have respectively evolved in appetitive and aversive situations to cope most effectively with the demands of the situation.[2] A friendly, appetitive situation demands exploratory and knowledge-driven processing. A threatening, aversive situation requires careful and more systematic processing strategies.

Although semantic priming could serve as alternative explanation for the results in Study 1, semantic priming cannot easily explain mood effects on people's information-processing styles. For this reason, we mainly focused on mood effects related to information processing to advance our evaluative-tone hypothesis. In Study 2, we explored and further tested the effects of mood on people's need for cognition. Previous research has assumed that "individuals high in need for cognition naturally tend to seek, acquire, think about, and reflect back on information to make sense of stimuli, relationships, and events in their world; individuals low in need for cognition, in contrast, are more likely to rely on others (e.g., experts), cognitive heuristics, or social comparisons to provide this structure" (Cacioppo, Petty, Feinstein, & Jarvis, 1996, p. 243).

Although need for cognition has often been shown to be a stable personality trait that one can measure reliably with a personality scale (Cacioppo & Petty, 1981; Cacioppo et al., 1996), there are no indications that need for cognition is also (at least to a certain extent) context dependent. The features that characterize how people process information as a function of their need for cognition remind us of the two processing styles between which, according to most dual-process models, people alternate depending on the situation: a systematic, effortful information-processing style and a heuristic, easy information-processing style (e.g., Chaiken, 1980; Petty & Caccioppo, 1986). In a similar vein, we expected that people's need for cognition could depend on situational factors. We proposed that analogous to the effect of mood on people's information-processing styles (i.e., more systematic information processing in a negative mood and more heuristic processing in a positive mood), people may experience a higher need for cognition when they feel bad than when they feel good. Thus, need for cognition may indirectly reflect people's mood states.

In Study 2, we used need for cognition to show that a dominating evaluative tone is also essential in evoking effects on indirect mood measures. Before turning to this main objective, we conducted a pretest to demonstrate that a well-known conscious mood induction technique (recalling positive or negative life events) indeed affects individuals' need for cognition. The aim of this pretest was thus to show that people's mood states affect their need for cognition.

Pretest

Participants, Design, Mood Induction, and Measures

Participants ($N = 38$) were undergraduates who took part for partial course credit. The participants were randomly assigned to the conditions of a three-factor (mood induction: positive, negative, or neutral) between-participant design.

Participants received a booklet consisting of the mood induction, the need-for-cognition items, and a mood question. We asked them, dependent on the mood induction condition, to remember a positive, a negative, or a neutral event from the past and to try to relive this experience (see, for instance, Bless et al., 1996; Fiedler & Stroehm, 1986, who have successfully used a similar procedure to induce mood). Then, participants completed the following four need-for-cognition items (selected from the Need for Cognition Scale, Cacioppo & Petty, 1982), using a scale ranging from 1 (*completely disagree*) to 5 (*completely agree*): "The idea of relying on thought to make my way to the top appeals to me"; "I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought"; "Thinking is not my idea of fun" (reverse coded); and "Learning new ways to think doesn't excite me very much" (reverse coded). We selected four representative items because of time concerns. Next, participants received the same mood question as in Study 1a.

Results

A mood induction ANOVA performed on the mood question demonstrated that our mood induction method was indeed successful, $F(2, 57) = 6.33$, $p < .01$, $\eta^2 = .27$. A further contrast analysis showed that participants who remembered and relived a positive life event indicated that they felt more positive ($M = 5.00$, $SD = 0.89$) than participants who remembered and relived a negative event ($M = 3.46$, $SD = 1.20$), with mood rating of the

[2] Note that although the typical finding is that people in a good mood rely more on heuristic, global processing strategies and people in a bad mood rely more on systematic, detailed ways of processing, researchers also have reported more complex findings. For example, mood can have motivational consequences because of mood management pressures during positive, negative, and neutral mood states (Gervey, Igou, & Trope, 2005; Isen, 1987; Wegener & Petty, 1994).

participants in the neutral condition lying between these two extremes ($M = 4.43$, $SD = 1.09$), $t(35) = 3.53$, $p < .05$.

Reliability analyses of the four need-for-cognition items were conducted to form a composite scale (Cronbach's $\alpha = .87$). A mood induction ANOVA on this measure revealed the predicted main effect, $F(2, 57) = 4.62$, $p < .05$, $\eta^2 = .21$. A contrast analysis showed that, as expected, in the negative mood condition, participants reported a higher need for cognition ($M = 4.23$, $SD = 0.97$) than participants from the positive mood condition ($M = 3.21$, $SD = 0.99$), with the neutral condition lying between these two extremes ($M = 3.59$, $SD = 0.53$), $t(35) = 3.02$, $p < .05$). Further analyses showed that the partial correlation (controlling for experimental condition) for these two dependent measures was high, $r = .80$ ($p < .01$).

Method

Participants ($N = 60$) were undergraduates who took part in the study for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: long or short) × 2 (prime valence: positive or negative) between-participant design or to a control condition, in which participants were subliminally primed with neutral traits.

The procedure was similar to that used in Study 1a. However, different dependent measures were used. Immediately after the priming procedure, participants completed the four need-for-cognition items that were used in the pretest. We again included a mood question to determine whether our mood induction worked.

Results and Discussion

A Prime Valence × Prime Exposure ANOVA on the need-for-cognition composite scale (Cronbach's $\alpha = .85$) revealed the predicted interaction, $F(1, 44) = 4.80$, $p < .05$, $\eta^2 = .10$, and a main effect of prime valence, $F(1, 44) = 6.97$, $p < .05$, $\eta^2 = .14$. There was no effect of prime exposure ($F < 1$). As can be seen in Table 3, the interaction effect reflects that, as expected, in the short exposure conditions, participants in the positive condition reported a lower need for cognition ($M = 3.13$, $SD = 0.49$) than participants in the negative condition ($M = 4.27$, $SD = 1.07$), $F(1, 46) = 12.04$, $p < .01$, $\eta^2 = .21$, whereas in the long exposure conditions, priming had no effect on reported need for cognition ($F < 1$). In those conditions, participants' need for cognition judgments were similar ($Fs < 1$) to those in the control condition ($M = 3.63$, $SD = 0.53$). To provide an overall test of the predicted pattern of results, we additionally performed a contrast analysis. On the basis of the predictions, we assigned weights of 1 to the cells that we expected not to differ (the long positive, long negative, and control conditions), a weight of 4 to the cell in which we expected the highest need for cognition (the short negative condition), and a weight of −7 to the cell in which we expected the lowest need for cognition (the short positive condition). This a priori contrast was highly significant, $t(55) = 3.58$, $p < .05$. In addition, we performed two contrast analyses to directly compare the short exposure conditions with the control condition. The contrast comparing positive with control reached significance, $t(55) = 2.40$, $p < .05$, whereas the contrast comparing negative with control was marginal, $t(55) = 1.87$, $p = .08$. We also tested whether the long exposure conditions differed from the control condition. As predicted, these two contrasts—one comparing positive with control, $t(55) = 0.53$, $p = .60$, and one comparing negative with control, $t(55) = 0.18$, $p = .86$—were not significant.

Table 3
Means and Standard Deviations of Scores for Items on Need for Cognition Scale and for Mood Judgments as a Function of Prime Exposure and Prime Valence (Study 2)

	Prime exposure			
	Long		Short	
Prime valence	*M*	*SD*	*M*	*SD*
	Need for cognition score			
Positive	3.46	0.59	3.13	0.49
Negative	3.57	1.00	4.27	1.07
	Mood judgment			
Positive	4.85	0.90	5.42	0.79
Negative	4.73	1.01	3.83	0.94

Note. The Need for Cognition Scale ranges from 1 to 5. Higher scores indicate a higher need for cognition. Mean need for cognition score in control condition was 3.63 ($SD = 0.53$). The mood judgment scale ranges from 1 to 7. Higher scores indicate more positive judgments. Mean mood judgment in control condition was 4.67 ($SD = 0.78$).

A Prime Valence × Prime Exposure ANOVA on the mood judgments also revealed the predicted interaction, $F(1, 44) = 7.74$, $p < .01$, $\eta^2 = .15$, and a main effect of prime valence, $F(1, 44) = 10.45$, $p < .01$, $\eta^2 = .19$. There was no effect of prime exposure ($F < 1$). The means and standard deviations are depicted in Table 3. Equivalent to the pattern of results for need for cognition, the interaction effect indicated that for the short exposure conditions, participants in the positive condition reported feeling more positive ($M = 5.42$, $SD = 0.79$) than participants in the negative condition ($M = 3.83$, $SD = 0.94$), $F(1, 46) = 18.76$, $p < .01$, $\eta^2 = .29$, whereas for the long exposure conditions, priming had no effect on experienced affect ($F < 1$). Again in those conditions, participants' mood judgments were similar ($Fs < 1$) to those in the control condition ($M = 4.67$, $SD = 0.78$). To provide an overall test of the predicted pattern of results, we performed a contrast analysis (with the same weights as in Study 1a) that was significant, $t(55) = 4.22$, $p < .05$. Contrast analyses comparing the control condition with the short positive condition, $t(55) = 2.08$, $p < .05$, and comparing the control condition with the short negative condition, $t(55) = 2.31$, $p < .05$, were also significant. Additional contrast analyses showed that in line with our hypotheses, neither the long positive condition, $t(55) = 0.51$, $p = .62$, nor the long negative condition, $t(55) = 0.16$, $p < .87$, differed from the control condition.

Further analyses showed that the partial correlation (controlling for experimental condition) for our two dependent measures was high, $r = .62$ ($p < .01$). This allowed us to test the robustness of our findings by computing a composite scale of the *z*-transformed need-for-cognition scores and the recoded and then *z*-transformed mood judgments. We performed the same contrast analyses as described earlier on our composite scale. A contrast analysis testing the expected overall pattern of results was highly signifi-

cant, $t(55) = 4.24$, $p < .05$. Contrast analyses performed to compare the short positive conditions with control and the short negative conditions with control were also significant, $t(55) = 2.17$, $p < .05$, and $t(55) = 2.58$, $p < .05$, respectively. Again as expected, additional contrast analyses showed that neither the long positive condition, $t(55) = 0.62$, $p = .54$, nor the long negative condition, $t(55) = 0.20$, $p < .84$, differed from the control condition.

The results thus show that when prime exposures are short, the evaluative tone of the primes affects people's reported need for cognition, whereas when prime exposures are long, the evaluative tone of the primes does not affect people's reported need for cognition. The same pattern of results was obtained on the mood question. These findings indicate that need for cognition is a stable personality trait that also depends on situational factors like mood. More important for the present purposes, people may experience a higher need for cognition when they feel bad than when they feel good. This finding is equivalent to mood effects on people's information-processing styles.

In sum, Study 2 provides support for our evaluative-tone hypothesis on an indirect mood measure. Thus far, we have demonstrated mood effects when prime exposure is relatively short. The results of Studies 1a, 1b, and 2 strongly suggest that under short exposure conditions, primarily the evaluative tone of the primed information is activated. However, the evaluative-tone logic also suggests another possible method of testing our hypothesis. An alternate way to manipulate the dominance of evaluative tone would be to use primed concepts that are sufficiently extreme in evaluative tone to dominate descriptive meaning, independent of whether prime exposure is extremely or moderately short. Thus, to expand our evidence, we tested this implication of our line of reasoning in Study 3.

Study 3

In this study, we demonstrated in a different way that evaluative tone is essential to induce a mood state. What is crucial in our all-you-need-is-evaluative-tone hypothesis is that evaluative cues of a concept are more salient, or more strongly activated, than are its descriptive cues. One way to achieve this state is to present the information for a sufficiently short duration that primarily the evaluative features are activated (Stapel et al., 2002), which we did in Studies 1a, 1b, and 2. Another way to achieve this is to use concepts that are extreme in their valence and thus strong in their (un)desirability (see Stapel & Koomen, 2000). Such concepts have a strong evaluative meaning that could dominate their specific descriptive meaning. Extremely valenced concepts, such as "wonderful" versus "horrific," for example, have a strong evaluative tone (i.e., positive vs. negative), whereas moderately valenced concepts, such as "pleasant" versus "unpleasant," although perhaps similarly specific in their descriptive meaning (see Hampson, John, & Goldberg, 1986; Stapel & Koomen, 2000), have a weaker evaluative tone. We therefore expected that when extremely valenced concepts were primed (i.e., with short and long exposures), their evaluative tone would be more likely to dominate their descriptive meaning and thus yield mood effects than when moderately valenced concepts were primed.

In the present study, we primed participants with trait concepts of extreme valence or with trait concepts of moderate valence, both under relatively long but subliminal exposure. Prime exposure duration was the same in all conditions and was similar to the long exposure conditions of Study 1a, 1b, and 2. In contrast to these previous studies, we expected that the relatively longer exposures to trait concepts might affect people's moods but only when the evaluative tone was sufficiently dominant. Therefore, this priming should only work with extreme traits.

Method

Participants ($N = 57$) were undergraduates who took part for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime extremity: moderate or extreme) $\times$ 2 (prime valence: positive or negative) between-participant design or to a control condition in which participants were subliminally primed with neutral traits.

The priming stimuli presented in the experimental trials were trait concepts with a moderate or extreme valence, taken from (and pretested by) Stapel and Koomen (2000). In the moderately positive priming condition, the following words were each flashed on the computer screen five times: "thrifty," "reasonable," "agreeable," "pleasant." In the extremely positive priming condition, the following words were each flashed five times: "wonderful," "sweet," "good," "positive." In the moderately negative priming condition, the following words were each flashed five times: "stingy," "weak," "plain," "unpleasant." In the extremely negative priming condition, the following words were each flashed five times: "horrific," "cruel," "bad," "negative."

The procedure was similar to that used in Study 1a, except that the time participants were exposed to the primes was always long (120 ms). The dependent measures were similar to those in Study 2: Participants reported their need for cognition and indicated to what extent they felt positive or negative.

Results

A Prime Valence $\times$ Prime Extremity ANOVA on the need-for-cognition composite scale (Cronbach's $\alpha = .83$) revealed the predicted interaction, $F(1, 41) = 5.28$, $p < .05$, $\eta^2 = .11$, and a main effect of prime valence, $F(1, 41) = 6.62$, $p < .05$, $\eta^2 = .14$. There was no effect of extremity ($F < 1$). As can be seen in Table 4, the interaction effect reflects that, as expected, when the prime words were extreme, participants in the positive condition reported a lower need for cognition ($M = 3.07$, $SD = 0.56$) than participants in the negative condition ($M = 4.27$, $SD = 1.07$), $F(1, 43) = 12.66$, $p < .01$, $\eta^2 = .23$, whereas when the prime words were moderate, priming had no effect on reported need for cognition ($F < 1$). In those conditions, participants' need-for-cognition judgments were similar ($Fs < 1$) to those in the control condition ($M = 3.56$, $SD = 0.59$). To provide an overall test of the predicted pattern of results, we also performed a contrast analysis. On the basis of the predictions, we assigned weights of 1 to the cells that we expected not to differ (the moderate positive, moderate negative, and control conditions), a weight of 4 to the cell in which we expected the highest need for cognition (the extreme negative condition), and a weight of -7 to the cell in which we expected the lowest need for cognition (the extreme positive condition). This a priori contrast reached significance, $t(52) = 3.76$, $p < .05$. Contrast analyses performed to compare the extreme positive condition

Table 4
Means and Standard Deviations of Scores for Items on Need for Cognition Scale and for Mood Judgments as a Function of Prime Extremity and Prime Valence (Study 3)

	Prime extremity			
	Moderate		Extreme	
Prime valence	*M*	*SD*	*M*	*SD*
	Need for cognition score			
Positive	3.86	0.64	3.07	0.56
Negative	3.75	0.90	4.27	1.07
	Mood judgment			
Positive	4.55	0.82	5.27	1.01
Negative	4.64	0.92	4.08	1.17

Note. The Need for Cognition Scale ranges from 1 to 5. Higher scores indicate a higher need for cognition. Mean need for cognition score in control condition was 3.56 ($SD = 0.59$). The mood judgment scale ranges from 1 to 7. Higher scores indicate more positive judgments. Mean mood judgment in control condition was 4.58 ($SD = 0.79$).

with control and the extreme negative condition with control were respectively significant, $t(52) = 2.07$, $p < .05$, and marginal, $t(52) = 2.01$, $p = .06$. As expected, additional contrast analyses testing the moderate positive condition against control and the moderate negative condition against control were not significant, $t(52) = 0.37$, $p = .72$ and $t(52) = 0.57$, $p = .57$ respectively.

A Prime Valence × Prime Extremity ANOVA on the mood judgments also revealed the predicted interaction, $F(1, 41) = 4.68$, $p < .05$, $\eta^2 = .10$, and a marginal effect of prime valence, $F(1, 41) = 3.44$, $p = .07$, $\eta^2 = .08$. There was no effect of prime extremity ($F < 1$). The means and standard deviations are depicted in Table 4. Equivalent to the pattern of results for need for cognition, the interaction effect indicates that when the prime words were extreme, participants in the positive condition reported feeling more positive ($M = 5.27$, $SD = 1.01$) than participants in the negative condition ($M = 4.08$, $SD = 1.17$), $F(1, 43) = 8.57$, $p < .01$, $\eta^2 = .17$, whereas when the prime words were moderate, priming had no effect on experienced affect ($F < 1$). Again in those conditions, participants' mood judgments were similar ($Fs < 1$) to those in the control condition ($M = 4.58$, $SD = .79$). We then performed a contrast analysis to provide an overall test of the predicted pattern of results. On the basis of the predictions, we assigned weights of 1 to the cells that we expected not to differ (the moderate positive, moderate negative, and control conditions), a weight of 4 to the cell in which we expected the most positive mood (the extreme positive condition), and a weight of −7 to the cell in which we expected the most negative mood (the extreme negative condition). This a priori contrast reached significance, $t(52) = 2.73$, $p < .05$. Contrast analyses performed to compare the extreme positive condition with control and the extreme negative condition with control were respectively marginal, $t(52) = 1.73$, $p < .09$, and nonsignificant, $t(52) = 1.28$, $p = .21$. We then conducted two additional contrasts, comparing the control condition with conditions in which we did not expect mood changes to occur. As expected, neither analysis—one contrasting moderate positive with control and one contrasting moderate negative with control—was significant, $t(52) = 0.10$, $p = .93$, and $t(52) = 0.13$, $p = .90$, respectively.

Further analyses showed that the partial correlation (controlling for experimental condition) for our two dependent measures (i.e., need for cognition and mood judgment) was high, $r = .62$ ($p < .01$). This allowed us to test the robustness of our findings by computing a composite scale of the *z*-transformed need-for-cognition scores and the recoded and then z-transformed mood judgments. Next, we performed the same contrast analyses as described earlier on our composite scale. The contrast analysis testing the expected overall pattern of results was highly significant, $t(52) = 3.83$, $p < .05$. Contrast analyses performed to compare the extreme positive conditions with control and the extreme negative conditions with control were also significant, $t(52) = 1.97$, $p < .05$, and $t(52) = 2.11$, $p < .05$ respectively. As expected, two additional contrasts comparing moderate positive with control and comparing moderate negative with control were not significant, $t(52) = 0.28$, $p = .78$, and $t(52) = 0.26$, $p = .80$.

The results of this study are important for two reasons: First, the findings replicate the effect of mood on people's reported need for cognition. Second, the results support our evaluative-tone hypothesis because mood was only affected when the evaluative meaning of the primed trait concepts dominated their descriptive meaning. Thus, participants who were primed with extreme positive trait concepts reported a lower need for cognition and indicated they felt better than participants who were primed with extreme negative trait concepts. As expected, reported need for cognition and mood were not affected in participants who were primed with moderate trait concepts.

Together, the first three studies demonstrate that a dominating evaluative tone is essential for influencing people's mood states. We have provided evidence on explicit mood measures and on people's motivations (i.e., need for cognition). To complete the picture, we set as our final goal providing support for our all-you-need-is-evaluative-tone hypothesis using a different processing-style measure than need for cognition. It was in this spirit that we conducted Study 4.

Study 4

As mentioned previously, moods may influence people's processing styles. People are more likely to rely on heuristic, easy, and global processing strategies when they feel good and tend to use more demanding, systematic, and local processing strategies when they feel bad. Bless, Bohner, Schwarz, and Strack (1990) showed the effects of mood on processing style in the realm of persuasion (see also Petty, DeSteno, & Rucker, 2001). The persuasion literature informs us that the impact of argument strength may differ depending on people's processing styles. Strong arguments are more convincing than weak arguments for people who use systematic processing strategies, whereas strong and weak arguments are equally convincing for people who use heuristic processing strategies. Building on these findings, Bless and colleagues (1990) showed that for participants who felt good, argument strength was not important in convincing them. For people in a negative mood, however, argument strength was important: People who felt bad were more influenced by strong rather than weak arguments.

The aim of the current research was to provide support for our evaluative-tone hypothesis on a processing-style measure. We used the impact of argument quality on persuasion to show that a dominating positive evaluative tone leads to a good mood, whereas a dominating negative evaluative tone leads to a bad mood. Thus, because people in a positive mood process information heuristically, they are equally likely to be convinced by weak or strong arguments. People in a negative mood tend to process information systematically and therefore are more likely to be convinced by strong rather than weak arguments. We primed participants with positive or negative trait concepts using long or short subliminal exposures, similar to those used in Studies 1 and 2. After the priming episode, participants were presented with several strong and weak arguments in favor of an attitude object and were then asked to indicate their attitude.

Method

Participants ($N = 108$) were undergraduates who took part in exchange for partial course credit. The participants were randomly assigned to the conditions of a 2 (prime exposure: long or short) × 2 (prime valence: positive or negative) × 2 (argument strength: weak or strong) between-participant design or to a control condition, in which participants were subliminally primed with neutral traits and read strong and weak arguments.

The procedure was similar to that used in Study 1a, but we relied on a different measure of processing style. Immediately after the priming procedure, participants read two arguments in favor of using English as the official language of the Dutch university at which this experiment was conducted. This would mean that all classes would be conducted in English rather than in Dutch. The arguments were pretested to be either strong or weak. The strong arguments were as follows: "If English is the official language, the university can attract more international students, which will increase its status and make it easier to improve facilities and teaching resources" and "The international employability of university graduates will increase if English is the official language." The weak arguments were as follows: "Improving the English of the university's students may be helpful to them on holidays" and "If English is the official language at our university, it will be easier to understand Anglo-Saxon movies and television series."

After reading the strong or weak arguments, participants were asked to indicate their attitude (1 = *completely disagree*, 7 = *completely agree*) toward the statement that it is "a good idea to make English the official language at our university and have all teaching in English." Similar to the procedure in our previous studies, we included a mood question to assess the successfulness of our mood induction. Finally, to check the successfulness of our argument strength manipulation, we asked participants to indicate the strength of the arguments they had read on a 7-point scale ranging from 1 (*completely disagree*) to 7 (*completely agree*).

Results

First, a Prime Valence × Prime Exposure × Argument Strength ANOVA on the argument strength manipulation check revealed that the predicted main effect of argument strength, $F(1, 88) = 55.67$, $p < .01$, $\eta^2 = .39$ (other $Fs < 1$), indicating that the strong arguments were indeed judged as stronger ($M = 5.00$, $SD = 0.83$) than the weak arguments ($M = 3.80$, $SD = .079$).

Next, a Prime Valence × Prime Exposure × Argument Strength ANOVA on the attitude judgment revealed a marginal three-way predicted interaction, $F(1, 88) = 3.32$, $p = .07$, $\eta^2 = .04$, a marginal Prime Valence × Argument Strength effect, $F(1, 88) = 2.82$, $p = .10$, $\eta^2 = .04$, a Prime Valence × Prime Exposure effect, $F(1, 88) = 6.61$, $p < .05$, $\eta^2 = .07$, a prime valence effect, $F(1, 88) = 10.21$, $p < .01$, $\eta^2 = .10$, and an argument strength effect, $F(1, 88) = 21.71$, $p < .01$, $\eta^2 = .20$. As can be seen in Table 5, the pattern of means behind these effects strongly supports our predictions. As expected, in the short exposure conditions, participants' attitudes were similarly positive in the strong ($M = 5.14$, $SD = 0.66$) and weak ($M = 4.86$, $SD = 0.86$) conditions ($F < 1$), whereas in the long exposure conditions, participants' attitudes were more positive in the strong condition ($M = 4.75$, $SD = 0.87$) than in the weak condition ($M = 3.25$, $SD = 0.75$), $F(1, 94) = 15.39$, $p < .01$, $\eta^2 = .14$. In other words, after short negative priming, argument strength mattered (suggesting a negative mood was induced), whereas it did not matter after short positive priming (suggesting that a positive mood was induced). In the long exposure conditions, prime valence had, as predicted, no (main or interaction) effect ($Fs < 1$). Here, strong arguments led to more positive attitudes ($M = 4.78$, $SD = 0.87$) than weak arguments ($M = 4.05$, $SD = 0.90$), $F(1, 94) = 6.07$, $p < .05$, $\eta^2 = .06$. Participants' attitudes in the long exposure–weak arguments conditions were similar ($F < 1$) to participants' attitudes in the control condition ($M = 4.08$, $SD = 0.52$). However, to provide an overall test of the predicted pattern of results, we again performed a contrast analysis. On the basis of the predictions, we assigned weights of 1 to the cells that we expected to have a positive attitude (all strong argument conditions and the short weak positive condition), weights of −1 to the cells in which we expected a relatively negative attitude (the long weak conditions and the control condition), and a weight of −2 to the cell in which we expected the most negative attitude (the short weak negative condition). This a priori contrast was highly significant, $t(99) = 6.87$, $p < .05$.

Table 5
Means and Standard Deviations for Attitude as a Function of Prime Exposure, Argument Strength, and Prime Valence (Study 4)

	Prime exposure			
	Long		Short	
Prime valence	*M*	*SD*	*M*	*SD*
Strong arguments				
Positive	4.82	0.87	5.14	0.66
Negative	4.70	0.95	4.75	0.87
Weak arguments				
Positive	4.08	0.90	4.86	0.86
Negative	4.00	0.94	3.25	0.75

Note. Scale ranges from 1 to 7. Higher scores indicate a more positive attitude. Mean attitude judgment in the control condition was 4.08 ($SD = 0.52$).

A Prime Valence × Prime Exposure × Argument Strength ANOVA on the mood judgments revealed the predicted Prime Valence × Prime Exposure interaction, $F(1, 88) = 19.06$, $p < .01$, $\eta^2 = .18$, and a main effect of prime valence, $F(1, 88) = 15.13$, $p < .01$, $\eta^2 = .15$ (other $Fs < 1$). As can be seen in Table 6, the interaction effect reflects that, as expected (as in the other experiments), in the short exposure conditions, participants in the positive condition reported feeling more positive ($M = 5.57$, $SD = 0.69$) than participants in the negative condition ($M = 4.13$, $SD = 0.90$), $F(1, 94) = 39.68$, $p < .01$, $\eta^2 = .30$, whereas in the long exposure conditions, priming had no effect on experienced affect ($F < 1$) and participants' moods were similar ($F < 1$) to those in the control condition ($M = 4.75$, $SD = 0.87$). Again, we performed a contrast analysis to provide an overall test of the predicted pattern of results. Using the same weights as in Study 1a, we found that the a priori contrast was significant, $t(103) = 5.40$, $p < .05$. Contrast analyses performed to compare the short positive conditions with control and the short negative conditions with control were also significant, $t(103) = 2.83$, $p < .05$, and $t(103) = 2.10$, $p < .05$, respectively. However as expected, contrast analyses performed to compare the long positive conditions with control and the long negative conditions with control were not significant, $t(103) = 0.28$, $p = .78$, and $t(103) = 0$, $p = 1$, respectively.

In a nutshell, this study provides additional support for our all-you-need-is-evaluative-tone hypothesis. The results show that in the long prime exposure conditions, participants were influenced more by the strong than by the weak arguments. Their moods were unaffected. More important, in the short prime exposure conditions, participants primed with positive trait concepts were influenced by both strong and weak arguments, whereas participants primed with negative trait concepts were influenced only by strong arguments. Those participants in the short exposure conditions also reported the expected mood states. Thus, a dominating evaluative tone influenced people's moods and, therefore, people's processing styles.

Table 6
Means and Standard Deviations for Mood Judgments as a Function of Prime Exposure, Argument Strength, and Prime Valence (Study 4)

	Prime exposure			
	Long		Short	
Prime valence	*M*	*SD*	*M*	*SD*
	Strong arguments			
Positive	4.67	1.16	5.50	0.52
Negative	4.90	0.88	4.08	0.87
	Weak arguments			
Positive	4.67	0.65	5.64	0.84
Negative	4.60	0.84	4.17	0.84

Note. Scale ranges from 1 to 7. Higher scores indicate a more positive mood. Mean mood judgment in the control condition was 4.75 (.87).

Summary of Findings

A critical reader could, perhaps, argue that in some of our studies, direct comparisons between the control condition and the conditions in which we expected mood changes to occur were not always significant. However, we presented multiple studies and replicated our main finding across measures (two types of mood measures, need-for-cognition scale, argument strength logic) and across a large number of studies (Study 1a, Study 1b, Study 2, Study 3, and Study 4). This clearly and convincingly shows that our effect is real and robust. To provide concrete statistical support for this claim, we performed additional contrast analyses across Studies 1a, 1b, 2, 3, and 4 on the *z*-transformed mood judgments and across Studies 2 and 3 on the *z*-transformed need-for-cognition scores.

First, we performed an overall test of the predicted pattern on the mood judgments. Using the same weights as in Study 1a, we found that the a priori contrast was highly reliable, $t(383) = 7.48$, $p < .05$. In addition, we performed two contrast analyses to directly compare the control condition with the conditions in which we expected mood changes to occur (the short exposure and extreme conditions). Both contrasts—one comparing positive with control, $t(383) = 4.04$, $p < .05$, and one comparing negative with control, $t(383) = 3.76$, $p < .05$—were highly significant. To make sure that the conditions in which we did not expect mood changes to occur (the long exposure and moderate conditions) did not differ from the control condition, we performed two additional contrast analyses. In line with our hypotheses, neither of the contrasts—one comparing positive with control, $t(383) = 0.57$, $p = .57$, and one comparing negative with control, $t(383) = 0.14$, $p = .89$—was significant.

Second, we performed similar contrast analyses on the need-for-cognition scores, starting with an overall test of the predicted pattern. Using the same weights as in Study 2, we found that the a priori contrast was highly reliable, $t(112) = 4.76$, $p < .05$. Next, we performed the two contrast analyses to directly compare the conditions in which we expected mood changes to occur with the control condition. Both contrasts—one comparing positive with control, $t(112) = 2.23$, $p < .05$, and one comparing negative with control, $t(112) = 3.08$, $p < .05$—were highly significant. As expected, neither of the contrasts testing the control condition against the conditions in which we did not expect mood changes to occur—one comparing positive with control, $t(112) = 0.18$, $p = .86$, and one comparing negative with control, $t(112) = 0.28$, $p = .78$—was significant.

Together, these contrast analyses provide strong support for our claim that only very brief presentations of evaluative information or presentations of very extreme evaluative information may influence mood and cognition. The fact that in some of our studies, single low-power comparisons between individual cells did not reach ordinary levels of significance is thus completely surpassed by the robustness and reliability of our hypothesized effect across a large number of studies and measures.

General Discussion

Most successful mood induction techniques rely on the conscious experience or recall of real or imagined mood-eliciting stimuli and demand a relatively high amount of cognitive capacity.

But what exactly are the necessary preconditions to influence people's mood states? What are the ingredients of a minimal mood induction paradigm? That is the central question of the present research. Together, the results of four studies indicate that successful mood induction is much more basic and simple than previous mood research would suggest. First, our mood induction paradigm does not demand a high amount of cognitive capacity, considering that participants only responded to the location of our masked priming materials. Second, the present studies indicate that moods can be induced without participants' awareness of the mood-eliciting stimuli. Thus, participants were not conscious that mood states were being elicited. Third, we used valenced trait concepts as mood-eliciting stimuli, which most researchers regard as cold priming materials (see e.g., Clore & Colcombe, 2003; Niedenthal, Rohman, & Dalle, 2003).

Recently, it has been argued that the activation of cold semantic concepts is insufficient to induce mood states and thus hot stimulus materials are required to produce mood effects (Clore & Colcombe, 2003; Innes-Ker & Niedenthal, 2002; Niedenthal et al., 2003). At first glance, the results of the present research seem to contradict this idea that hot materials are necessary because our findings show that the activation of semantic concepts can produce affective experiences. However, a closer look supports the view that hot materials are crucial. Our results clearly reveal that mood effects occur when mainly the hot features of these cold concepts are activated. Our results support the notion that the essential hot ingredient in mood-induction procedures is a dominating evaluative tone.

The present studies illustrate two ways in which evaluative tone may dominate descriptive cues. According to the affective primacy hypothesis, nondescriptive, nonspecific evaluative stimulus cues are especially likely to be picked up when stimulus exposure is very short. Thus, we can separate the activation of evaluative and descriptive meaning with subliminal, very short stimulus exposures, activating mainly the evaluative tone of the stimulus (see also Stapel et al., 2002). The evaluative tone of a stimulus also dominates descriptive meaning when the stimulus is sufficiently extreme. Evaluative meaning is generally more salient in extremely valenced trait concepts than descriptive meaning is.

We conclude from our studies that what all successful mood-induction techniques have in common is that they prime positively or negatively toned information at the expense of specific meaning. All you need to produce a mood state is a dominating activation of global, diffuse, nonspecific evaluative information. The activation of mainly evaluative, and thus diffuse, information may then spill over to people's moods (Zajonc, 2000; see also Forgas, 1995; Schwarz & Clore, 1996). However, mood effects become less likely when evaluative as well as descriptive information is activated, cognitively constraining the evaluative tone.

Summary of Results

In Studies 1a and 1b, we tested our evaluative-tone hypothesis using very short versus relatively long subliminal exposures to positive and negative trait concepts. Both studies demonstrate that subliminal exposure to valenced information is most likely to affect explicit mood judgments when prime exposures are short enough to activate evaluative reactions that have no specific descriptive content. Thus, when subliminal exposure to the valenced trait concepts was short, then the activated evaluative tone spilled over into participants' explicit mood reports. In contrast, when subliminal exposure to the valenced trait concepts was relatively long, no effects were found in the participants' explicit mood reports. Thus, mood changes only took place in the case in which the evaluative tone dominated the descriptive meaning of the prime. The results of Study 1b suggest that such carryover effects are most likely to occur on relatively general and evaluative mood judgments but not on relatively specific, descriptive self-judgments and person judgments.

Study 2 extends the findings of Study 1 to an indirect mood measure: The results illustrate that subliminally primed trait concepts affected the participants' reported need for cognition when the evaluative tone dominated the descriptive meaning of the primes. Thus, the activation of a positive evaluative tone resulted in a more positive mood than the activation of a dominating, negative evaluative tone. Similar to our findings in Study 1, we obtained no mood effects when the descriptive meaning was sufficiently activated (i.e., under relatively long stimulus exposures). Besides supporting our evaluative-tone hypothesis, Study 2 is the first study to demonstrate that need for cognition can fluctuate due to situational factors. Specifically, people experienced a higher need for cognition when they felt bad than when they felt good. This finding demonstrates that need for cognition may serve as an indirect mood measure, equivalent to people's information-processing styles. Moreover, this finding shows for the first time that need for cognition can be used as a dependent measure. In previous studies, need for cognition always served as a mediating or moderating variable. Thus, the present findings show that it makes sense to distinguish between "state" and "trait" need for cognition in future research.

Study 3 provides additional evidence for our evaluative-tone hypothesis. In the previous studies, we separated the activation of evaluative and descriptive meaning by presenting the information for a sufficiently short duration that primarily the evaluative features were activated. In Study 3, we used trait concepts with an evaluative meaning that always dominated their descriptive meaning. Thus, we primed participants with trait concepts of extreme valence or with trait concepts of moderate valence, both under relatively long, but subliminal, exposure durations. Consistent with our evaluative-tone hypothesis, reported need for cognition and explicit mood judgments indicated that participants who were primed with extreme positive trait concepts felt more positive than participants who were primed with extreme negative trait concepts. As expected, the mood states of participants who were primed with moderate trait concepts were unaffected.

Studies 1, 2, and 3 provided evidence for our evaluative-tone hypothesis on explicit mood measures and on people's motivational states (i.e., need for cognition). To complete the picture, we conducted Study 4, which directly measured processing style. After the priming episode, we offered participants at a Dutch university either strong or weak arguments in favor of using English as the official university language. In line with our prediction, strong arguments were more persuasive than weak arguments for participants who were exposed for a very short time to negative trait concepts, whereas strong and weak arguments were equally persuasive for participants who were exposed for a very short time to positive concepts. However, when prime exposure was relatively long, strong arguments were more persuasive than

weak arguments for all participants. Together, these findings indicate that participants in a good mood used heuristic, global processing styles to process the arguments, and participants in a bad mood used systematic, detailed processing styles. Thus, the results expand our evaluative-tone hypothesis to yet another indirect mood measure: information-processing style.

Affective or Semantic Primacy?

In sum, the results of our studies strongly support the all-you-need-is-evaluative-tone hypothesis. Our findings also provide additional support for affective primacy, the hypothesis that people extract the evaluative meaning of a stimulus before its descriptive meaning. We showed several times, using explicit and implicit mood indicators, that subliminal presentations of valenced trait concepts only affect people's mood states when exposure is very short. Subliminal presentations of these trait concepts do not affect people's mood states when exposure is relatively long but still subliminal. We can only conclude from our findings that people extracted evaluative meaning before descriptive meaning. It seems very unlikely that specific content or descriptive information induced good and bad moods in the participants.

Recently, researchers have argued that it is a "sin" (Clore et al., 2005, p. 394) to assume that affect may precede semantic analysis and that the evidence for affective primacy is weak (see also Storbeck & Robinson, 2004). These conclusions were based on (a subset of) previous affective priming studies and research that compared semantic priming and affective priming (Storbeck & Robinson, 2004). Storbeck and Robinson (2004) showed that semantic priming was consistent and more robust than affective priming. They took their results to mean that semantic analysis is more obligatory at encoding than affective analysis is. However, another (and less sectarian) way to interpret these results is that (automatic) information processing is flexible (see also Stapel & Koomen, 2006): Sometimes, people extract evaluative meaning before descriptive meaning, whereas at other times, people extract descriptive meaning before evaluative meaning. Sometimes it makes sense to see immediately whether an animal is a snake or a spider (by extracting descriptive information), whereas at other times it is more functional to see immediately whether an animal is cute or threatening (by extracting evaluative information). In the specific, minimal mood induction paradigm we used in the current studies, people were more likely to extract evaluative meaning before descriptive meaning when subliminal exposure to the primed information was extremely short. However, we emphasize that even though we expected affective primacy to occur in our current studies, we do not argue that affect always precedes cognition. Rather, we applied the affective primacy logic to create the circumstances to test our evaluative-tone hypothesis.

Unconscious Moods

Our findings show that mood effects are especially likely when we expose people for a very short time to the subliminal primes. Put differently, shorter flashes lead to stronger feelings. Although some emotion researchers have posited that it is indeed possible to elicit mood effects outside of conscious awareness (Chartrand, Van Baaren, & Bargh, 2006; Kihlstrom, Mulvaney, Tobias, & Tobis, 2000, Öhman & Soares, 1994; Robles, Smith, Carver, & Wellens, 1987; Winkielman & Berridge, 2004; Winkielman, Berridge, & Wilbarger, 2005b), until the present studies hardly any reliable empirical evidence explained how and when moods could be unconsciously induced. Theoretically, it makes sense to assume that people can be aware of their emotional states without being aware of the antecedents that evoked these states. Often, people do not have conscious access to the antecedents that evoked their feelings, thoughts, motivations, and behaviors (Nisbett & Wilson, 1977).

Nevertheless, most previous research has pointed out that unconsciously presented stimuli do not affect people's mood states. Subliminal priming may have an impact on the preference for and liking of neutral target stimuli, without having an impact on people's affective state (e.g., Banse, 2001; Clore & Colcombe, 2003; Edwards, 1990; Krosnick, Betz, Jussim, & Lynn, 1992; Murphy & Zajonc, 1993; Winkielman, Berridge, & Wilbarger, 2005a). These null findings on mood measures probably led Schwarz and Clore (1996) to conclude that in general, affective priming studies are irrelevant to the study of mood effects. Such studies demonstrate effects of subliminal priming on judgments of words, people, or Chinese characters, but they do not show subliminal priming effects on experienced moods. Thus, Schwarz and Clore (1996) concluded, "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 . . . , rather than feeling-based inferences" (p. 440).

We posit that Schwarz and Clore (1996) may have been right in their conclusion that to date, there is no consistent evidence that subliminal priming may affect people's affective feelings. However, this should not be taken to mean that it is impossible for subliminally presented information to influence people's mood (see e.g., Chartrand et al., 2006). There does not seem to be an a priori reason to assume that people's moods cannot be affected by subliminally primed information. Why should the subliminally primed information only be capable of affecting a perceiver's judgments of Chinese characters (e.g., Murphy & Zajonc, 1993; Winkielman, Zajonc, & Schwarz, 1997) or other people's behaviors (e.g., Stapel et al., 2002) but not also affect the perceiver him- or herself? We think that spreading activation, the mechanism presumed to underlie evaluative priming (Bargh, 1997; Ferguson & Bargh, 2003; Wentura, 2000), may equally relate to people's moods as to people's liking judgments. However, mood effects need a stronger evaluative tone, one that dominates the descriptive cues.

Thus, we explain the lack of mood effects in previous subliminal affective priming research by our hypothesis that evaluative tone needs to overrule the descriptive cues. It seems likely that in previous research, the activation of evaluative cues was sufficient to produce affective priming but insufficient to affect people's moods because descriptive cues were also activated. In most of the studies that have shown dissociation between effects on liking judgments and mood, researchers used facial expressions as affective primes. Participants were subliminally primed with happy, neutral, or angry faces, which resulted in evaluatively congruent liking judgments of Chinese ideograms or an unfamiliar beverage (e.g., Winkielman et al., 2005a). We think that a possible explanation for the null findings on mood measures might lie in the fact that people are very efficient at "face perception" (Farah, Wilson,

Drain, & Tanaka, 1998, p. 482). Some researchers have even assumed a specialized module for the perception of faces. Other research has demonstrated, for example, that even the social category of a subliminally presented face may have an impact on subsequent judgments (Ruys, Spears, Gordijn, & De Vries, 2007; Stapel et al., 2002). Thus, activation of specific descriptive "face information" is likely to occur early in the information-processing chain. When evaluative cues + face information are activated, effects on liking judgment might still occur. It seems functional to assume that something is pleasant when other people enjoy it. However, it seems less functional that mood states would be affected in this way. Evaluative cues only influence mood when the activation of evaluative cues is cognitively unbound.

In sum then, the current studies clearly demonstrate—via a minimal mood induction paradigm—that all you need to influence people's mood states is evaluative tone. The essential ingredient for the genesis of mood effects is a dominance of evaluative meaning over descriptive meaning. Whereas most previous research findings may be interpreted as suggesting that hot, cognitive-capacity-demanding, and conscious experience of mood-eliciting stimuli are necessary for successful mood induction, the results of the present studies support the notion that people's mood states can be influenced without their awareness of the mood-eliciting stimuli. Thus, relatively cold concepts can induce hot mental states.

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