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Intuition, Affect, and Personality: Unconscious Coherence Judgments and Self-Regulation of Negative Affect

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According to personality systems interaction theory, a negative mood was expected to reduce access to extended semantic networks and to reduce performance on intuitive judgments of coherence for participants who have an impaired ability to down-regulate negative affect (i.e., state-oriented participants). Consistent with expectations, state-oriented participants reporting higher levels of perseverating negative mood had a reduced discrimination between coherent and incoherent standard word triples (Study 1) and individually derived word triples describing persons (Study 2). Participants who are able to down-regulate negative affect (i.e., action-oriented participants) did not show this tendency. In addition, Study 2 revealed a dissociation between state orientation and Neuroticism that is discussed in terms of a functional difference between the two constructs.

Imagine the following situation: Unexpectedly, you have guests for dinner and need to prepare a meal with the available ingredients. In this stressful situation, do you think that your current mood may influence the way you approach your task, that is, having a spontaneous "gestalt-like" perception of a dish when looking at the single articles of food or having to compare them step by step with the listed ingredients of different recipes? And do you think that your personality—apart from your expertise as a cook—will influence this ability? We propose they do. In everyday life we often solve problems and come to decisions *intuitively* without being able to explain the way we got there. However, at other times we solve problems through more analytical strategies and rely on explicit step-by-step knowledge instead of our intuition. The present two studies investigate the influence of personality dispositions and affect on intuition.

Our interest in the study of intuitive information processing is embedded in a research program aiming at an analysis of the self and its regulatory functions (Kuhl & Beckmann, 1994). There is a growing consensus that human self-representations are largely based on intuitive processing (Greenwald & Banaji, 1995; Kuhl, 1994b, 2000). Autonoetic memories that convey feelings associated with self-relevant experiences ("remembering what") can dissociate from conceptual ("knowing that") memories (Wheeler, Stuss, & Tulving, 1997). Implicit representations can be assessed on the basis of *spontaneous* productions, irrespective of whether they have motivational and self-related contents (Klinger, 1999; Schultheiss & Brunstein, 1999) or do not relate to the self (Schacter, 1987). Experimental evidence suggests that implicit self-representations and explicit self-concepts are mediated by different processing systems: Information related to self-related experiences (e. g., words reminding of episodes when one had the feeling of being smart) had no priming effect on the processing of information related to one's conceptual self (e.g., words describing self-attributes: "I am a smart person") and vice versa (Klein & Loftus, 1993). In a similar vein, neuropsychological findings show dissociations between explicit and implicit self-representations: For example, a neuropsychological patient was able to describe changes in his personality after brain damage on an abstract, conceptual level (e.g., from extravert to introvert) whereas his episodic memory, a precondition for self-related feelings, was lost (Kihlstrom & Klein, 1997).

In the research reported here, we focus on the more general processing characteristics attributed to the implicit self. It has been argued that access to implicit self-representations is impaired under conditions of stress and negative affect (Kuhl, 1994b, 2000). Presumably, this impairment is not confined to implicit self-representations, but to other kinds of intuitive processing as well. In a previous study, we could show that an experimental induction of negative affect impairs intuitive judgments and positive affect improves them, even when those judgments are not related to the self (Bolte, Goschke, & Kuhl, 2002). The two studies described in this article examine the hypothesis that the impairment of intuitive judgment through negative affect interacts with an individual difference measure related to self-regulation. Specifically, our hypothesis is that impairment of intuitive performance is moderated by the ability to down-regulate negative affect as assessed by the action control scale (i.e., action vs. state orientation after failure; AOF). State-oriented individuals who cannot terminate perseverating negative emotional states when exposed to aversive events (Kuhl & Beckmann, 1994) are expected to show impairments of intuitive performance when in a negative mood whereas action-oriented participants should not show this impairment.

Operationally, we define intuition in terms of the perception of *coherence*. Although there are many definitions and aspects of intuition (Bastick, 1982), we focus on the spontaneous or preliminary perception of coherence that is not consciously represented (Bowers, Regehr, Balthazard, & Parker, 1990). The task requires

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participants to intuitively rate word triads as *coherent* or *incoherent*. For example, the word triad *goat, pass, green* can be perceived as coherent because each constituent word is associated with the fourth (solution) word *mountain*. In contrast, the word triad *bird, pipe, road* is more likely to be perceived as incoherent because the constituent words are not easily associated with a single solution word. The main question is how well participants can discriminate coherent triads that they are unable to solve in an explicit test at the end of the experiment. The effects of consciously not represented information on discriminative judgments have been demonstrated in many research areas (e.g., Marcel, 1983; Reber & Squire, 1994; Yaniv & Meyer, 1987). The processes involved in these effects seem to be relevant for our focus on intuition: The automatic activation of *extended* associationistic networks, implicit representations, and parallel-holistic processing may be regarded as the functional basis of intuitive judgments (Beeman et al., 1994; Smith & Shapiro, 1989). In the theory of personality systems interaction (PSI; Kuhl, 2000), the system providing implicit representations of extended semantic networks is called *extension memory*. Access to this system is necessary to have an overview of extended semantic fields, relevant episodes experienced (Wheeler, Stuss, & Tulving, 1997), and integrated self-representations (Kuhl, 2000). In their experiments on "summation priming," Beeman et al. (1994) found the activation of extended semantic networks to be supported more by the right than by the left hemisphere of the human brain.

According to PSI theory, extension memory is a high-level intuitive system that can be distinguished from a low-level intuitive (i.e., automatized) behavior output control. Implicit self-representations (i.e., the "self-system") are part of this high-level intuitive system. When extension memory participates in decision making and action, a great number of internal states, such as needs, preferences, feelings, and action alternatives, are taken into account simultaneously so that a person can choose goals that satisfy multiple constraints and easily feel priorities and make decisions among a variety of options without having to scrutinize each of them in a step-by-step, conscious manner. In addition, access to differentiated self-aspects seems to play an important role in the self-regulation of affect (Linville, 1987; Showers & Kling, 1996). This may be due to the close interaction between implicit, right hemispheric processes that self-representations are based on and emotional processing (Dawson & Schell, 1982; Tucker, 1981). According to PSI theory, this functional characteristic of the high-level intuitive system differs from low-level intuitive behavior control. Research has shown that low-level experiential processing, which is associated with impulsive and sometimes irrational or esoteric thinking, correlates *negatively* with measures of rational control of thought and affect (Epstein, Pacini, Denes-Raj, & Heier, 1996). The characteristics of the rational (high-level) form of intuition are described by the term *feeling*, which aptly combines both the emotional and the cognitive component ("tacit knowledge") of high-level intuition (Kuhl, 2000): "When we cannot explain how we perform a certain task or how we arrived at a particular solution we refer to an intuitive feeling (I don't know how I did it, I just feel it is right this way)" (p. 132).

According to PSI theory, positive and negative affect modulate the activation of cognitive systems (i.e., extension memory, intention memory, object recognition, and behavioral output control). The modulating influence of affect on cognitive processing has been empirically demonstrated especially for positive affect (Bodenhausen, Kramer, & Suesser, 1994; Isen, 1987; Schwarz, Bless, & Bohner, 1991). In categorization tasks, positive affect increased the tendency to rate less prototypical exemplars as members of the category (Isen & Daubman, 1984). In word-association tasks, positive affect led participants to produce more unusual first associates (Isen, Johnson, Mertz, & Robinson, 1985). Positive affect also has been found to facilitate creative problem solving (Isen, Daubman, & Nowicki, 1987). Using the Remote Associates Test designed by Mednick, Mednick, and Mednick (1964), participants were presented with items consisting of three words (e.g., *mower, atomic, foreign*) and were asked to find a word that relates to each of the three words in the item (i.e., *power*). The induction of positive affect led to improved performance. Beeman et al. (1994) presented theoretical and empirical arguments for the claim that tasks that require participants to detect semantic overlap ("coherence") among weakly associated words are supported by the right hemisphere. This account is consistent with our view that the findings reported by Isen and her associates (Isen & Daubman, 1984; Isen et al., 1985, 1987) support the assumption that positive affect facilitates access to extension memory.

In addition to the facilitating influence of positive affect, PSI theory assumes an inhibitory influence of negative affect on extension memory and high-level intuition. Positive and negative affect are conceptualized as orthogonal dimensions (Diener & Emmons, 1985; Kuhl, 2000; Watson & Tellegen, 1985). Nevertheless, the experimental manipulation of positive affect or reward often influences the level of negative affect and the activation of the punishment system and vice versa. Thus, it remains an open question whether the facilitating influence of positive affect is attributable to a direct effect or indirect influences that are due to the reduction of negative affect. In the present two experiments we focused on the inhibitory influence of negative affect. According to PSI theory, negative affect reduces access to extension memory and increases perceptual sensitivity for elementary sensations and isolated "objects" (i.e., object recognition). Intuitive judgments of coherence should be more difficult under this system configuration. The present studies addressed the question whether even low to moderate levels of negative affect suffice to disrupt intuitive processing.

When studying the influence of negative affect, one has to take into consideration individual differences in coping. Negative affect will only reduce the activity of extension memory and the performance in intuitive judgments when it perseverates, that is, when the ability to reduce (self-regulate) negative affect once aroused is impaired. The ability to self-regulate negative affect is described by the personality disposition of *action* versus *state orientation* after failure (disengagement vs. preoccupation). Whereas action-oriented individuals respond to aversive experiences with a focus on options for action that support coping, state-oriented individuals tend to respond with ruminations about past, present, or future states (Kuhl, 1994c). The conceptualization of state orientation in terms of a low ability to volitionally control negative affect and intrusive thoughts elicited by it is supported by many findings showing that differences between action and state orientation are observed under negative, stressful conditions and are absent under relaxed conditions (e.g., Kuhl & Beckmann, 1994). A high ability to volitionally control perseveration of negative affect does not

imply that action-oriented individuals do not experience negative affect. In contrast, they were found to be even more sensitive to negative affect than state-oriented participants at an early processing stage (Rosahl, Tennigkeit, Kuhl, & Haschke, 1993) and to self-regulate negative affect only when it is in conflict with their momentary interests (e.g., disturbing during task performance or threatening the self-worth). When the task requires intuitive judgments of coherence, we expect action-oriented participants to down-regulate negative affect, presumably through the compensatory activation of extension memory. In contrast, state-oriented participants lose access to this system when negative affect is high and perseverates because of their reduced ability to down-regulate it.

To summarize, the present two experiments investigated the role of the personality disposition toward action and state orientation and the role of negative affect in intuitive judgments of coherence. Our hypothesis predicts a personality and mood interaction: When negative affect is low, action- and state-oriented participants are expected to show an equally high discrimination of coherent and incoherent word triples. When negative affect is high, state-oriented participants are expected to show a decreased discrimination of coherent and incoherent triples whereas action-oriented participants are expected to maintain a high level of discrimination.

Experiment 1

The high-level intuition task required participants to classify word triads as coherent or incoherent (Bowers et al., 1990). A word triple was defined as coherent on a priori grounds if each constituent clue-word was a low associate of a fourth (solution) word that was not presented. For example, the words *salt*, *deep*, and *foam* were all associated with the word *sea*. A triple was defined as incoherent if the constituent clue-words were associates of three different stimulus words. For example, there was no single associate or solution word for the three words *bird*, *herring*, and *steam*. Participants were asked to respond intuitively according to their vague feeling of coherence and not to search for a solution word explicitly. The number of correctly identified coherent triples that could not be recognized as coherent in an explicit test at the end of the experiment was taken as a measure of high-level intuition.

Previous studies from our lab on intuitive judgments of coherence (Bolte, 1999; Bolte et al., 2002) and self-infiltration (Baumann, 1998; Baumann & Kuhl, in press) have demonstrated that naturally occurring moods yield parallel effects to experimentally induced moods. Because findings with induced and naturally occurring moods were so similar, we focused on participants' momentary mood as a measure of negative affect in this experiment. To measure negative mood, we assessed a variety of different states (e.g., helplessness, hopelessness, over-arousal, guilt, and sadness). Despite the differences in these mood states, PSI theory predicts a modulating influence on intuition of the above composite of negative moods. Because one does not expect to find high levels of negative moods in a healthy population, it is an interesting question to see whether even low to moderate levels of negative mood suffice to reduce intuitive judgments of coherence.

Method

Participants

Forty-eight participants (23 women and 25 men) were recruited through flyers at the University of Osnabrück, Germany and paid DM 20 ($10) for their participation. Their mean age was 24.5 years.

Materials

The Action Control Scale (ACS-90; Kuhl, 1994a) was administered. Example items on the failure-related action orientation (AOF) scale are as follows: "When I am told that my work has been completely unsatisfactory: (a) I don't let it bother me for too long, or (b) I feel paralyzed"; "When I have put all my effort into doing a really good job on something and the whole thing doesn't work out: (a) I don't have too much difficulty starting something else, or (b) I have trouble doing anything else at all."[1] In these two example items, option *a* reflects the action-oriented and option *b* reflects the state-oriented response alternatives. The scale ranged from 0–12 with higher scores indicating lower state orientation (*preoccupation*) and higher action orientation (*disengagement*). Six negative items (*helpless*, *sad*, *hopeless*, *discouraged*, *guilty*, and *over-aroused*) were used as a mood adjective checklist to assess participants' momentary mood. The scale ranged from 0 (*not at all*) to 3 (*very strongly*). Higher scale means indicated higher level of negative mood.

Target items for the intuition task were 12 coherent and 12 incoherent standard triples taken from a German adaptation (Bolte, 1999) of the dyads of triads task from Bowers et al. (1990). The coherent triples were all semantically convergent, in that the solution word meant the same in combination with each of the clue-words (items 3, 4, 7, 8, 17, 20, 27, 29, 37, 41, 53, and 56 from Bowers et al., 1990). The 12 incoherent triples were taken from the same items (dyads of triads).

Procedure

Participants were tested individually. They started with the ACS-90. The cover story of the experiment dealt with intuitive intelligence. In daily life, decisions are often made according to one's intuitive feeling rather than according to one's exact knowledge. The aim of the experiment was to find out more about this ability. Participants were introduced to example triples and asked to "intuitively" classify them as coherent or incoherent. Instructions encouraged participants to rely on their spontaneous or vague feeling and not to think about possible solution words. Each trial started with a fixation stimulus (+) shown for 500 ms in the center of the screen, which was followed by the presentation of a target stimulus for 3 s. When participants did not respond within 3 s, target stimuli were replaced by a blank screen until participants entered their classification response. There was a variable intertrial interval of 500 ms to 3 s. Participants' viewing distance to the computer monitor was about 60 cm. The word triples measured in average 4.5-cm wide × 6-cm high. The clue-words of each triple were presented in left justified columns. Practice trials were repeated until participants learned to respond within 3 s. The combination of 2 Triple Types (coherent vs. incoherent) × 12 items × 3 presentations gave a total of 72 trials. After the classification task, participants were asked to rate their momentary mood. Subsequently, an explicit test for standard triples was carried out. Participants were given a list of all 24 triples and asked to write down a solution word if they could think of one. Finally, participants were debriefed concerning the purpose of the experiment and paid. The whole experimental session lasted about 60 min.

[1] Reproduced with permission from *Volition and Personality* by Kuhl, ISBN 0-88937-029-X and ISBN 3-8017-0338-X, 1994, pp. 47–59, Hogrefe & Huber Publishers (Seattle).

Results

Descriptives

The AOF scale had an internal consistency (Cronbach's alpha) of $\alpha = .78$. AOF scores ranged from 0 to 11. Applying the norms (Kuhl, 1994a), 24 participants were classified as more state-oriented because their score was below the median of the norms (i.e., lower than 5, indicating a stronger disposition to preoccupy; $M = 2.25$, $SD = 1.42$) and 24 participants were classified as more action-oriented because their score was above the median of the norms (i.e., a score of 5 or higher; $M = 7.29$, $SD = 1.76$). The negative mood scale had an internal consistency of $\alpha = .73$. Negative mood scores ranged from 0 to 1.13. The sample was median split into a low negative mood group ($M = 0.06$, $SD = 0.07$) and a high negative mood group ($M = 0.51$, $SD = 0.30$). State- and action-oriented participants were equally represented in the two different groups: In the low negative mood group, 12 participants (6 women and 6 men) were state-oriented and 12 participants (5 women and 7 men) were action-oriented. In the high negative mood group, 12 participants (8 women and 4 men) were state-oriented and 12 participants (4 women and 8 men) were action-oriented.

To assess whether state- and action-oriented participants in the two mood groups had different levels of negative affect, independent *t* tests were computed. As expected, there were no significant differences in level of negative affect between state- and action-oriented participants either within the group of low negative mood ($M = 0.04$ vs. $M = 0.06$, respectively), $t(22) = -0.80$, *ns*, or within the group of high negative mood ($M = 0.54$ vs. $M = 0.49$, respectively), $t(22) = 0.35$, *ns*. Consistent with the hypothesis that state orientation is not associated with increased sensitivity to negative affect, the correlation between action orientation and negative mood was not significant ($r = -.10$).

Discrimination Index

A coherent triple was scored as solved when participants provided the preordained word or an exact synonym in the explicit test at the end of the experiment. The mean rate of correct solutions was 27.4% (range = 8.3%–58.3%). This was comparable with mean solution rates between 21.9% and 31.6% in five studies by Bowers et al. (1990; calculated from Table 1). Incoherent triples were—per definition—unsolvable.

The interesting question was how well participants could identify coherent triples that they were unable to solve in the explicit test. To control for response tendencies, a discrimination index was calculated from hit and false-alarm rates as the main dependent variable. Hit rates were calculated as the proportion of *unsolved* coherent triples that were correctly classified as coherent. False-alarm rates were calculated as the proportion of incoherent triples that were falsely classified as coherent. Because of the limited number of observations per subject, it was not advisable to compute the signal detection measure of sensitivity d' (Pollack, 1970). Therefore, a nonparametric analog to d' called A' was used that can be calculated even when the number of observations per cell was small and produced hit rates of 1.0 and false-alarm rates of 0.0 on occasion (Pollack, 1970; Pollack & Norman, 1964). A' has been shown to be highly correlated with d' (Snodgrass, Volvovitz, & Walfish, 1972) and to be theoretically equivalent to the probability of a correct response in a two-alternative, forced-choice experiment (Green & Swets, 1974). Therefore, it is comparable with the "guiding index" that Bowers et al. (1990) calculated from participants' forced choices between two triples (one coherent and one incoherent) presented simultaneously as "dyads of triads." Chance performance yields an A' of .5, whereas perfect discrimination performance is reflected in an A' value of 1.0.[2]

Discrimination rates A' were analyzed using an Action Control (state vs. action orientation) × Negative Mood (low vs. high) analysis of variance (ANOVA). Results yielded a significant Action Control × Negative Mood interaction, $F(1, 44) = 6.68$, $p < .02$. As shown in Figure 1, discrimination rates A' did not differ for state- and action-oriented participants reporting low levels of negative mood. However, state-oriented participants had significantly lower discrimination rates than action-oriented participants when reporting high levels of negative mood, $t(22) = -3.08$, $p < .005$. Results were consistent with our hypothesis.[3]

The discrimination index used above applied a strict criterion of intuition: Coherent triples were excluded from analyses if they were solved in an explicit test at the end of the experiment. However, participants may not have known the solution before they had the opportunity to explicitly think about it without any time constraints. Therefore, speeded coherence judgments prior to the explicit test may have been intuitive. To test whether the same results were obtained for a lax criterion of intuition, a second discrimination index A' was calculated with hit rates defined as the proportion of *all* coherent triples (solved and unsolved) correctly classified as coherent. The Action Control × Negative Mood ANOVA yielded a significant interaction effect, $F(1, 44) = 5.73$, $p < .03$. State-oriented participants had significantly lower discrimination rates A' than action-oriented participants when reporting high levels of negative mood ($M = 0.72$ vs. $M = 0.80$, respectively), $t(22) = -2.64$, $p < .02$. Discrimination rates did not differ for state- and action-oriented participants reporting low levels of negative mood ($M = 0.78$ vs. $M = 0.75$, respectively). Results for the lax criterion replicated those for the strict criterion of intuition.

Participants' gender could be an important confounding variable, as women may be more intuitive than men. To test this hypothesis, all analyses were calculated including the factor Gender (women vs. men). There were no significant main or interaction effects for gender. Results do not support the hypothesis that women are more intuitive than men. Moreover, the modulating effect of negative affect on intuitive processing seems to be inde-

[2] A' was calculated by the following formulas, where H is the hit rate and FA is the false-alarm rate: (a) if $H > FA$, $A' = .5 + (H - FA)(1 + H - FA)/4H(1 - FA)$; (b) if $H = FA$, $A' = .5$; and (c) if $H < FA$, $A' = .5 - (FA - H)(1 + FA - H)/4FA(1 - H)$.

[3] Because dichotomization of continuous or graduated variables has been criticized (e.g., Cohen, 1983), a hierarchical regression analysis was carried out with discrimination rates as the dependent variable, AOF and Negative Mood entered as Block 1, and their interaction term entered as Block 2. The AOF × Negative Mood interaction was significant ($p < .02$) confirming the ANOVA findings reported in the text.

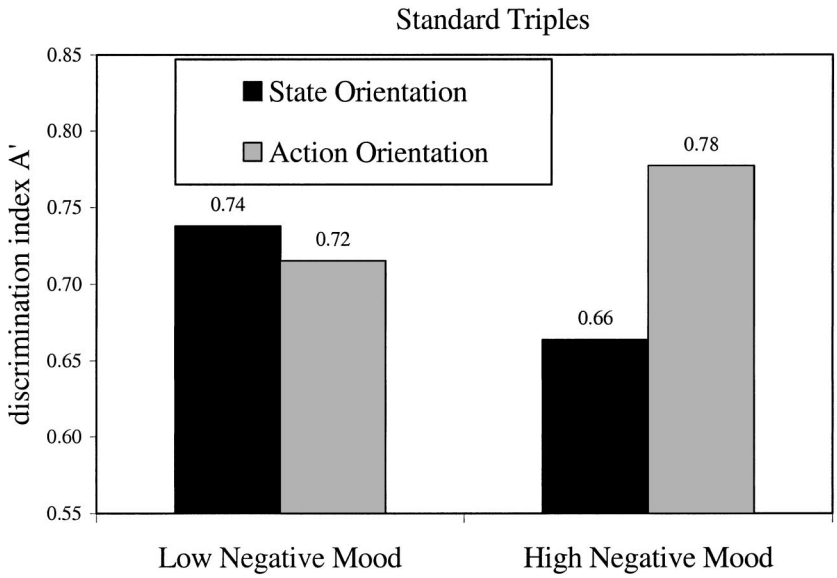

Figure 1. Mean discrimination index A' of standard triples, as a function of state versus action orientation and negative mood for Experiment 1. Higher values on the ordinate indicate higher discrimination between coherent and incoherent standard triples.

pendent of gender. The interaction of action control and negative mood in intuitive judgments of coherence (as depicted in Figure 1) can be generalized across genders.

Response-Bias

In addition to the ability to detect coherence in word triples, participants' mood may have influenced their response-tendency. To test this hypothesis, the response-bias index *C* was calculated (Snodgrass & Corwin, 1988).[4] Positive *C* values indicate a conservative bias, *C* values of zero indicate no bias, and negative *C* values indicate a liberal bias. An Action Control × Negative Mood ANOVA was calculated with the response-bias *C* as the dependent variable. There were no significant main or interaction effects. Including the factor Gender in the analysis did not yield any significant effects. Findings are consistent with the assumption that a negative mood did not influence state-oriented participants' response tendency but actually reduced their performance on intuitive judgments of coherence.

Response-Latency Analyses

To rule out alternative interpretations of discrimination data, the correlation between the discrimination index A' and response latencies was calculated. A significant positive correlation between these two dependent variables might indicate a speed–accuracy trade-off. In addition, long latencies might indicate an analytical–sequential search for coherence that is presumably more time consuming. However, there was a marginal significant negative correlation of $r = -.24$ ($p < .10$) between A' and response latencies: Faster responses were associated with a higher discrimination between coherent and incoherent standard triples. The finding does not support the alternative interpretations mentioned.

Discussion

Experiment 1 investigated the effects of a naturally occurring negative mood on intuitive judgments of coherence. Consistent with our hypothesis, state-oriented participants who reported a negative mood had a reduced discrimination between coherent and incoherent standard triples whereas action-oriented participants were not impaired in their perception of coherence by a negative mood. When not in a negative mood, state- and action-oriented participants had equally high discrimination rates. This pattern of results was obtained for a lax (i.e., analyzing all triples) as well as for a strict criterion of intuition (i.e., excluding explicitly solved triples). The negative correlation between discrimination rates and response latencies further supported the interpretation of higher discrimination rates as indicating intuitive judgments: Higher discrimination rates were associated with more spontaneous, intuitive responses in contrast to presumably more time-consuming, analytical responses. In addition, performance decrements were not due to other factors, such as changes in response tendencies: The discrimination index A' is free of response tendencies and there were no significant changes in the response-bias index *C*.

To summarize, results of Experiment 1 were consistent with our central hypothesis that state-oriented individuals lose access to extension memory and intuition when in a negative mood. Of interest, even low to moderate levels of negative mood sufficed to disrupt intuition in state-oriented participants. However, there remain open questions. Because the mood was assessed at the end of the experiment, one could argue that a person who is not able to intuitively feel coherence and who does not manage the intuition

[4] *C* was calculated by the following formula: $C = -.5$(standardized hit rate + standardized false-alarm rate).

task well becomes frustrated or sad during the experiment. Accordingly, a negative mood would not be the cause of decreased intuition, but its effect.

Experiment 2

To rule out the possibility that performance on the intuition task systematically influenced the level of sadness and hopelessness, participants' momentary mood was assessed at the beginning of Experiment 2. In addition, Neuroticism was assessed as a personality disposition that is typically associated with negative affect. Eysenck (1990) explains Neuroticism as an instability of emotional reactions due to low activation thresholds in the sympathetic nervous system or visceral brain. Indeed, the disposition to react more sensitive to minor stresses (i.e., Neuroticism) was found to be a more powerful predictor of high psychological distress than environmental factors (Ormel & Wohlfarth, 1991). Although constructs like Neuroticism or anxiety are positively correlated with state orientation (Kuhl & Beckmann, 1994), they need to be separated from a functional point of view. Whereas Neuroticism and anxiety describe a generally high sensitivity to punishment signals (Gray, 1987), state orientation describes difficulties in the ability to volitionally control negative affect once it is aroused. In other words, anxiety and Neuroticism describe how quickly an individual *enters* a negative state whereas action versus state orientation describes how quickly an individual is able to *leave* an emotional state once it is aroused. This conceptual difference should be reflected in an empirical dissociation between Neuroticism and state orientation. That is, despite a positive correlation between state orientation and Neuroticism, our hypotheses predict different relationships with relevant variables. In contrast to state orientation, Neuroticism is expected to be significantly correlated with participants' negative mood. Furthermore, the disposition toward action and state orientation is expected to modulate the relationship between Neuroticism and intuition similar to its modulating role in the relationship between negative affect and intuition. That is, even people with a low threshold for experiencing negative affect (i.e., a high score in Neuroticism) can maintain access to extension memory and high-level intuition when their ability to self-regulate negative affect (i.e., their action orientation) is high. In contrast, low Neuroticism (i.e., emotional stability) is not expected to compensate the inhibitory influence of negative affect on intuition to a similar extent as action orientation does. That is, even a high threshold for experiencing negative affect (i.e., a low score in Neuroticism) does not necessarily help individuals to reduce negative affect when situational stressors are strong enough to make them feel bad.

To summarize, high levels of negative mood as well as high Neuroticism are expected to reduce access to extension memory and intuition only when the ability to down-regulate negative affect is impaired. In Experiment 2, the task consisted of individual word triples derived from self-generated material in the context of person perception. This item material was chosen because the ability to perceive different aspects of or experiences with significant others as coherent should be an important integrative function of extension memory. In addition, intuitively feeling coherence or incoherence in the perception of persons should be more self-relevant than feeling the shared meaning of standard words. Finally, the changes in item material offered the opportunity to test the generalizability of our results to different tasks.

Method

Participants

Fifty-two participants (25 women and 27 men) were recruited through flyers at the University of Osnabrück, Germany and paid DM 20 ($10) for their participation. Their mean age was 24.2 years.

Material

The same questionnaires were administered as in Experiment 1 (ACS-90, mood adjective checklist). In addition, the German adaptation (Borkenau & Ostendorf, 1993) of the NEO Five Factor Inventory (NEO-FFI; Costa & McCrae, 1989) was administered to assess Neuroticism. The scale ranged from 0 to 48, with higher scores indicating higher Neuroticism. In contrast to the standard triples in Experiment 1, target items for the intuition task were developed for each participant individually. Participants were asked to describe two friends by writing down three positive and three negative adjectives for each friend that characterized him or her best. They were not allowed to use adjectives twice or to use synonyms. Adjectives were combined to coherent and incoherent "person triples." All person triples were heterogeneous with respect to the valence of adjectives. That is, half of the person triples consisted of one positive and two negative adjectives whereas the other half consisted of one negative and two positive adjectives. Twelve coherent person triples were put together from the description of a single friend. Twelve incoherent person triples consisted of a positive and a negative adjective from the description of one friend and a (positive or negative) adjective from the description of the other friend.

Procedure

In contrast to Experiment 1, participants were asked to rate their momentary mood at the beginning of the experiment. Subsequently, participants described two friends and filled out the ACS-90 and the NEO-FFI. As in Experiment 1, the cover story of the experiment dealt with intuitive intelligence. Participants were introduced to example triples and asked to "intuitively" classify them as coherent (i.e., describing one person) or incoherent (i.e., describing two different persons). Instructions encouraged participants to rely on their spontaneous or vague feeling. All details of item presentation were the same as in Experiment 1. The combination of 2 Triple Types (coherent vs. incoherent) $\times$ 12 items $\times$ 3 presentations gave a total of 72 trials. Finally, participants were debriefed concerning the purpose of the experiment and paid. The experimental session lasted about 60 min.

Results

Descriptives

The AOF scale had an internal consistency (Cronbach's alpha) of $\alpha = .80$. AOF scores ranged from 0 to 11. Applying the norms (Kuhl, 1994a), 26 participants were classified as more state-oriented because their score was below the median of the norms ($M = 2.08$, $SD = 1.49$), and 26 were classified as more action-oriented because their score was above the median of the norms ($M = 7.31$, $SD = 1.74$). The negative mood scale had an internal consistency of $\alpha = .64$. Negative mood scores ranged from 0 to 1.25. The sample was median split into a low negative mood group ($M = 0.06$, $SD = 0.07$) and a high negative mood group

($M = 0.54$, $SD = 0.29$). In the low negative mood group, 11 participants (5 women and 6 men) were state-oriented and 14 participants (2 women and 12 men) action-oriented. In the high negative mood group, 15 participants (11 women and 4 men) were state-oriented and 12 participants (7 women and 5 men) action-oriented. State- and action-oriented participants did not differ in their level of negative affect either within the group of low negative mood ($M = 0.07$ vs. $M = 0.05$, respectively), $t(23) = 0.54$, *ns*, or within the group of high negative mood ($M = 0.58$ vs. $M = 0.50$, respectively), $t(25) = 0.73$, *ns*.

The Neuroticism scale had an internal consistency of $\alpha = .80$. Neuroticism scores ranged from 5 to 42. Twenty-three participants (12 low and 11 high in negative mood) were classified as low in Neuroticism because their score was below the median ($M = 17.00$, $SD = 3.58$), and 27 (12 low and 15 high in negative mood) were classified as high in Neuroticism because their score was above the median ($M = 28.85$, $SD = 5.25$). Two participants were not classified because of incomplete NEO-FFI data. Within the group of low negative mood, participants low and high in Neuroticism did not differ in their level of negative affect ($M = 0.06$ vs. $M = 0.07$, respectively), $t(22) = -0.19$, *ns*. Within the group of high negative mood, participants low in Neuroticism reported less negative affect than participants high in Neuroticism ($M = 0.43$ vs. $M = 0.64$, respectively). The difference was marginally significant, $t(24) = -1.83$, $p < .08$.

As in Experiment 1, there was no significant correlation between action orientation and negative mood as assessed at the beginning of the experiment ($r = -.14$). In contrast, Neuroticism showed the expected significant positive correlation with negative mood ($r = .33$, $p < .05$). These findings are consistent with the expectation that Neuroticism is associated with higher sensitivity for negative affect whereas action and state orientation are not related to emotional sensitivity. In light of the divergent findings for initial mood states, the marginally significant correlation between action orientation and Neuroticism ($r = -.25$, $p < .10$) cannot be interpreted in terms of a conceptual identity of the two constructs.

Discrimination Index

As in Experiment 1, a discrimination index A' was calculated from hit and false-alarm rates. Hit rates were calculated as the proportion of coherent triples that were correctly classified as coherent. Because the item material was self-generated, it was not possible to exclude triples that were explicitly solved. However, in Experiment 1 this lax criterion of intuition has been shown to yield the same results as a more strict criterion. False-alarm rates were calculated as the proportion of incoherent triples that were falsely classified as coherent. Discrimination rates A' were analyzed using an Action Control (state vs. action orientation) $\times$ Negative Mood (low vs. high) ANOVA. Results yielded a significant Action Control $\times$ Negative Mood interaction, $F(1, 48) = 4.64$, $p < .04$. As can be seen in Figure 2, state- and action-oriented participants did not differ in their discrimination rates A' when reporting low levels of negative affect. In contrast, state-oriented participants had significantly lower discrimination rates A' than action-oriented participants when reporting high levels of negative affect, $t(25) = -2.83$, $p < .01$. Results are consistent with our hypothesis and replicate the finding of the previous experiment.

To examine whether Neuroticism had similar effects as state-oriented preoccupation, discrimination rates A' were analyzed using a Neuroticism (low vs. high) $\times$ Negative Mood (low vs. high) ANOVA. There were no significant main or interaction effects for Neuroticism (all ps $> .20$). Entering AOF as a covariate did not change this pattern of results. Vice versa, the Action Control $\times$ Negative Mood interaction remained significant when

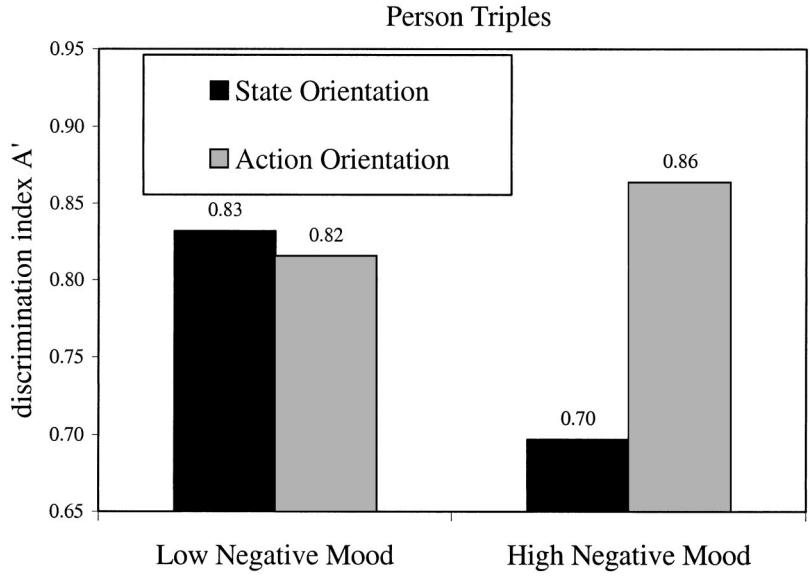

Figure 2. Mean discrimination index A' of person triples, as a function of state versus action orientation and negative mood for Experiment 2. Higher values on the ordinate indicate higher discrimination between coherent and incoherent person triples.

entering Neuroticism as a covariate, $F(1, 45) = 5.16$, $p < .03$. To examine whether Neuroticism had similar effects as a negative mood, an Action Control (state vs. action orientation) × Neuroticism (low vs. high) ANOVA was calculated. Results yielded a significant Action Control × Neuroticism interaction, $F(1, 46) = 4.10$, $p < .05$. Similar to the results depicted in Figure 2, state- and action-oriented participants did not differ in their discrimination when Neuroticism was low (see Table 1). In contrast, state-oriented participants had significantly lower discrimination rates than action-oriented participants when Neuroticism was high, $t(25) = -2.64$, $p < .02$. The Action Control × Neuroticism interaction was marginally significant when entering negative mood as a covariate, $F(1, 45) = 4.56$, $p < .07$.[5]

Because women might be more intuitive than men, all analyses were calculated including the additional factor Gender (women vs. men). Results yielded no significant main or interaction effects for gender. Women and men did not differ in their intuitive judgments of coherence nor was negative affect associated with differential modulations of intuitive processing across genders. The findings reported above can be generalized across genders.

Response Bias

To test whether participants' mood influenced their preference for one of the two response alternatives, the response-bias index *C* was analyzed using an Action Control × Negative Mood ANOVA. There were no significant main or interaction effects. Including the factor Gender in the analysis did not yield any significant effects. Consistent with Experiment 1, a negative mood did not influence state-oriented participants' response tendency but actually reduced their performance on intuitive judgments of coherence.

Response-Latency Analyses

To rule out a speed–accuracy trade-off, the correlation between the discrimination index A' and response latencies was calculated. In addition, long latencies might indicate a more time-consuming, analytical–sequential search for coherence. The correlation between A' and response latencies was not significant ($r = .18$, *ns*). This result does not support alternative interpretations of the discrimination index.

Discussion

Experiment 2 replicated the inhibitory influence of a naturally occurring negative mood on intuitive judgments of coherence for state-oriented participants who presumably have a deficit in the ability to self-regulate negative affect. Because participants' mood was assessed at the beginning of the experiment, the relationship between a negative mood and reduced intuition could not be attributed to possible effects of low task performance on participants' mood. Nevertheless, findings remain correlative. Previous experiments on intuition (Bolte et al., 2002) have supported the assumption that a negative mood actually plays a *causal* role in reducing performance on intuitive judgments of coherence. To the extent that, compared with subjectively experienced affect, experimentally induced mood can more quickly change as a function of individual coping mechanisms, the findings presented here confirm the generalizability of the experimental findings (Bolte et al., 2002). In the present experiments, the relationship between unattenuated negative affect and reduced intuition was stable across different tasks. It was found in a standard remote associates test and replicated with individual word material in the context of person perception. The second task did not allow to control explicit knowledge about correct solutions as well as the first task. Nevertheless, response latencies did not support a possible alternative interpretation that high discrimination rates were obtained by time-consuming analytical search strategies instead of intuitive judgments: There was no significant positive correlation between response latencies and discrimination rates.

Consistent with our hypothesis, there was a dissociation between the moderately correlated constructs of state orientation and Neuroticism. The former did not correlate with the likelihood of entering a negative mood at the beginning of the experiment whereas the latter was significantly correlated with initial ratings of negative mood. The finding supports the conceptualization of Neuroticism in terms of elevated sensitivity toward negative affect or activation of a punishment system (Gray, 1987). Whereas low Neuroticism did not compensate the negative influence of a negative mood on intuition, action orientation did. Even when experiencing a negative mood, action-oriented participants were able to keep access to extension memory and intuition as soon as they were confronted with the task. The finding is consistent with the conceptualization of state and action orientation in terms of individual differences in the ability to volitionally control negative affect when task conditions require such a control. Action-oriented participants were not only able to self-regulate a negative mood, but also to compensate high levels of Neuroticism. The dissociation between Neuroticism and state orientation obtained points to the functional differences between the two constructs: High sensitivity to versus low volitional control of negative affect, respectively.

Table 1
Mean Discrimination Index A' of Person Triples, as a Function of State Versus Action Orientation and Neuroticism for Experiment 2

	Low Neuroticism			High Neuroticism		
Action control	*N*	*M*	*SD*	*N*	*M*	*SD*
State orientation	9	0.84	(0.15)	16	0.70	(0.17)
Action orientation	14	0.82	(0.16)	11	0.85	(0.11)

Note. Higher values indicate higher discrimination between coherent and incoherent person triples.

General Discussion

The findings on intuition complement findings on self-infiltration that state-oriented participants tend to be infiltrated by social expectations and misperceive external assignments as self-selected intentions when feeling sad (Baumann & Kuhl, in press; Kazén, Baumann, & Kuhl, 2001). According to PSI theory, state-oriented individuals exposed to negative mood confound external

[5] Hierarchical regression analyses yielded the same pattern of results.

assignments with their own choices because perseverating negative affect impairs access to extension memory, including its representation of the integrated self. The present two experiments provide a more fine-grained analysis of the functional characteristics of extension memory and their relation to individual differences in affect regulation. According to the PSI view, access to extension memory does not only provide implicit self-representations that are the basis for checking self-compatibility of intentions as in the self-infiltration studies cited, but also facilitates an intuitive-holistic mode of processing and a "feeling of knowing." The modulating roles of affect and a disposition to self-regulate affect have been demonstrated in both phenomena—self-compatibility checking as a measure to avoid self-infiltration (Baumann & Kuhl, in press; Kuhl & Kazén, 1994) and perception of coherence investigated in the two experiments reported here. To the extent that implicit self-representations require a memory system providing extended semantic networks, the present findings suggest that impaired self-compatibility checking, which presumably causes self-infiltration effects (i.e., misperceiving assigned goals as one's own) in state-oriented individuals when feeling sad, may be regarded as a special case of impaired access to extended networks that provide remotely associated semantic units. Beeman et al. (1994) have provided convincing theoretical and empirical arguments for the operationalization of extended semantic networks on the basis of tasks that require the integration of shared meaning of three or more remotely associated words. They attribute the extraction of shared meaning to the semantic fields of the right hemisphere of the brain: Because they are more extended than left-hemispheric semantic networks, the right-hemispheric semantic fields are more likely to produce the type of overlap even among remote associates that is necessary to detect some shared meaning.

From a personality point of view, detection of shared meaning can be regarded as a functional prerequisite of integrative competence needed to develop a coherent self-representational system. Access to a self-representational system, which provides a simultaneous implicit overview of many potentially relevant personal needs, values, attitudes, and other self-aspects, enables the organism to quickly and intuitively form goals and find actions that are in accordance with a variety of self-aspects and basic needs, that is to increase self-determination (Deci & Ryan, 1991). The integrative capacity of a differentiated ("complex") self can be regarded not only as a basis for the development of a coherent self-system (Sheldon & Kasser, 1995), but also as a functional requirement for affect regulation in everyday life (Linville, 1987) and in therapy (Antonovsky, 1987; Gilligan, 1997). Integration of contradictory experiences seems to be one of the most remarkable accomplishments of a mature self-system (Gilligan, 1997). In fact, self-descriptions that integrate positive and negative affects associated with various self-aspects may be used as indicators of the integration level achieved by a developing self-system (Showers & Kling, 1996).

It should be noted, however, that the role of the integrated self in affect regulation may be subject to individual differences. According to recent findings from our laboratory, the maturity level of the integrated self may be more important as a coping mechanism for some people (e.g., emotionally sensitive or "neurotic" individuals) than for others (Biebrich & Kuhl, 2002). These findings are in accordance with data reported by Showers and Kling (1996) showing that emotionally sensitive participants who gave negative self-aspects more weight than positive self-aspects were able to recover from an induced negative mood only if they were instructed to access self-representations (i.e., write an essay on "who am I"). Distraction from self-related thoughts (e.g., count backwards) aggravated induced negative mood in this group. In contrast, participants who provided largely positive self-descriptions without much evidence for integration of contradictory feelings (as an indication of an undifferentiated, "compartmentalized," albeit positive self) recovered from negative mood in the distraction condition whereas the self-activation condition even aggravated the negative mood in this group.

Taken together, experimental and clinical evidence for the role of self-complexity in the regulation of affect suggests a reciprocal relationship between affect regulation and self-development, especially in emotionally sensitive individuals: Whereas earlier research demonstrates effects of an integrated self on affect regulation (Linville, 1987; Showers & Kling, 1996), the findings of the two experiments reported here suggest that access to coherence-producing cognitive processing in turn depends on affect regulation. Neurobiological research suggesting the right hemisphere of the human brain to be involved both in nonconscious, coherence-producing cognitive processing (Beeman et al., 1994) as well as in unconscious perception (Dawson & Schell, 1982) and control (Wittling, 1990) of affect suggests that the dual role of coherence-producing cognitive processing and affect regulation of the self may be mediated by a common functional locus of these two characteristics of the self-system.

What practical conclusion can be drawn from the present findings? A simple advice for the surprised host described at the beginning of this article would be: If you are a type of sensitive person who tends to ruminate, take care of your mood before starting to cook an improvised meal. In a more general sense, when a task requires high-level intuition, integrative capacity, or self-based decisions, the ability to self-regulate moods may be crucial for efficient performance, perhaps even more so than the momentary or typically predominant mood itself.

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