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# Incongruency effects in affective processing:

# Automatic motivational counter-regulation or mismatch-induced salience?

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Abstract

Attention is automatically allocated to stimuli that are opposite in valence to the current motivational focus (Rothermund, 2003; Rothermund, Voss, & Wentura, 2008). We tested whether this incongruency effect is due to affective-motivational counter-regulation or to an increased salience of stimuli that mismatch with cognitively activated information. Affective processing biases were assessed with a search task in which participants had to detect the spatial position at which a positive or negative stimulus was presented. In the motivational condition, positive or negative affective-motivational states were induced by performance feedback after each trial. In the cognitive activation condition, participants memorized the word "good" or "bad" during the search task. The affective incongruency effect was replicated in the motivational condition, whereas an affective congruency effect obtained in the cognitive activation condition. These findings support an explanation of affective incongruency effects in terms of automatic counter-regulation that is motivational in nature.

KEY WORDS: Affective Processing Biases; Negativity Bias; Positivity Bias; Motivation; Motivational Control; Goals; Feedback;

Incongruency effects in affective processing:

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The current literature on affective processing biases is dominated by accounts proposing a general and stable asymmetry in the processing of valent information. The nature of this asymmetry, however, is still a topic of debate. Some researchers have argued that negative stimuli attract and hold attention automatically ("negativity bias"; Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Fox, Russo, Bowles, & Dutton, 2001; Rozin & Royzman, 2001; Taylor, 1991), whereas others have proposed that information processing is biased towards positive and self-enhancing information (Kunda, 1990; Weinstein, 1980), while negative information is typically suppressed ("perceptual defense"; Erdelyi, 1974; McGinnies, 1949). Impressive evidence can be cited supporting a negativity bias as well as a positivity bias in perception, attention, and judgment (positivity bias: Balcetis & Dunning, 2006; Juth, Lundqvist, Karlsson, & Öhman, 2005; Maner et al., 2003; Voss, Rothermund, & Brandtstädter, 2008; negativity bias: Buchner, Rothermund, Wentura, & Mehl, 2004; Fox, Russo, & Dutton, 2002; Hansen & Hansen, 1988; Öhman, Flykt, & Esteves, 2001; Öhman, Lundqvist, & Esteves, 2001; Pratto & John, 1991; Smith, Cacioppo, Larsen, & Chartrand, 2003).

The diversity of findings leads to the conclusion that neither the negativity bias hypothesis nor the positivity bias hypothesis provides a comprehensive account of affective processing in general. Multiple variables have been proposed to account for the variability in findings. Examples for these are stimulus features that are confounded with valence (e.g., arousal, perceptual features carrying evolutionary relevance; Horstmann & Bauland, 2006; Müller, Andersen, & Keil, 2008; Purcell, Stewart, & Skov, 1996; Schimmack, 2005), stable interindividual differences (e.g., optimism, anxiety, depression; Bar-Haim et al., 2007; Isaacowitz, 2005; Mathews & MacLeod, 2005), or situational factors (e.g., degree of personal control over outcomes; Averill & Rosenn, 1972; Brandtstädter, Voss, & Rothermund, 2004;

Miller, 1979; Rothermund, Brandtstädter, Meiniger, & Anton, 2002). Depending on these factors, affective processing can be biased towards either negative or positive information. If a general conclusion can be drawn from the literature on the moderators or concomitants of affective processing biases, affective processing might be better characterized by a relevance bias than by a general preference towards information of a specific valence (Brosch, Sander, Pourtois, & Scherer, 2008; Brosch, Sander, & Scherer, 2007; Rothermund, in press; Schupp et al., 2004; Wentura, Rothermund, & Bak, 2000).

A related implication of the apparently heterogeneous findings regarding positivity and negativity biases is that affective processing is much more flexible than is typically assumed. Rather than reflecting a rigid and stable bias, it seems plausible that affective processing is context-dependent and varies in accordance with the currently activated goals and motives of a person. This account suggests that positivity and negativity biases emerge as a result of a flexible configuration of affective processing depending on currently activated superordinate motivational orientations. According to this view, affective processing is seen as a tool that is flexibly attuned to the regulatory needs of goal pursuit and goal adjustment (Rothermund, in press; Wentura & Rothermund, 2009).

## Affective-motivational counter-regulation

To test the hypothesis that affective processing is under motivational control, we have conducted various studies in our labs investigating the influence of different types of motivational variables on affective processing (for a review, see Rothermund, in press). In particular, we compared affective processing biases towards positive and negative information under positive and negative motivational states. Specifically, we investigated the influence of motivational states related to previous success and failure (Rothermund, 2003), and we investigated the influence of goal pursuits with a positive outcome focus (striving for gains and positively framed accomplishments) with goal pursuits with a negative outcome focus (preventing losses and trying to avert dangers; Rothermund, Wentura, & Bak, 2001; Rothermund, Voss, & Wentura, 2008; Wentura, Voss, & Rothermund, 2009).

Somewhat surprisingly, these studies yielded consistent evidence that positive motivational states (success or positive outcome focus) are accompanied by a negativity bias in affective processing, whereas negative motivational states (failure or negative outcome focus) are associated with a positivity bias in affective processing (Rothermund, 2003; Rothermund et al., 2001, 2008; Wentura et al., 2009). Similar incongruency effects have been found by other researchers investigating the influence of motivational states on affective processing (de Lange & van Knippenberg, 2007; Derryberry, 1993; Ellenbogen, Schwartzman, Stewart, & Walker, 2002; Gawronski, Deutsch, & Strack, 2005; Koole & Jostmann, 2004).

We have summarized the findings attesting to an incongruent relation between motivation and affective processing with the concept of affective-motivational counter-regulation (Rothermund, in press; Rothermund et al., 2008). According to this functional view, an automatic orienting of attention to information that is affectively incongruent with current motivational states serves to enhance motivational flexibility and establishes a balanced processing of positive and negative information, which helps to avoid an escalation of motivational-affective states. Specifically, a heightened accessibility of negative information during the pursuit of positive incentives increases the salience of potential dangers and helps to prevent impulsive behavior. A tendency to allocate attention to positive information during a prevailing negative motivational focus, on the other hand, counteracts this focus, and thus prevents paralysis in the face of threat (Derryberry, 1993). Both of these mechanisms can help to prevent emotional states from becoming chronic or extreme.

## An alternative explanation: Perceptual contrast effects

In this article, we contrast this functional explanation of affective-motivational incongruency effects in terms of a counter-regulation mechanism operating in the service of motivational flexibility and balance with a non-motivational explanation of the findings in terms of mismatch-induced salience. Such a non-motivational explanation could draw on an analogy to contrast-induced pop-out phenomena in the domain of visual perception (Duncan & Humphreys, 1989; Rosenholtz, 1999). According to this view, motivational states relating to success/failure or to positively/negatively defined goal states might constitute a kind of a perceptual context or background against which affectively mismatching stimuli tend to pop out whereas affectively congruent information tends to “sink in”. Three different cognitive accounts have been proposed for the explanation of affective contrast effects, (a) the perceptual salience account (Klauer, Mierke, & Musch, 2003), (b) the affective blindness hypothesis (Eder & Klauer, 2007, 2009), and (c) the psychophysical account (Klauer, Teige-Mocigemba, & Spruyt, 2009).

(a) *Perceptual salience*. Perceptual contrast effects in the processing of valent stimuli have been reported by Klauer et al. (2003). In their study, Klauer et al. manipulated the relative frequency of positive and negative target stimuli in the affective priming paradigm. Stronger affective priming effects were obtained for primes belonging to the valence category that was less frequently presented as a target, indicating that stimuli that mismatched in valence with the experimental context were more salient and automatically attracted attention. Relatedly, Gawronski, Deutsch, and Seidel (2005) found that affective priming effects were stronger if a pre-prime was presented before the prime stimulus that was opposite in valence to the prime, compared to a condition with a congruent pre-prime. The authors argued that an incongruent pre-prime enhanced the salience of the valence of the prime, thus increasing its influence on responding to the target.

(b) *Affective blindness*. A different explanation of perceptually based incongruency effects can be derived from the code competition hypothesis. Information that is currently held in working memory occupies the corresponding mental codes that are used to represent this type of information, making it more difficult to perceive and integrate subsequent stimulus information that competes for the same representational codes (Müsseler & Wühr, 2002). Transferring the code competition hypothesis to the domain of valence processing, Eder and Klauer (2007, 2009) showed that actively maintaining information referring to either a positively or negatively valenced action in working memory interfered with the detection of briefly presented stimuli of the same valence, producing what they denoted as an "affective blindness" for affectively congruent information.

(c) *Psychophysical account*. On a purely psychophysical basis, it can be argued that it is harder to detect a change or an increase in activation if the current state of activation for the to-be-detected feature is already high due to a pre-activation of the respective mental feature code (Weber-Fechner law). An increased perceptual threshold for pre-activated content has been repeatedly demonstrated (Hochhaus & Johnston, 1996; Johnston, Hochhaus, & Ruthruff, 2002). Klauer, Teige-Mocigemba, and Spruyt (2009) could obtain evidence in support of a psychophysical account of repetition blindness effects (i.e., reduced sensitivity for detecting the valence of a stimulus that repeats the valence of a previously presented prime stimulus) in the domain of affective processing.[1] Using variants of the affective priming paradigm, they could show that affective incongruency effects emerged under conditions in which the prime and target were represented as separate mental entities.

Although the perceptual contrast, code competition, and psychophysical hypotheses rest on somewhat different theoretical grounds, emphasizing either an increased salience of perceptually mismatching stimuli or an impeded processing and integration of congruent information, they nevertheless converge in predicting affective incongruency effects on the basis of a cognitive activation of a certain valence. Since these hypotheses are purely cognitive in nature, they provide an alternative account of affective incongruency effects that is unrelated to motivational mechanisms.

*Explaining motivational incongruency effects in terms of salience*. The studies by Eder and Klauer (2007, 2009), Gawronski, Deutsch, and Seidel (2005), and by Klauer et al. (2003,

2009) did not involve the manipulation of motivational variables, nor do the respective theories of mismatch-induced salience or affective blindness make an explicit reference to motivational states. In order to apply these purely cognitive explanations to the domain of motivational-affective incongruency effects, one has to assume that positive and negative motivational states (related to success/failure or to positively/negatively defined goal states) are held active in working memory as positive or negative valence information. The affective incongruency of a currently encountered positive or negative stimulus to such an active motivational state would then lead to an automatic attentional capture, whereas affective congruency of the encountered stimulus would interfere with the processing and integration of stimulus valence. Motivational-affective incongruency effects might thus reflect a basic cognitive phenomenon rather than being due to a counter-regulation mechanism that is operating in the service of motivational balance and flexibility.

*Interactions between working memory and attention for non-valent features*. In spite of the evidence that was reported by Klauer et al. (2003, 2009), Gawronski, Deutsch, and Seidel (2005), and Eder and Klauer (2007, 2009) regarding the effects of valence matches and mismatches on affective processing, a closer look at the recent literature on interactions between working memory and attention does not seem to yield strong support for incongruency effects between cognitive activation and attention. The prevailing finding in these studies is that holding a stimulus or a stimulus dimension active in working memory facilitates processing of this stimulus or stimulus dimension in an ongoing task and also leads to an automatic allocation of attention to the memorized stimulus if it is presented as a distractor in an ongoing task (Downing, 2000; Huang & Pashler, 2007; Lauwereyns, Wisnewski, Keown, & Govan, 2006; Lucas & Lauwereyns, 2007; Olivers, Meijer, & Theeuwes, 2006). These findings suggest a congruent relation between working memory and attention rather than providing an explanation for incongruency effects based on a mismatch-induced increase in salience.

It has to be noted, however, that none of the cited studies regarding interactions between working memory and attention was related to valence. Instead, in most of these studies specific stimuli rather than classes of stimuli characterized by an abstract feature had to be memorized. It thus remains to be seen whether keeping information of a positive or negative valence active in memory has a congruent or incongruent effect on attention allocation. Furthermore, because the studies on memory-attention interactions differed in various procedural respects from the studies in which motivational-affective incongruency effects were obtained, a comparison of the results might be due to these procedural differences rather than to a difference in underlying processes and mechanisms.

## Overview of the present research

The aim of the current study thus consisted in investigating the effects of holding a specific valence active in working memory on valence biases in affective processing. In addition, we wanted to compare the effects of memorizing a valence to the effects of a motivational manipulation. To rule out procedural differences as a potential source of differences in findings, we used the same type of task for both experiments. Specifically, in order to assess affective processing biases, we employed a task in which two words were presented simultaneously in each trial, one on the left side and the other on the right side of the screen. One of the two words had a neutral valence, whereas the other word had either a positive or a negative valence. Participants had to indicate the position of the valent word by pressing a corresponding left or right key (“search the valent target”).

In the memory experiment, one valence (the word “good” or “bad”) was presented before each trial of the search task and had to be memorized for a recognition task that immediately followed the respective trial of the search task. The to-be-memorized valence varied randomly from trial to trial, independently of the valence of the valent word in the search task. This allowed us to manipulate memorized valence and valence of the to-be-detected valent word orthogonally. In the motivational experiment, participants received positive or negative performance feedback linked to a gain or loss of points after each trial of the search task that functioned as a manipulation of motivational states for the subsequent trial of the search task (Rothermund, 2003). To establish the motivational relevance of the feedback, point scores at the end of each block of trials were connected to monetary incentives.

We predicted a replication of the motivational counter-regulation effect of previous studies for the motivational manipulation. Specifically, we predicted an affective incongruency effect for the positive and negative performance feedback on affective processing biases in the valence search task. Conversely, we expected a congruent effect of the working memory manipulation on affective processing biases, in line with recent studies on memory-attention interactions. That is, we expected that memorizing a positive or negative word in the memory experiment should facilitate the detection of words of the same valence in the valence detection task.

## Experiment 1: Effects of success/failure feedback on affective processing biases

The first experiment was a conceptual replication of Rothermund (2003). We investigated the effects of success and failure feedback on subsequent affective processing biases. The evaluation task (i.e., the positive or negative valence of single target words had to be identified by pressing one of two keys) that was used to assess affective processing biases in the study by Rothermund (2003) was replaced by a search task in which participants had to identify the spatial position (right or left) of the valent word in displays consisting of one neutral and one valent (positive or negative) word. The advantage of the search task is that responding is completely independent of positive and negative valence because words of both valences are presented equally often to the right or to the left of fixation.

*Participants.* Eighty students of the Friedrich-Schiller University of Jena took part in the experiment (59 females). Participants' mean age was 22.2 years (*SD* = 3.1). Participants received a bar of chocolate for their participation. In addition, they could earn up to 3 Euro, depending on their performance in the task (average remuneration: 1,11 Euro). Experimental sessions lasted approximately 30 minutes.

*Materials.* A total of 99 nouns (25 positive, 25 negative, 49 neutral nouns) were selected as stimuli for the search task. All words were either mono- or disyllabic, ranging between four and seven letters. Positive, negative, and neutral words were matched in length. All words were presented in uppercase letters in a white font on a black computer screen.

*Procedure.* Participants were tested individually. Instructions were given on the screen. Participants were informed that in each trial, two words were presented on the screen, one to the right and one to the left of fixation. One of the words was neutral whereas the other word was either positive or negative. Participants had to identify the position of the valent word and had to press either the left ('D') or right ('L') key on the computer keyboard accordingly. Participants were instructed to keep their left and right index fingers above the response keys throughout the experiment. Participants were reminded to respond as quickly and accurately as possible. Each participant performed a block of 49 practice trials first, followed by six experimental blocks consisting of 49 trials each. The practice block paralleled the experimental block except that no money could be gained. Within each block of trials, each word (except for one valent word) was presented once, resulting in 24 trials in which a neutral word was combined with a positive word, and 24 trials in which a neutral word was combined with a negative word, and one starter-trial with a positive or negative word, the feedback of which determined the motivational context of the first trial. A different random order of words and positions of the valent word was used for each participant.

Each trial consisted of the following sequence of events: A fixation cross (+) appeared at the center of the screen. After 1,000 ms, the two words appeared on the screen, one to the left and one to the right of the fixation cross. The stimuli remained on the screen until participants pressed one of the two response keys. Immediately following the response, either a positive or a negative feedback screen was presented for 1,500 ms, consisting of a picture of closed hand with the thumb pointing either upwards or downwards, and a brief text message ("very good", "too slow", "wrong key"). Simultaneously, a sound sequence of either increasing or decreasing frequency was emitted via headphones. A negative feedback was given for erroneous and slow responses, whereas a positive feedback was given for responses that were fast and accurate. The criterion for fast and slow responses was the median of the response time distribution of the last ten responses that a participant had given. Using such a floating criterion incorporates practice effects and establishes an equivalent proportion of positive and negative feedback throughout the experiment (see Rothermund, 2003).

After each block of 49 trials, participants were informed regarding their average performance in the corresponding block. Whenever they had received more or at least as many positive as negative feedbacks in the last blocks, their money account was increased by 50 Euro Cent. At the end of the experiment, participants were thanked, debriefed, and rewarded accordingly.

*Results and Discussion*

Trials with erroneous responses (27.1 % of trials) and with reaction times that were below 150 ms or more than 1.5 interquartile ranges above the third quartile of the individual distribution of search task RTs (2.4 %; Tukey, 1977) were discarded from analyses.

Average RTs were computed separately for each participant for trials with positive and negative targets words and depending on whether the feedback before the respective trial had been either positive or negative (see Table 1). These means were then entered into a 2 × 2 analysis of variance (ANOVA) with the within-subject factors target valence (positive vs. negative) and feedback (positive vs. negative). The analysis revealed a main effect of target valence, $F(1,79) = 30.96$, $p < .001$, $\eta_p^2 = .28$, indicating faster responses if the to-be-detected valent target word was positive. In line with our hypothesis, the main effect of target valence was qualified by an interaction with feedback, $F(1,79) = 5.76$, $p < .05$, $\eta_p^2 = .07$. The pattern of this interaction corresponded to an affective-motivational incongruency effect: Negative targets were detected faster after positive compared to negative feedback, $t(79) = 2.33$, $p < .05$, whereas a reversed but non-significant effect of feedback obtained for positive targets, $t < 1$. An analysis of error frequencies revealed only a main effect of target valence, $F(1,79) = 16.48$, $p < .001$, $\eta_p^2 = .17$. Detecting the position of negative targets was more error prone (28.8% errors) than the detection of positive targets (25.8% errors). Neither the main effect of feedback nor the target valence x feedback interaction reached significance, both $F < 1$.

The findings of Experiment 1 yielded a conceptual replication of affective-motivational incongruency effects of performance feedback that have previously been reported by Rothermund (2003). The spatial position of positive and negative target stimuli was detected faster after receiving feedback of the opposite valence. It should be noted that in the present experiment, feedback was based on the actual performance in the preceding trial. Although veridical feedback is confounded with good vs. bad performance, we think it unlikely that the incongruency effects can be explained by differences in performance. First, there is no theoretical rationale that would predict a faster detection of negative (positive) valence after good (bad) performance. Second, and more important, in previous experiments we obtained the same pattern of effects for veridical and randomized performance (Rothermund, 2003, Exp. 3), indicating that the feedback rather than the performance is crucial for the emergence of the motivational-affective incongruency effect. Third, due to using a floating criterion (see Procedure), the factual correlation between performance speed and feedback across all trials is modest.

The current data do not allow a substantial interpretation of the fact that feedback only had a significant influence on the detection times of negative targets but not of positive targets. In the absence of a neutral baseline condition, it is impossible to disentangle the simple main effects of feedback for the positive and negative targets from a more general effect of feedback that is independent of target valence (e.g., negative feedback might lead to a general slowing of performance which might have counteracted an incongruency effect for the positive targets).

## Experiment 2: Effects of memorizing good/bad on affective processing biases

In the second experiment, we adapted a working memory manipulation that had been used in previous studies (e.g., Lauwereyns et al., 2006; Lucas & Lauwereyns, 2007) and applied it to valent categories. Before each trial of the search task, either the word ‘good’ or ‘bad’ was presented and had to be memorized. The remembered word had to be indicated by either pressing or not pressing the space bar at the end of a trial. The working memory task served to investigate the effects of a purely cognitive activation of a valence category on valence asymmetries in affective processing. The same search task that was already used to assess valence biases in affective processing in the previous experiment was also employed in the present experiment in order to make the two studies procedurally comparable.

*Participants.* Fifty students of the Friedrich Schiller University of Jena took part in the experiment. Three participants were removed from the sample due to extremely high error rates (more than 40% errors, far outliers according to Tukey, 1977). The final sample consisted of 10 male and 37 female participants, mean age was 22.8 years (*SD* = 2.7). Participants were tested individually and received 2 Euro for their participation. Experimental sessions lasted approximately 30 minutes.

*Materials.* The same word stimuli as in Experiment 1 were used in the search task.

*Procedure.* Instructions for the valence search task were identical to the previous experiment with the exception that no performance feedback was given after each trial and overall performance was not linked to monetary incentives. For the additional memory task, either the word ‘good’ or ‘bad’ was presented on the screen before each trial of the search task. At the end of each trial, a memory test screen was shown and participants had to indicate by pressing or not pressing the space bar which of the two words (‘good’ or ‘bad’) had been shown before the respective trial. The memory screen specified whether the space bar had to be pressed for ‘good’ and not pressed for ‘bad’ or vice versa. The nature of the memory response varied randomly between trials.

Following a first block of 49 trials in which only the valence search task was practiced, the additional memory task was introduced in a second practice block (20 trials) that was followed by four experimental blocks consisting of 49 trials each. Like in the previous experiment, each word (except for one valent word) was presented once within each block of trials. The position of the valent word in the search and the to-be-memorized word (‘good’ vs. ‘bad’) was determined randomly for each trial. A different random order of target words, position of the target word, and to be memorized valence, which ensured that all sequences of conditions of the factors valence of target word, position, and valence of memorized word were realized equally often, was used for every participant.

Each trial consisted of the following sequence of events: A fixation cross (+) appeared at the center of the screen. After 1,000 ms, the fixation cross was replaced by the to-be-memorized word (either ‘good’ or ‘bad’) that was shown for 1,000 ms in the center of the screen and was then replaced by the fixation cross again. After another 1,000 ms, the two words of the search task appeared on the screen, one to the left and one to the right of the fixation cross. The word stimuli remained on the screen until participants pressed one of the two response keys. Immediately following the response in the search task, a memory test screen was shown that specified the response rules for the memory task (either ‘good → press SPACE / bad → press nothing’, or ‘bad → press SPACE / good → press nothing’). Which of the two response screens was presented was determined randomly for each trial. The memory test screen remained on the screen until either the SPACE bar had been pressed or until 2,500 ms had elapsed.

After each block of 49 trials, participants could take a brief break. At the end of the experiment, participants were thanked, debriefed, and paid.

## *Results and Discussion*

Trials with erroneous responses in the search or memory task (10.4 % of trials) and with reaction times that were below 150 ms or more than 1.5 interquartile ranges above the third quartile of the individual distribution of search task RTs (3.2 %; Tukey, 1977) were discarded from analyses.

Average RTs were computed separately for each participant for trials with positive and negative targets words in the search task and depending on whether the word ‘good’ or ‘bad’ had to be memorized during the respective trial (see Table 2). These means were then entered into a 2 × 2 analysis of variance (ANOVA) with the within-subject factors target valence (positive vs. negative) and memorized valence (positive vs. negative). The analysis revealed only a significant interaction of target valence and memorized valence, $F(1,46) = 9.37$, $p < .01$, $\eta_p^2 = .17$, both main effects were not significant, $F(1,46) < 2.64$, $p > .11$. The pattern of this interaction corresponded to a congruency effect: Positive targets were detected faster if the word ‘good’ had to be memorized compared to the negative memory condition, $t(46) = 2.78$, $p < .01$, whereas negative targets were detected faster if the word ‘bad’ had to be memorized, $t(46) = -2.30$, $p < .05$. An analysis of error frequencies yielded no significant effects, all $F < 1.84$, $p > .18$.

A joint analysis of the RT data of the two experiments in which the feedback and memory valence factors were treated as a superordinate factor ‘type of valence activation’ yielded a highly significant three-way interaction of target valence, valence activation, and experiment, $F(1,125) = 18.85$, $p < .001$, $\eta_p^2 = .13$.

## General Discussion

Two experiments were conducted in which valence biases in affective processing were assessed with a valence search task. During the search task, we manipulated either valent motivational states (success vs. failure feedback, Experiment 1) or the cognitive activation of valent categories (memorize the words ‘good’ vs. ‘bad’, Experiment 2). The motivational manipulation had an incongruent effect on the detection of valent stimuli in the search task, replicating previous findings of an affective motivational counter-regulation in affective processing (Rothermund, 2003; Rothermund et al., 2001, 2008; Wentura et al., 2009; see also Derryberry, 1993; Ellenbogen et al., 2004). To the contrary, activating one of the two valence categories by a non-motivational working memory manipulation had a congruent effect on the detection of valent stimuli in the search task. The latter finding is in accordance with recent findings indicating a congruent relation between attention and working memory (Downing, 2000; Huang & Pashler, 2007; Lauwereyns et al., 2006; Lucas & Lauwereyns, 2007; Olivers et al., 2006).

Taken together, the findings of our experiments suggest that cognitive and motivational manipulations of valence have opposite effects on affective processing. The strength of the present research consists in the use of the same visual search task for assessing valence biases in both experiments, which rules out procedural factors as an explanation for the difference in findings. In addition, the valence search task provides an assessment of valence processing that is free from response biases.

It should be noted that the monetary incentives that were used in Experiment 1 in order to strengthen the relevance of the feedback factor were accompanied by a shift regarding the speed/accuracy tradeoff. Responses were much faster and less accurate in Experiment 1 compared to Experiment 2. This focus on fast responding at the cost of many errors is typically observed if fast responses are rewarded with monetary incentives (Rothermund, 2003). Although this difference in speed/accuracy tradeoffs invokes a confound between the two studies, we would like to point out that reducing accuracy motivation and increasing the motivation for speed in Experiment 1 actually works against the emergence of affective incongruency effects. Klauer et al. (2009) have argued on the basis of their psychophysical account that increasing accuracy motivation should lead to a more exclusive form of processing that should enhance contrast effects (for related arguments linking accuracy motivation and contrast effects, see Fockenberg, Koole, & Semin, 2008; Wentura &

Rothermund, 2003). The fact that we obtained contrast effects even in a situation in which accuracy was very low additionally supports a motivational explanation of the affective incongruency effect.

What remains to be explained is the apparent discrepancy of the results of the second experiment with findings that were reported by Eder and Klauer (2007, 2009), Gawronski, Deutsch, and Seidel (2005), and Klauer et al. (2003, 2009). In these studies, incongruent effects of a currently activated valence on the processing of valent stimuli were reported. A major difference to these studies consists in the fact that in our experiments no specific evaluative decision regarding the valence of the target stimulus was required, which eliminates the typical confound between valence detection and selection of a specific valent response. This procedural difference in the assessment of valence biases might account for the difference in findings.

Another procedural difference refers to the fact that none of the previous studies used a working memory task to manipulate the cognitive accessibility of positive and negative valence. This might explain why the findings of Eder and Klauer (2007, 2009), Gawronski, Deutsch, and Seidel (2005), and Klauer et al. (2003, 2009) are in contrast with previous findings in which congruent effects of currently memorized stimuli or stimulus features on attention were found (Downing, 2000; Huang & Pashler, 2007; Lauwereyns et al., 2006; Lucas & Lauwereyns, 2007; Olivers et al., 2006). Apparently, then, incongruent effects of a cognitive feature activation on processing seem to be confined to specific circumstances, and cannot easily be used to explain affective-motivational incongruency effects.

## Conclusions

The present findings provide further support for a mechanism of counter-regulation in the domain of automatic affective processing that is specifically triggered by motivational states. Motivational influences on affective processing thus differ strongly from the way in which the cognitive activation of a category or feature affects processing. A cognitive activation typically facilitates the processing and encoding of semantically related and associated content, preparing the organism for the co-occurrence of related information in the environment. Affective-motivational counter-regulation, on the other hand, provides the basis for a balanced processing of valence even in situations in which affective processing might tend to become one-sided. A combination of both cognitive and motivational control over affective processing thus allows for context-sensitivity while simultaneously preventing rigidity and escalation.

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Footnotes

Fn. 1: Recently, the psychophysical account or “evaluation window account” has also been used to explain contrast and assimilation effects in response priming (Klauer & Dittrich, 2010).

Table 1. *Means and standard errors (in parentheses) for reaction times in the valence search task depending on experimental condition (Exp. 1).*

| | Target Valence | | | |
|---|---|---|---|---|
| | positive | | negative | |
| | Feedback on Previous Trial | | | |
| | positive | negative | positive | negative |
| RT (in ms) | 503 (9) | 501 (10) | 509 (10) | 517 (11) |

Table 2. *Means and standard errors (in parentheses) for reaction times in the valence search task depending on experimental condition (Exp. 2).*

| | Target Valence | | | |
|---|---|---|---|---|
| | positive | | Negative | |
| | Valence of Memorized Word | | | |
| | positive | negative | positive | Negative |
| RT (in ms) | 837 (17) | 853 (18) | 859 (18) | 844 (18) |