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Personality, Mood, and the Evaluation of Affective and Neutral Word Pairs

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Four studies bridged the areas of personality–mood and mood–cognition relations by investigating the effects of Extraversion and Neuroticism on the evaluation of affectively pleasant, unpleasant, and neutral word pairs. Specifically measured were affectivity ratings, categorization according to affect, judgments of associative strength, and response latencies. A strong, consistent cognitive bias toward affective as opposed to neutral stimuli was found across participants. Although some biases were systematically related to personality and mood, effects of individual differences were present only under specific conditions. The results are discussed in terms of a personality–mood framework and its implications for cognitive functioning.

Personality traits influence the frequency and intensity of experienced affective states (Costa & McCrae, 1980; Gross, Sutton, & Ketelaar, 1998; Larsen & Ketelaar, 1991). Affective states, in turn, influence cognitive processes (e.g., Gotlib & McCann, 1984; Mathews & MacLeod, 1985; Schwarz & Clore, 1983). We bridge this research with the hypothesis that specific personality dimensions—namely, Extraversion (E) and Neuroticism (N)—are systematically related to cognitive processing of affective stimuli. In a series of four studies, we examined the effects of personality, mood, and stimulus valence on cognitive functions and response times.

Personality Theories

Personality may be defined as "a more or less stable and enduring organization of a person's character, temperament, intellect, and physique" (Eysenck, 1970, p. 2). Although five dimensions are emphasized in descriptive models of personality traits, causal theories emphasize E and N (Revelle, 1995). In addition to the obvious relation to social behavior, E has been found to predict a wide range of behaviors, including efficacy of classical and operant conditioning, vigilance, pain tolerance, and sensory threshold (Eysenck & Eysenck, 1985). These relations have been explained in terms of cortical-arousal differences between extraverts and introverts.[1] Stated simply, extraverts are believed to be less aroused relative to introverts and more active in an effort to reach an optimal level of arousal. Individual differences in cortical arousal are implicated in the biological basis of N as well but are considered to be secondary to differences in limbic system activity. The functioning of this system is proposed to determine the intensity of physiological response to stress, which is positively correlated with N.

The impulsivity component of E has been proposed to reflect individual differences in sensitivity to signals of reward and nonpunishment (Gray, 1991). Greater sensitivity is manifested in increased physical activity in the presence of these signals—specifically, approach toward potential rewards and active avoidance of potential punishments. Such behavior is mediated by the behavioral activation system (BAS), made up of the mesolimbic dopaminergic pathway and related structures (Gray, 1991).

In this model, the BAS functions independently of the system that underlies sensitivity to signals of punishment and frustrative nonreward, the behavioral inhibition system (BIS). Trait anxiety is proposed to reflect this system's strength, which is manifested in a lack of movement—passive avoidance of potential punishment and efficient extinction of responses that no longer yield reward.

The Structure of Mood and Personality

A two-factor model has consistently emerged when affective structure is studied through the method of factor analysis. An early model identified affective valence and intensity as the two fundamental dimensions (Russell, 1979). A rotation of these dimensions yields the factors of *Positive Affect* (PA), which reflects the degree to which an individual feels excited, alert, and attentive, and *Negative Affect* (NA), which reflects the degree to which an individual feels distressed, upset, and afraid—two

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[1] Although statements such as this suggest a categorical orientation, they are used only for convenience. Eysenck, in fact, has promoted a dimensional approach to personality.

constructs that have received empirical attention in the area of personality–mood relations (Watson & Tellegen, 1985). Although the labels imply that PA and NA are strongly negatively correlated, PA and NA have in fact emerged as orthogonal dimensions in factor analytic studies (but see Green, Goldman, & Salovey, 1993).

Circumplex models of affect acknowledge the different rotational perspectives and include adjectives at the high and low ends of the activation and pleasantness–unpleasantness dimensions as well as those at the high and low ends of the PA and NA dimensions (Larsen & Diener, 1992). Circumplex models are compatible with two-factor models; the former simply do not ascribe special status to any two factors within the two-dimensional space.

Although PA and NA have been conceptualized as transient feelings, they have also been related to stable personality characteristics. Several seemingly diverse personality scales converge on a general factor of vulnerability to distress, labeled *trait* NA (Watson & Clark, 1984). High-NA individuals are more likely to report experiencing a wide variety of negative mood states, including anger, guilt, and anxiety, at all times and across situations.

In addition to the N-NA link, E may be associated with PA (Costa & McCrae, 1980). Factor analytic techniques have shown that state PA, trait PA, and E indeed share a common dimension, and state NA, trait NA, and N share a second, orthogonal dimension (Meyer & Shack, 1989). Two caveats to this statement are required: (a) The independence of the personality–mood relations may depend on the response format of the mood scale (Warr, Barter, & Brownbridge, 1983), and (b) the strength of the E-PA association may depend on which measure of E is used (Johnson & Ostendorf, 1993).

At a theoretical level, personality traits that reflect sensitivities to reward and punishment should show greater convergence with PA and NA than those reflecting basal cortical arousal level and stress reactivity. In fact, it has been suggested that PA and NA directly reflect activation of the BAS and the BIS, respectively (Tellegen, 1985). It follows that measures of E and N may tap BAS and BIS strength more than do measures of impulsivity and anxiety, a point acknowledged by Gray (1991). Recently, Carver and White (1994) proposed a promising new measure of BAS and BIS strength and examined its validity with respect to a variety of personality factors, including E and trait anxiety.

Affect and Cognitive Bias

Predispositions to experience particular affects have been proposed to relate to several different cognitive processes. Depressed individuals are believed to consistently use cognitive structures, or schemas, that are negative in nature and lead them to process more negative information (Beck, 1967). Depressed individuals deploy greater attention to and more deeply process negative-content stimuli than do nondepressed individuals (Gotlib & McCabe, 1992). However, cognitive functioning is influenced more by a depressed mood state than a trait-like propensity to become depressed.

Normal mood states are also associated with cognitive biases. Nondepressed individuals often demonstrate a bias toward positive information (Alloy & Abramson, 1979). For example, nondepressed participants attend more to manic-content words than depressed- or neutral-content words, whereas depressed participants attend equally to all types of words (Gotlib, McLachlan, & Katz, 1988). Similarly, the effect of mood on schema activation is not specific to the affective and anxiety disorders (Isen, Shalker, Clark, & Karp, 1978). However, just as advocates of "depressive schemas" have yet to demonstrate that these constructs are stable across time, the role of stable individual differences in the relations between mood and processing of affective information has not been established.

Nevertheless, it is clear that traits can play a prominent role in the allocation of attention. MacLeod and Mathews (1988) measured trait anxiety by self-report, manipulated state anxiety by proximity to a major examination, and assessed allocation of attention by a probe-detection technique. Only trait-anxious participants tended to shift attention toward threatening stimuli in both high- and low-state-anxiety conditions, which supports the view that stable characteristics can influence cognitive processing. In addition, increased state anxiety was associated with increased attention to threatening stimuli in trait-anxious participants and increased avoidance of such stimuli in participants with low trait anxiety. MacLeod and Mathews concluded that, in predicting the attentional response to threatening stimuli, trait and state anxiety should be considered to function interactively.

With this evidence and the demonstration of a shared personality–affective structure, research on cognitive biases should consider the relative contributions of and interactions between mood state and trait-like orientations to affect. A consistent orientation to emotional stimuli could be influenced by sensitivities to cues for reward and punishment. Thus, extraverts, who may be more sensitive to pleasant stimuli (cues for reward) than are introverts, may show greater attention to and deeper processing of pleasant stimuli than do introverts. Individuals high in N, who may be more sensitive to unpleasant stimuli (cues for punishment) than are emotionally stable individuals, may show greater attention to and deeper processing of negative stimuli than do emotionally stable individuals.

For the most part, these hypotheses have yet to be tested. However, the work of Derryberry, Reed, and their colleagues represents one beginning. Derryberry (1987) tested the cue-sensitivity model directly through an analysis of reaction times and errors in responding to affective cues. Following signals of reward, extraverts responded more rapidly and with a higher error rate than introverts. Following signals of punishment, introverts responded more slowly than extraverts. Using a target-detection task, Derryberry and Reed (1994) found that extraverts were slower to shift attention away from the point where a positive incentive cue had been located, whereas introverts were slower to shift from the point where a negative incentive cue had been located. These biases were found to be strongest in highly neurotic participants.

These results are important in three respects. First, they suggest that latency for shifting attention away from a stimulus should be considered as well as latency for shifting attention toward a stimulus. Second, they do not support a simple alignment of E with sensitivity to positive cues and N with sensitivity to negative cues. Rather, they support the notion that E relates to sensitivities to both types of cues and suggest that N amplifies E's effect on cognitive biases. Third, the effects were obtained in the absence of a mood manipulation, suggesting that E and N may be related to individual differences in the processing of affective information. This assertion must remain tentative, however, as the investigators did not report participants' mood.

Individual differences in sensitivities to affect have also been found to relate to the tendency to group stimuli according to common affective valence (Weiler, 1992). Participants were asked to read three words (a triplet) and choose the two that were most strongly associated. The ''pleasant affect'' personality variables (e.g., E) were related to the tendency to form pleasant pairs, and the ''unpleasant affect'' personality variables (e.g., N) were related to the tendency to form unpleasant pairs.

Overview of Present Research

In four studies, we examined the relations between mood–personality and the evaluation of pleasant, unpleasant, and neutral word pairs. Specifically, we examined affectivity ratings, categorization, judgments of associative strength, and response latencies as a function of E and N. Extraverts, as people who are sensitive to reward cues, were expected to be biased toward pleasant pairs relative to introverts. Similarly, bias toward unpleasant pairs was expected to depend on the individual's level of N or sensitivity to punishment cues.

Study 1

Method

Participants

The participants were 71 undergraduates (33 men and 38 women) at Northwestern University who were fulfilling part of an introductory psychology course requirement.

Materials

Pleasantness–unpleasantness rating scale (PURS). The PURS consists of 146 word pairs, each of which was followed by a 4-point scale for rating the pair's pleasantness or unpleasantness (0 = *neutral,* 1 = *slightly,* 2 = *somewhat,* 3 = *very*). The associative strengths of 144 of the pairs were identified through the Connecticut Free Association Word Norms (Bousfield, Cohen, Whitmarsh, & Kincaid, 1961). Of these 144 word pairs, 48 were intuitively pleasant, 48 were intuitively unpleasant, and 48 were intuitively neutral. The other two word pairs (*pleasant–nice* and *unpleasant–bad*) served as a check that participants performed the indicated task.

Mood measure. A 72-item multidimensional measure of mood, the motivational state questionnaire–revised form (MSQ-R; Revelle & Anderson, 1994), asked participants to rate their feelings on a 4-point scale (1 = *not at all,* 2 = *a little,* 3 = *moderately,* 4 = *very much*). It included the items from the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988) and the Activation–Deactivation Adjective Checklist (Thayer, 1989) as well as other adjectives sampled from the affective circumplex (Larsen & Diener, 1992).

Personality measure. The Eysenck Personality Inventory (EPI) was used to obtain a measure of participants' levels of E and N (Eysenck & Eysenck, 1964) and E's subcomponents, impulsivity and sociability (see Rocklin & Revelle, 1981).

Procedure

Between 1 and 6 participants were scheduled per session. The experimenter was present in the experimental testing room throughout the experiment. On entering the room, participants completed the PURS and the EPI. To control for order effects, we constructed alternate forms of the PURS and counterbalanced their presentation. Participants then began working through the MSQ-R. A study involving mood manipulation and emotional responses was then conducted. The data from that study are not relevant, and results will not be reported in this article. All participants were debriefed and thanked before being excused.

Results and Discussion

Analyses of the word pair ratings largely confirmed the preliminary categorizations of pleasant and unpleasant pairs. Mean pleasantness ratings of the pleasant and unpleasant pairs were 2.0 and 0.4, respectively. Mean unpleasantness ratings of the pleasant and unpleasant pairs were 0.2 and 1.8, respectively. See Appendix A for word pairs and affective ratings. From the 144 word pairs, the 36 most pleasant pairs, the 36 most unpleasant pairs, and the 36 most neutral pairs were selected for use in subsequent studies. In addition, 18 pleasant–unpleasant, 18 pleasant–neutral, and 18 unpleasant–neutral sets of word pairs were formed (see Appendix B for an explication of the decision rules).

In addition to providing an empirically based categorization of word pairs, the procedure used made possible an examination of the consistency of affective ratings across stimuli and the relations between these ratings and personality–mood factors.[2] However, paper-and-pencil ratings may be influenced by response styles—characteristic ways of responding to items regardless of their content—that may obscure relations between personality factors and sensitivity to the affective nature of the word pairs (Hamilton, 1968; Nunnally, 1978). In order to avoid this problem, the remaining studies employed computer tasks that do not involve ratings. Thus, they provide a clearer picture of the relations between personality, mood, and the evaluation of affective and neutral word pairs.

Study 2

Method

Participants

The participants were 75 undergraduates (30 men and 45 women[3]) at Northwestern University who were fulfilling part of an introductory psychology course requirement.

Materials

Categorization task. Six practice items and 108 experimental items were presented using Macintosh Plus computers. Each item consisted of a single word pair. Experimental items were the 36 most pleasant, unpleasant, and neutral word pairs as determined by the results of Study

[2] Stable individual differences in raw affective ratings of word pairs were revealed and were predicted by the interaction of E and N. However, when the raw ratings were ipsatized to control for individual differences in the use of the rating scale, no meaningful relations between personality or mood factors and affective ratings were found.

[3] Although the predicted relations were not expected to be influenced by gender, we followed significant findings with investigations of gender differences. As expected, none of the effects reported in this article were moderated by gender.

1. Practice items consisted of two pleasant pairs (e.g., *nice–kind*), two unpleasant pairs (e.g., *mean–ugly*), and two neutral pairs (e.g., *jump–skip*).

Mood and personality measures. The same mood and personality measures that were administered in Study 1 were administered in Study 2.

Procedure

Between 1 and 7 participants were scheduled per session. They were seated in separate carrels with desks. The experimenter was present in the experimental testing room throughout the experiment. On entering the room, participants completed the MSQ-R.

Participants then received instructions for the computer task from both the screen and the experimenter. Participants were asked to categorize word pairs as pleasant, unpleasant, or neutral as quickly as possible. The pairs appeared in the center of the computer screen. To control for right- or left-side response biases, two versions of the task were used. One required the participant to press the "Z" key to categorize a pair as pleasant and the "/" key to categorize a pair as unpleasant. The other version reversed the keys. Both versions required the participant to press the space bar to categorize a pair as neutral. The order of pleasant, unpleasant, and neutral pairs was block randomized within sets of six items. After six practice trials, any questions the participants had were answered and they continued through the task. The categorization task lasted between 3 and 7 min. The computer stored the participants' key presses and response times.

Following the computer task, participants completed the EPI. When all participants had completed the experiment, they were debriefed, thanked, and excused.

Results

Categorization Choice

Two multiple regression analyses were conducted to measure the effects of pair valence, personality, and mood on (a) the number of congruent categorizations (pleasant pairs as pleasant vs. neutral pairs as neutral vs. unpleasant pairs as unpleasant) and (b) the number of biased categorizations (neutral pairs as pleasant vs. neutral pairs as unpleasant). All effects reported in this article are significant at the $p < .05$ level unless otherwise specified.

Pair valence predicted number of congruent categorizations: $F(2, 142) = 3.5$. Single degree-of-freedom trend analyses revealed a difference between congruent categorizations of pleasant and unpleasant pairs, $F(1, 71) = 11.2$, but not between affective and neutral pairs. The number of congruent categorizations of unpleasant pairs (30.7) was higher than the number of congruent categorizations of pleasant pairs (27.8), which did not differ from the number of congruent categorizations of neutral pairs (28.4). Number of congruent categorizations was not modified by personality. When the trait factors were replaced by mood factors, a PA $\times$ NA interaction was found, $F(1, 71) = 5.3$. Simple effects analyses were nonsignificant, but inspection of the regression slopes indicated the following pattern: High NA was inversely related to the total number of congruent categorizations, but only among participants low in PA.

A pleasantness bias was demonstrated in the categorization of neutral pairs, which were more frequently categorized as pleasant (5.8) than unpleasant (1.8), $F(1, 71) = 34.4$. This categorization bias was not modified by personality or mood factors.

Response Times (RTs)

Two multiple regression analyses were conducted to measure the effects of pair valence, personality, and mood on (a) RTs for congruent categorizations (pleasant as pleasant vs. neutral as neutral vs. unpleasant as unpleasant) and (b) RTs for biased categorizations (neutral pairs as pleasant vs. neutral pairs as unpleasant).

Pair valence predicted RTs for congruent categorization, $F(2, 142) = 76.6$. Congruent categorization was faster for pleasant pairs (970 ms) and unpleasant pairs (990 ms) than it was for neutral word pairs (1240 ms), $F(1, 71) = 96.8$. There were no significant effects of personality or mood factors on RTs for congruent categorizations.

Neutral words were categorized as unpleasant more quickly (910 ms) than they were categorized as pleasant (1120 ms), $F(1, 71) = 7.9$. Again, there were no significant effects of personality or mood factors on RTs.

Discussion

Study 2 offers little evidence that personality and mood affect performance on categorization tasks involving affective stimuli. In fact, only one significant finding involving these factors was revealed: The interaction of PA and NA was found to predict the frequency of congruent categorizations. Although simple effects analyses were nonsignificant, the means indicated that low-PA/high-NA participants were least likely to make congruent categorizations and that high-PA/low-NA participants were most likely to make congruent categorizations. This suggests that mood has a stronger influence on overall accuracy of categorizations than on a specific categorization bias. In fact, no tendency for PA to determine responses to pleasant stimuli or for NA to determine responses to unpleasant stimuli was found. Furthermore, PA and NA did not predict bias in categorizing neutral pairs as either pleasant or unpleasant. In contrast to the weak effects of personality and mood, strong effects of pair valence on both choice and RTs were revealed.

The choice analyses revealed that (a) the number of congruent categorizations of unpleasant pairs was higher than the number of congruent categorizations of pleasant pairs, which did not differ from the number of congruent neutral pairs, and (b) neutral pairs were more frequently categorized as pleasant than unpleasant. This pattern of results suggests that unpleasant pairs are easy to distinguish from neutral and pleasant pairs, but that the boundary between neutral and pleasant categories is less clear. These results appear inconsistent with the results of Study 1, which allowed for the selection of pleasant and unpleasant pairs with equivalent affective ratings. In other words, the pleasant pairs were as pleasant as the unpleasant pairs were unpleasant. However, Study 1 also indicated that many of the pairs believed to be neutral actually had at least a slight emotional valence, and almost invariably, this valence was pleasant. Considering the results of both studies, people appear to be more willing to ascribe pleasantness than unpleasantness to a neutral stimulus. Whether this tendency would also be found in a clinical sample is unclear, but the finding is consistent with the notion that individuals not suffering from mood or anxiety disorders demonstrate a set of positive cognitive biases.

The RT analyses revealed that (a) participants congruently categorized pleasant and unpleasant word pairs much more quickly than neutral word pairs and (b) when participants categorized neutral pairs as unpleasant, they did so more quickly than when they categorized neutral pairs as pleasant.

There are at least three different explanations for the first finding. Although the key assignments for the two affective categories were counterbalanced, the key assignment for the neutral category was constant. The participants were instructed to use their index fingers to press the affective keys ("Z" and "/") and their thumbs to press the neutral key ("SPACEBAR"). Thus, the RT differences could, in part, be the result of differences in the speed of simple motor responses as opposed to differences in the speed of cognitive processing. This methodological explanation, however, cannot adequately account for the 250 ms difference between categorizations of affective word pairs and categorizations of neutral word pairs.

The second explanation is that categorizing neutral stimuli requires more effortful cognitive processing than categorizing affective stimuli. This would certainly be expected if the only categories offered were "pleasant" and "unpleasant." The neutral pairs, by operational definition, were low on both of these dimensions and, thus, are less prototypic instances of those categories. Although a "neutral" category was offered, Study 1 indicated that people implicitly assume that all stimuli have at least some affective intensity and may be relatively less inclined to use the neutral category.

A third explanation is that participants' relatively rapid categorization of affective pairs is a result of the tendency to direct attention to stimuli with strong affective qualities. This tendency has, in fact, received empirical support, although the focus of these studies has typically been on enhanced responsiveness to negative stimuli. For example, Taylor's (1991) mobilization–minimization hypothesis argues that people show greater physiological, cognitive, and emotional responses to negative information. The heightened engagement offers the evolutionary advantage of immediate assessment of and coping with threat or other unpleasant signals in the environment. In fact, the second finding, that biased categorization of neutral pairs as unpleasant occurs more quickly than biased categorization of neutral pairs as pleasant, is consistent with this notion. The categorization choice data also offer indirect support in that congruent categorizations of unpleasant pairs were more frequent than congruent categorizations of pleasant and neutral pairs.

Despite this pattern of differences in frequency, people congruently categorized pleasant stimuli as quickly as they did unpleasant stimuli. This finding makes sense, however, because heightened response to positive as opposed to neutral stimuli also carries an evolutionary benefit. The key to survival and transmission of genes is not only the detection and avoidance of threatening situations but also the detection and approach toward vital resources such as food, water, and a sexual partner. In other words, responding to signals of reward as well as punishment is adaptive.

This study, however, cannot stand as strong confirmation of the speculative third explanation. Two other studies used a cognitive task that renders the first two explanations inapplicable and allows the third to be adequately tested.

Study 3

Method

Participants

Ninety-eight undergraduates (58 men and 40 women) at Northwestern University participated in the study as part of an introductory psychology course requirement.

Materials

Judgment task. Four practice items and 72 experimental items were presented using a Macintosh Plus computer. Each item consisted of two pairs of words known to be of equal associative strength (Bousfield et al., 1961). For example, in one item, *sugar* and *spice* made up one pair and *slime* and *snake* made up the other pair. When presented with the word *sugar* and asked to give the first word that came to mind, 5 people out of 150 had said *spice*. Similarly, when presented with the word *slime*, 5 people out of 150 had said *snake*.[4] As described in the method section of Study 1, the pairs were subjected to pleasantness–unpleasantness ratings. Decision rules were developed to identify 18 items that contained pleasant and unpleasant pairs, 18 items that contained pleasant and neutral pairs, and 18 items that contained unpleasant and neutral pairs. All analyses reported examined responses to these 54 items.

Mood and personality measures. The same mood and personality measures that were administered in the first two studies were administered in Study 3.

Procedure

Between 1 and 7 participants were scheduled per session. All participants were tested by the same experimenter, who remained in the experimental testing room throughout the experiment. On entering the room, participants completed the MSQ-R.

Participants then received instructions for the computer task from both the screen and the experimenter. They were told they would see a pair of words on the left side of the screen and a pair of words on the right side of the screen. They were asked to decide which pair of words "best go together" and to respond as soon as they had reached a decision.

Participants then began working through the items on microcomputers in separate carrels. For each item, one pair appeared on the left side of the screen and one pair appeared on the right side of the screen simultaneously. To control for right- or left-side biases, the position of the pairs was counterbalanced. Thus, participants saw pleasant, unpleasant, and neutral pairs an equal number of times on each side of the screen. To control for order effects and help mask the nature of the task, we employed a Latin square design.

Participants then completed the trait measures. When all participants had completed the experiment, they were debriefed, thanked, and excused.

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[4] The pairs in this example item contain the same number of letters. However, because we were matching pairs according to associative strength, we were not able to also match pairs according to length. Nevertheless, there were no significant differences in pair length among the three types of pairs (pleasant, unpleasant, and neutral).

Results

Pair Choice

Three multiple regression analyses were conducted to examine the effects of pair valence, personality, and mood factors on (a) choice between pleasant and neutral pairs, (b) choice between unpleasant and neutral pairs, and (c) choice between pleasant and unpleasant pairs.

Pleasant pairs were judged to be more strongly associated than neutral pairs more frequently than vice versa, $F(1, 94) = 84.8$. Similarly, unpleasant pairs were judged to be more strongly associated than neutral pairs, $F(1, 94) = 53.1$. Neither of these effects was modified by personality or mood factors. The effects of pair valence on decisions between pleasant and neutral pairs, unpleasant and neutral pairs, and pleasant and unpleasant pairs are shown in Figure 1.

Although pleasant and unpleasant word pairs were chosen equally often, this choice was modified by the interaction of E and N, $F(1, 94) = 5.4$. Individuals high in N judged unpleasant pairs to be more strongly associated than pleasant pairs, but only at higher levels of E (see Figure 2). Alternatively, extraverts judged pleasant pairs to be more strongly associated than unpleasant pairs, but only at lower levels of N.

The E $\times$ N interaction was found to hold, $F(1, 92) = 6.2$, even when their relations with mood were partialed out. Follow-up analyses of pleasant versus unpleasant pair choice were conducted with the subcomponents of impulsivity and sociability individually replacing E. The interaction remained significant when substituting sociability, $F(1, 94) = 5.0$, but not impulsivity, $F(1, 94) = 3.0$. Nevertheless, the interaction involving the higher order factor, E, was a more powerful predictor than either of the interactions involving the subcomponents.

Response Times

Three multiple regression analyses were conducted to examine the effects of pair valence, personality, and mood factors on the following sets of RTs: (a) when choosing pleasant over neutral pairs and vice versa, (b) when choosing unpleasant over neutral pairs and vice versa, and (c) when choosing pleasant over unpleasant pairs and vice versa.

Participants were generally faster to choose pleasant pairs over neutral pairs than vice versa, $F(1, 94) = 6.3$, and unpleasant pairs over neutral pairs than vice versa, $F(1, 94) = 23.7$ (see Figure 3). Neither of these effects was modified by personality or mood factors.

No effects of pair valence or personality factors were found on RTs for choosing pleasant over unpleasant pairs or vice versa. When the trait factors were replaced with mood factors as predictors, an interaction between NA and pair valence was found, $F(1, 94) = 9.2$. Simple effects analyses indicated that participants high in NA chose unpleasant pairs more quickly than pleasant pairs (2.4 s vs. 2.6 s), $F(1, 34) = 8.9$. The interaction remained significant when personality factors were controlled for, $F(1, 94) = 9.0$.

Discussion

Study 3 provides two independent sets of results that strongly support the hypothesis that people are more oriented toward

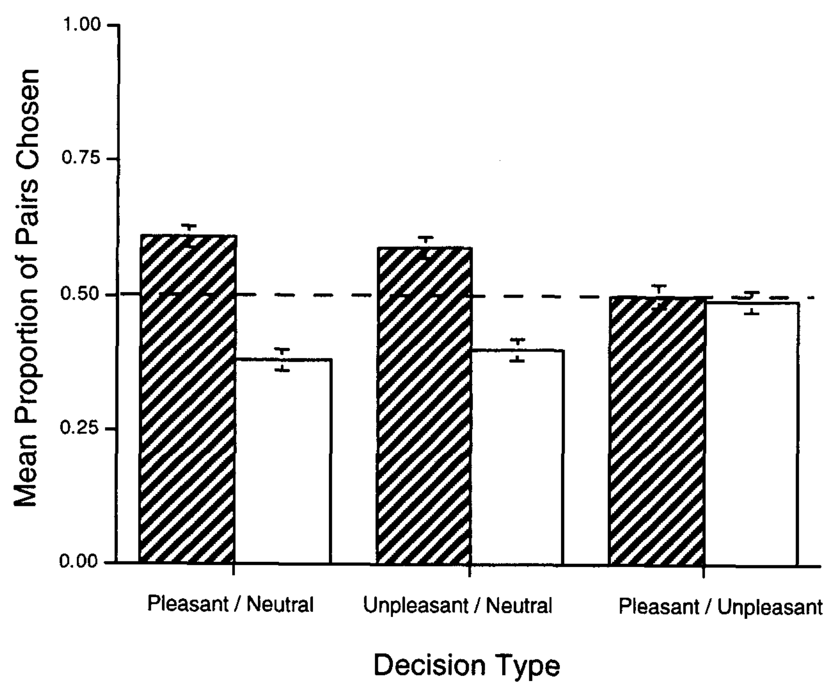

Figure 1. Proportion of word pairs chosen as a function of pair valence for each of the three decision types ($\pm SE$). The dotted line represents the number of word pairs expected to be chosen by chance alone. The proportions may not sum to 1.0 because of failures to respond and missed keystrokes.

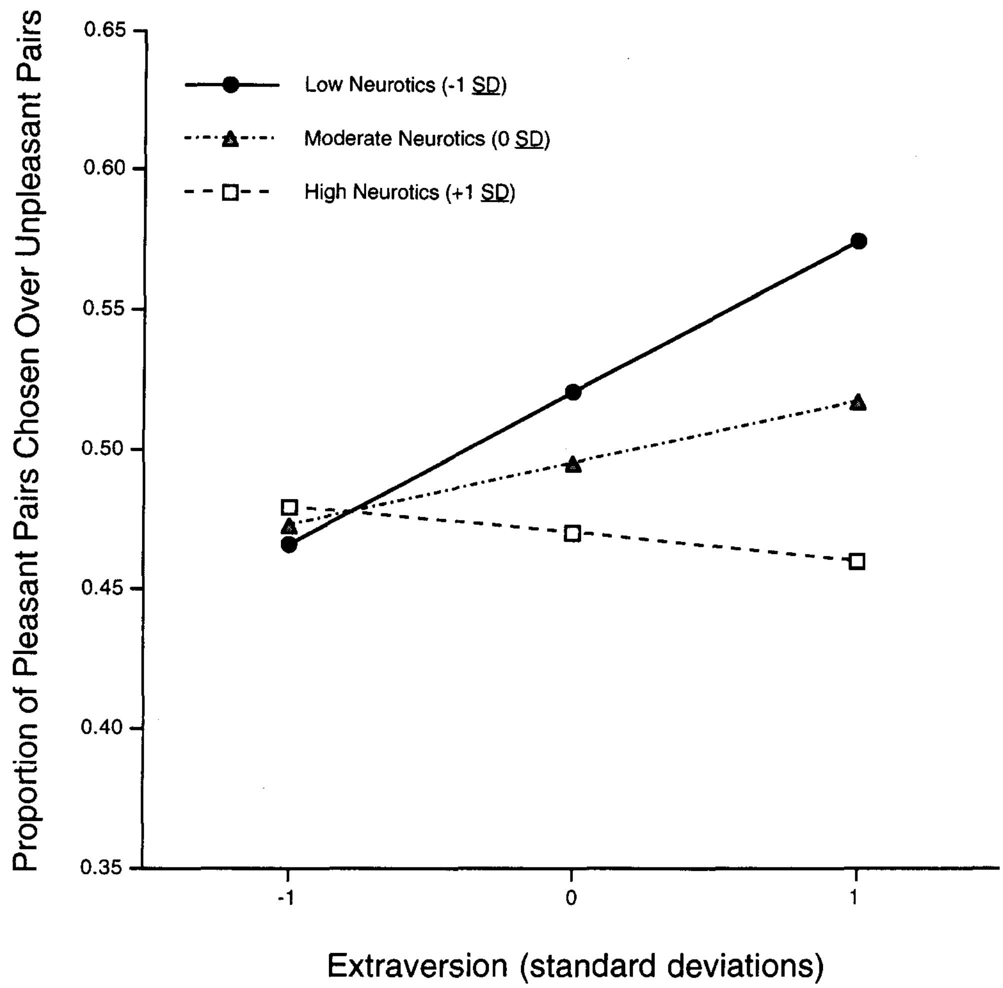

Figure 2. Best-fitting regression lines showing proportion of pleasant pairs chosen over unpleasant pairs as a function of Extraversion and Neuroticism.

affective stimuli than neutral stimuli. Participants judged words in pairs with high-affective tone, whether pleasant or unpleasant, to be more strongly associated than words in pairs with low-affective, or neutral, tone. This occurred despite the fact that the word pairs in each item were selected for their equal associative strength. When pleasant and unpleasant word pairs were presented together, there was no general tendency to judge one pair as more strongly associated than the other.

Interestingly, this decision was the only one that could be predicted by personality factors. N was positively correlated with number of unpleasant pairs chosen, and E was positively correlated with number of pleasant pairs chosen, findings that support the notion that these personality traits are linked to emotion sensitivity. However, the relation between N and choice of unpleasant pairs was modified by E, and the relation between E and choice of pleasant pairs was modified by N. Such relations are not consistent with predictions stemming from a two-factor model characterized by orthogonal dimensions of N-NA and E-PA. From this perspective, N would be expected to relate to the processing of unpleasant stimuli independent of E and E would be expected to relate to the processing of pleasant stimuli independent of N.

One possible interpretation of our finding is that, whereas N is associated with an orientation toward negative stimuli, E is associated not with an orientation toward positive stimuli, but with engagement in the task. This seems consistent with the fact that introverts' judgments did not depend on their level of N. Interestingly, the results are somewhat consistent with Eysenck's (1967) theory, which characterizes N as a dimension of emotional responsiveness and E as a dimension of cortical arousal, independent of emotional responsiveness. That is, extraverts, because of their hypothesized greater need for external stimulation, may have been more involved in the task. If this is true, they may have more effortfully processed the pairs' attributes, allowing the influence of N on choice to be more apparent. Of course, this is a post hoc explanation and requires several assumptions. Nevertheless, the possibility that N is the strongest determinant of responses toward affective stimuli and E actually mediates that relation as a determinant of task engagement is worthy of consideration.

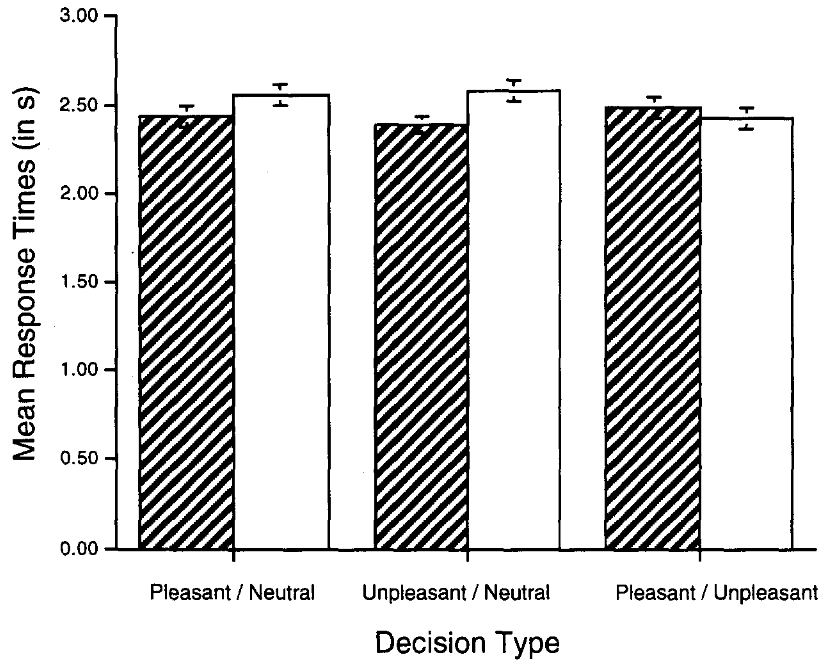

Figure 3. Response times (in seconds) as a function of pair valence for each of the three decision types ($\pm SE$).

As stated above, personality factors only influenced judgment when the choice was between pleasant and unpleasant stimuli. Although personality was also expected to influence responses to affective stimuli when they were presented with neutral stimuli, the pattern makes sense in the context of adaptation to the environment. It is almost always beneficial to be more attentive to cues that elicit emotion than to those that do not. For example, quickly identifying a stationary, inanimate object is less essential than quickly identifying either the opportunity to secure food or the possibility of becoming food. As a result, there would be less variability in responding when an affective cue is presented with a relatively neutral cue. However, when two affective cues are presented together, one pleasant and one unpleasant, there would be greater variability in responding because the two responses are more equal in terms of adaptivity. The person can attend to the opportunity for gain and take action with its associated risks, or the person can attend to the threat of loss and not act, thereby minimizing the risk. These competing strategies have been proposed as the manifestations of predominantly BAS or predominantly BIS activity, respectively.

The second set of results, those involving response times for making the various judgments, is entirely consistent with the first set in indicating greater attention toward stimuli with stronger affective qualities. Participants chose affective pairs, whether pleasant or unpleasant, more quickly than neutral pairs. Again, there was no difference in RTs when pleasant pairs and unpleasant pairs were compared. Of course, the assumption must be made that longer RTs indicate less orientation toward the chosen stimulus than when the stimulus is chosen quickly. An alternative explanation is that longer RTs indicate a preference to concentrate on the chosen pair. However, because participants were given the instructions to respond as soon as they made their judgments, it is unlikely that the latter explanation is viable. Also, this paradigm should not be confused with one based on interference, such as the Stroop task. In the Stroop paradigm, the processing of the stimulus is believed to interfere with participants' ability to complete the task (Mathews & MacLeod, 1985). In the present task, such interference is not a consideration. The processing of the stimulus is believed to facilitate, rather than inhibit, responses.

Also paralleling the pair choice results, affectivity factors did not influence RTs for decisions involving affective versus neutral stimuli but did influence RTs when one affective stimulus (a pleasant pair) was pitted against another (an unpleasant pair). However, that influence was not equivalent to the interaction observed in the choice data. Overall, participants chose unpleasant pairs over pleasant pairs more quickly than vice versa, but this difference was only significant among participants high in NA. Furthermore, the effect remained significant when personality factors were controlled for. It is noteworthy that, for the pleasant–unpleasant items, mood influenced RTs independent of personality and personality influenced choice independent of mood.

The results of the first three studies indicate that orientation toward affective versus neutral stimuli across individuals is a much more robust phenomenon than any individual differences in the processing of affective and neutral stimuli but that the influences of personality and mood are revealed when there is competition for processing of oppositely valenced stimuli. Study 4 attempted to replicate and extend the findings from the correlational studies by manipulating mood prior to presenting the judgment task.

Study 4

Method

Participants

The participants were 156 undergraduates (80 men and 76 women) at Northwestern University who were fulfilling part of an introductory psychology course requirement.

Materials

Judgment task. The judgment task was identical to that used in Study 3, except that 72 neutral filler items were added such that every other item was an experimental item.

Mood and personality measures. The same mood and personality measures administered in the first three studies were administered in Study 4.

Procedure

Between 1 and 7 participants were scheduled per session. The experimenter remained in the experimental testing room. After entering the room, participants completed the mood and personality questionnaires.

Participants then viewed one of four film clips, three mood-inducing and one neutral. The clip to be shown was determined by a modified block randomization. Once all four films had been viewed, the next one shown was that which the fewest participants had seen. The mood-inducing clips were taken from the comedy *Parenthood* (Grazer & Howard, 1989), a *Frontline* documentary about Nazi concentration camps (Documentary Consortium of Public Television Stations, 1985), and the horror film *Halloween* (Hill & Carpenter, 1978). The neutral clip was a *National Geographic* documentary about African wildlife (National Geographic Society & WQED/Pittsburgh, 1980).

After viewing the film clip, participants were instructed to complete a movie ratings form, intended to reduce demand characteristics by disguising the purpose of the film clips. Following completion of the mood measure for the second time, participants began working through the judgment task at Macintosh Plus computers in separate carrels. The instructions and procedures for the computer task were identical to those in Study 3.

If participants were in the *Parenthood* or *National Geographic* conditions, they were debriefed, thanked, and excused. If participants were in the *Frontline* or *Halloween* conditions, they were shown a brief clip from *Parenthood* before being debriefed, thanked, and excused. This procedure was added to help eliminate the negative mood induced earlier in the experimental session.

Results

Mood Manipulation

A within-subjects analysis of variance (ANOVA) was conducted to predict PA pre- and postfilm from film condition. Change in PA was found to vary as a function of the film condition, $F(3, 152) = 6.7$. This analysis was followed by separate, repeated measures regressions, examining change in PA after each film clip. The pre- and postfilm PA scores were significantly different in the concentration camp film condition, $F(1, 39) = 4.5$, with PA decreasing. The pre- and postfilm PA scores were also significantly different in the comedy film condition, $F(1, 37) = 13.4$, with PA increasing. Neither the horror clip nor the nature clip had a significant effect on PA.

Another within-subjects ANOVA was conducted to predict NA pre- and postfilm from film condition. Change in NA was found to vary as a function of the film condition, $F(3, 152) = 31.9$. This analysis was followed by separate, repeated measures regressions, examining change in NA after each film clip. The pre- and postfilm NA scores were significantly different in the concentration camp film condition, $F(1, 39) = 55.9$, with NA increasing. The pre- and postfilm NA scores were also significantly different in the horror film condition, $F(1, 34) = 8.5$, with NA increasing. The pre- and postfilm NA scores were also significantly different in the comedy film condition, $F(1, 37) = 17.6$, with NA decreasing. The nature clip did not have a significant effect on NA.

The effects of the four film clips on both PA and NA are shown in Figure 4. Because the two negative films had different effects on PA, they were not combined in subsequent analyses.

Pair Choice

Before investigating the effects of personality factors and film condition on pair choice, we attempted to replicate the finding that the words in affective pairs are judged to be more strongly associated than the words in neutral pairs. Across films, participants indeed judged the words in pleasant pairs to be more strongly associated than the words in neutral pairs, $t(155) = 5.0$. Similarly, participants judged the words in unpleasant pairs to be more strongly associated than the words in neutral pairs, $t(155) = 7.1$. When the choice involved pleasant and unpleasant pairs, an effect of pair valence was again not evident.

Following these analyses, three multiple regression analyses were conducted to examine the effects of personality and film condition on (a) choice between pleasant and neutral pairs, (b) choice between unpleasant and neutral pairs, and (c) choice between pleasant and unpleasant pairs.

The first analysis yielded no significant findings involving film condition or personality factors. The second analysis revealed a marginally significant E × Film Condition interaction, $F(3, 140) = 2.6$, $p < .06$. Simple effects analyses revealed that E was significantly related to choosing neutral pairs over unpleasant pairs after the neutral film, $t(42) = -3.4$. A marginally significant relationship in the same direction was found for the comedy film condition, $t(47) = -1.8$, $p < .08$. These relationships did not hold for either of the two unpleasant film conditions. The analysis examining pleasant versus unpleasant pair choice yielded no significant findings involving film condition or personality factors.

Response Times

Before investigating the effects of personality factors and film condition on RTs, we attempted to replicate the finding that choice of affective pairs over neutral pairs is made more quickly than the reverse choice. Participants were again found to judge the words in pleasant pairs to be more strongly associated than the words in neutral pairs more quickly than vice versa, $F(1, 155) = 4.7$. Similarly, participants again judged the words in unpleasant pairs to be more strongly associated than the words in neutral pairs more quickly than vice versa, $F(1, 155) = 13.7$. Finally, it was again found that when the choice involved

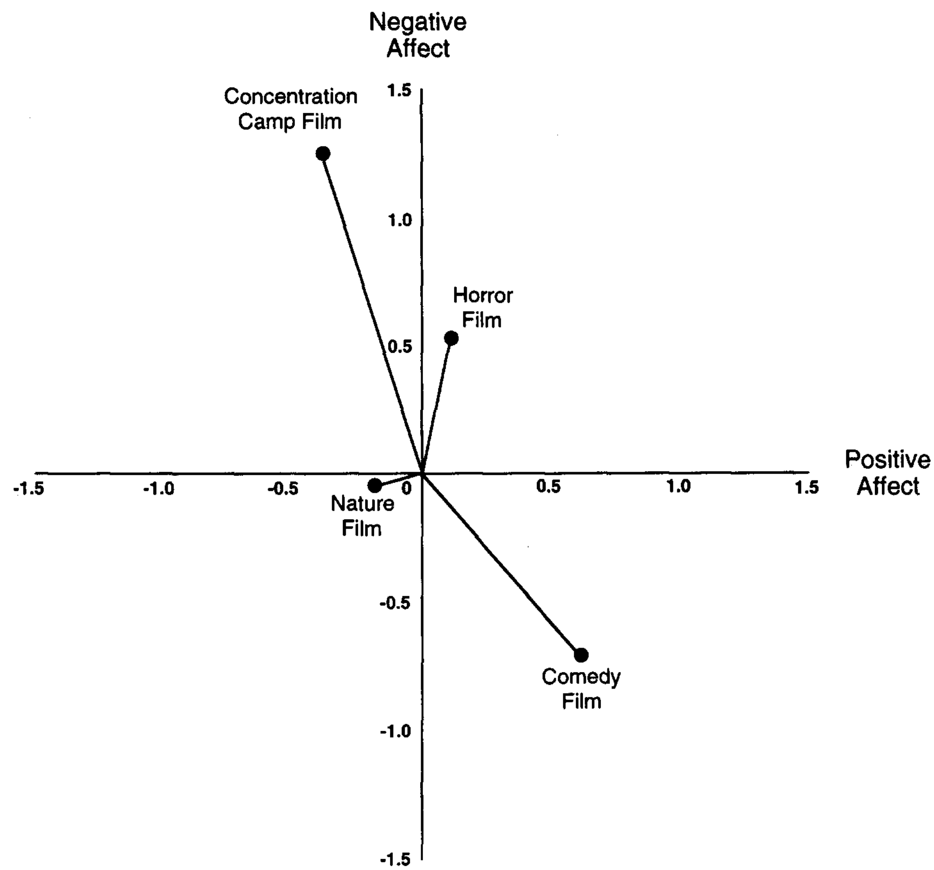

Figure 4. Pairwise effect sizes of film clip manipulations on change in Positive Affect and Negative Affect.

pleasant and unpleasant pairs, neither choice was made more quickly than the other.

Three multiple regressions were then conducted to examine the effects of personality and film condition on the following sets of RTs: (a) when choosing pleasant over neutral pairs and vice versa, (b) when choosing unpleasant over neutral pairs and vice versa, and (c) when choosing pleasant over unpleasant pairs and vice versa.

The first analysis revealed a trend toward an E $\times$ N $\times$ Pair Valence interaction that approached significance, $F(1, 140) = 3.5, p < .07$. Simple effects analyses revealed that, among participants high in N, there was an effect of pair valence. Neurotics were faster to choose pleasant pairs over neutral pairs than vice versa, $F(1, 70) = 5.3$. For emotionally stable participants, an E $\times$ Pair Valence interaction was found, such that extraverts were faster to choose the pleasant over neutral pairs than vice versa, $F(1, 82) = 4.7$.

The second and third analyses revealed no significant effects of film condition or personality factors.

Discussion

Study 4 provides a replication of the previous findings that people are more oriented toward affective stimuli than neutral stimuli. As in Study 3, when participants were asked to decide which of two pairs contained words that were more strongly associated with each other, they more frequently chose the affective pair, whether it was pleasant or unpleasant, over the neutral pair. To reiterate, this finding is especially important because the two word pairs in each item were matched for associative strength. That is, if two independent judgments are made, the words in the neutral pairs appear to be as strongly associated as the words in the affective pair. However, when the pairs are compared, it seems as though the affective words are more strongly associated than the neutral words. The tendency remained robust despite adding neutral filler items that may have reduced the emotional saliency of the task. In addition, the choice of affective pairs over neutral pairs was again made more quickly than vice versa. Study 4 also replicated the finding that, for decisions involving a pleasant pair and an unpleasant pair, there was no general tendency to choose one kind of pair over another and the speed of making a response was not related to the valence of the pair that was chosen.

The interaction between E and N for predicting choice between pleasant and unpleasant pairs found in Study 3 was not replicated in Study 4. There was a trend for introverts to choose more unpleasant pairs over neutral pairs than for extraverts to do so, but only after neutral or positive mood inductions. This trend would not be predicted from the two-factor model, which suggests that E is unrelated to responses to negative stimuli, but it is not incompatible with models suggesting that E is positively related to enhanced responding to positive stimuli and inversely related to enhanced responding to negative stimuli (e.g., Gray, 1981).

Another finding from Study 4 suggests that E's relation to processing of pleasant stimuli is moderated by N. Although all participants chose the pleasant pairs more quickly than the neutral pairs, the difference was significantly greater for stable extraverts than it was for stable introverts. This serves as a conceptual replication of the Study 3 finding that, among stable individuals, extraverts were more likely to choose pleasant over unpleasant pairs. Again, such an interaction is difficult to explain from a two-factor model of affect and differential sensitivities to affective cues.

The purpose of Study 4 was to couple mood manipulation with the experimental task used in Study 3. Although the film clips induced the expected affective states, the analyses revealed no significant effects of film condition on either pair choice or RTs for making the decisions. This supports the notion that trait-like orientations to emotional stimuli can influence cognitive processing without being mediated by differential mood states. It also casts doubt on the robustness of the previous finding that high NA was related to choosing unpleasant pairs over pleasant pairs more quickly than vice versa.

General Discussion

Together, the studies described above demonstrate convincingly that there is a general tendency, across persons, cognitive tasks, and mood manipulations, to orient toward affective stimuli more than neutral stimuli. This tendency was stronger for unpleasant stimuli than pleasant stimuli. Participants correctly categorized unpleasant pairs more frequently than pleasant and neutral pairs, and they correctly categorized affective pairs more quickly than neutral pairs. Furthermore, affective pairs were more frequently judged to have stronger associative strength than neutral pairs, and the choice of affective over neutral pairs was made more quickly than vice versa. This effect held even after the manipulation of participants' mood.

We were also interested in the influence of individual differences in affectivity, both momentary and stable, on orientation to emotional stimuli. We expected that those traits that had been associated with PA and NA, specifically E and N, would be independently related to biases toward pleasant and unpleasant stimuli, respectively. In accord with this two-factor model, high NA was associated with choosing unpleasant pairs more quickly than pleasant pairs. Outside of this effect, the influence demonstrated by personality and mood factors did not point to a simple alignment of E and PA independent of the relation between N and NA. For example, an interaction between E and N was found to predict choice between pleasant and unpleasant stimuli, but not the kind of interaction that would be expected from the two-factor model. In summary, although some significant effects of trait and state affectivity were revealed, they were generally inconsistent with predictions. It seems likely that positive and negative affectivity act interactively rather than independently in influencing the cognitive processing of emotional stimuli.

It is important to note that the effects involving trait affectivity remained significant even when current affect levels were statistically controlled for. Thus, it appears that trait affectivity has an influence on the evaluation of affective and neutral stimuli that is not mediated by temporary mood state. Furthermore, the studies offer evidence that individual differences in the evaluation of affective information are not limited to differences between clinically depressed or anxious and nonclinical groups.

Importantly, however, it appears that individual differences will only be detected with specific cognitive tasks and under certain circumstances. Three factors seem to be especially salient: (a) the context in which the stimuli appear (e.g., unpleasant and neutral pairs together vs. unpleasant and pleasant pairs together), (b) the requirements of the cognitive task (e.g., categorization vs. judgments of associative strength), and (c) experience immediately prior to the task (e.g., normal laboratory conditions vs. an emotional film clip). The conditions under which personality is most likely to be influential are those that do not involve prior manipulation of mood but do require competing behavioral strategies.

All individuals are motivated to attend to both the possibility of threat and the potential for reward. When only one or the other is present in the environment, it has no competition with other stimuli. However, it is much more common to face both potentials simultaneously. When this occurs, the individual is faced with a more difficult decision, an approach–avoidance conflict. The available cognitive resources must be devoted either to the avoidance of punishment or the pursuit of reward at the relative expense of the other.

This simple explanation of personality–mood relations is supported by the evidence that there are two neurologically based, affective systems: one determining approach behavior and one determining inhibitive behavior (reviewed by Revelle, 1995). Despite making impressive progress in the understanding of these systems, research has tended to test the independent strength of these systems. That is, responses to aversive stimuli are taken as an index of trait inhibition or negative affectivity, and responses to appetitive stimuli are taken as an index of trait activation or positive affectivity.

Future research would benefit by examining situations in which both aversive and appetitive stimuli are presented simultaneously, requiring the inhibition and approach systems to compete. Standard go/no-go discrimination learning tasks and reaction time priming tasks have been employed to examine individual differences in behavior when both reward and punishment are possible outcomes (Derryberry, 1987; Zinbarg & Mohlman, 1998; Zinbarg & Revelle, 1989). We have embellished this basic paradigm by placing cues for reward and punishment (pleasant and unpleasant word pairs) in the same stimulus field and observing differential judgments and latencies for making those judgments. Analogously, studying situations in which opportunities and threats compete for attention can augment our knowledge about the impact of individual differences in affectivity on cognition and behavior.

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(Appendixes follow)

Appendix A

Means and Standard Deviations of Pleasantness and Unpleasantness Ratings of Word Pairs

Word pair	Pleasantness M	Pleasantness SD	Unpleasantness M	Unpleasantness SD	Word pair	Pleasantness M	Pleasantness SD	Unpleasantness M	Unpleasantness SD
art–beauty	2.7	0.5	0.1	0.4	knife–kill	0.3	0.7	2.6	0.8
truth–honesty	2.7	0.6	0.3	0.5	grief–death	0.2	0.4	2.6	0.7
family–friends	2.7	0.6	0.1	0.3	devil–satan	0.2	0.8	2.5	0.9
dream–fantasy	2.6	0.6	0.1	0.3	sin–hell	0.3	0.8	2.5	0.9
stars–heaven	2.5	0.7	0.1	0.4	hate–despise	0.1	0.3	2.5	0.8
baby–cute	2.4	0.8	0.2	0.4	anger–rage	0.2	0.4	2.4	0.7
ocean–beach	2.4	0.8	0.2	0.4	starving–hunger	0.2	0.4	2.3	0.8
won–victory	2.4	0.8	0.1	0.2	larceny–thief	0.3	0.6	2.3	0.9
rose–smell	2.4	0.9	0.2	0.4	criminal–prison	0.2	0.6	2.3	1.5
dancing–fun	2.4	0.9	0.1	0.4	war–gun	0.2	0.5	2.2	1.0
bath–shower	2.3	0.8	0.1	0.3	jail–convict	0.4	0.8	2.2	1.0
god–love	2.3	0.9	0.2	0.5	germ–cold	0.3	0.8	2.2	0.9
silk–satin	2.3	0.8	0.1	0.3	mad–insane	0.2	0.5	2.2	0.8
happy–glad	2.3	0.9	0.1	0.2	tetanus–infection	0.2	0.6	2.1	1.0
calm–serene	2.3	0.9	0.1	0.4	take–steal	0.2	0.6	2.1	1.0
music–note	2.2	0.9	0.2	0.4	fat–obese	0.2	0.5	2.1	0.9
health–wealth	2.2	0.9	0.4	1.6	fever–ill	0.1	0.3	2.1	0.8
right–good	2.1	0.7	0.1	0.3	fraud–lie	0.1	0.3	2.0	0.8
woman–mother	2.1	1.1	0.3	0.5	mock–ridicule	0.3	0.6	2.0	0.4
courage–strong	2.1	0.7	0.1	0.3	leper–colony	0.2	0.7	2.0	0.9
chair–comfortable	2.0	0.7	0.1	0.4	weak–sick	0.2	0.7	2.0	0.8
flower–garden	2.0	0.9	0.1	0.3	robbery–theft	0.1	0.3	2.0	0.8
feather–soft	2.0	1.0	0.2	0.6	afraid–dark	0.4	0.5	1.9	1.5
scene–view	2.0	1.0	0.2	0.4	pain–ache	0.3	0.8	1.9	1.1
stream–brook	2.0	1.0	0.1	0.3	abortion–illegal	0.4	0.9	1.8	1.1
candy–chocolate	2.0	1.0	0.3	0.5	fear–fright	0.2	0.5	1.8	0.8
balloon–child	2.0	0.9	0.4	0.8	dirt–filth	0.4	0.9	1.8	1.0
bright–shine	1.9	0.9	0.2	0.4	hurt–cry	0.2	0.4	1.7	0.9
glow–warm	1.9	0.7	0.2	0.5	slime–snake	0.3	0.6	1.7	0.9
sugar–spice	1.9	1.0	0.3	0.6	beggar–tramp	0.2	0.5	1.6	0.8
America–home	1.9	1.1	0.5	0.9	bitter–taste	0.5	0.9	1.6	0.8
lily–Easter	1.9	1.0	0.1	0.2	rat–rodent	0.6	1.0	1.6	1.0
cushion–pillow	1.9	1.0	0.1	0.4	bark–bite	0.2	0.4	1.5	1.0
yachting–sailing	1.9	1.0	0.2	0.4	false–wrong	0.2	0.4	1.5	0.8
fancy–pretty	1.9	0.9	0.2	0.5	spider–insect	0.3	0.5	1.4	0.8
jelly–sweet	1.8	0.8	0.4	0.6	chill–shiver	0.6	0.8	1.3	0.7
sledding–hill	1.8	0.8	0.3	0.5	hungry–thirsty	0.5	0.8	1.3	0.9
statue–marble	1.8	1.1	0.2	0.4	rough–tough	0.5	0.8	1.2	0.8
animal–cat	1.8	1.1	0.5	0.9	earthworm–slimy	0.5	0.7	1.2	0.9
clean–hands	1.8	1.0	0.1	0.3	ant–bug	0.7	1.1	1.1	1.0
dog–pet	1.8	1.0	0.5	0.8	frigid–ice	0.6	0.8	1.1	0.8
dough–cake	1.8	0.9	0.2	0.4	pig–mud	0.7	1.1	1.1	0.8
skiing–sport	1.8	1.0	0.3	0.6	maid–work	0.7	0.8	1.1	0.9
deer–fawn	1.8	1.1	0.2	0.5	heavy–load	0.4	0.8	1.1	1.0
sun–tan	1.7	1.0	0.5	0.7	quota–limit	0.3	0.6	1.1	0.8
copper–gold	1.7	1.1	0.2	0.4	sloth–slow	0.6	0.7	0.9	0.9
doctor–help	1.7	1.1	0.5	0.7	fishhook–bait	0.7	0.9	0.8	0.7
city–lights	1.7	0.9	0.4	0.6	lizard–crawl	0.6	0.7	0.7	0.7
bronze–silver	1.7	1.0	0.3	0.6	yankee–north	0.7	1.0	0.7	0.8
rabbit–fur	1.7	1.0	0.4	0.8	rayon–stockings	0.5	0.7	0.6	1.6
cork–champagne	1.7	0.9	0.2	0.5	close–far	0.6	0.9	0.5	0.8
cherry–pie	1.6	1.0	0.3	0.6	box–container	0.3	0.5	0.5	1.5
bread–food	1.5	1.0	0.1	0.3	block–building	0.8	0.7	0.4	0.6
buy–money	1.5	1.1	0.4	0.9	moose–call	0.6	0.7	0.4	0.7
car–fast	1.4	0.9	0.6	0.7	carrot–peas	1.0	0.9	0.4	0.6
baseball–diamond	1.4	1.1	0.4	0.5	atom–small	0.6	1.0	0.4	0.8
organ–pipe	1.4	1.1	0.4	0.7	buoy–float	0.9	0.9	0.3	0.6
butter–milk	1.3	0.8	0.4	0.7	badge–pin	0.8	0.7	0.3	0.5
accordion–instrument	1.3	1.0	0.7	0.8	collar–blouse	0.6	0.8	0.3	0.7

Appendix A (*continued*)

Word pair	Pleasantness *M*	Pleasantness *SD*	Unpleasantness *M*	Unpleasantness *SD*	Word pair	Pleasantness *M*	Pleasantness *SD*	Unpleasantness *M*	Unpleasantness *SD*
puddle–splash	1.3	1.0	1.1	1.6	part–section	0.4	0.7	0.3	0.5
book–cover	1.3	1.0	0.2	0.4	mark–check	0.3	0.6	0.3	0.7
basketball–gym	1.3	1.1	0.3	0.6	head–toe	0.7	0.8	0.3	0.5
land–tree	1.3	1.1	0.1	0.4	key–chain	0.6	0.8	0.3	0.5
clothes–suit	1.3	1.1	0.3	0.5	barrel–water	0.8	0.8	0.3	0.6
dock–pier	1.3	0.9	0.3	0.6	window–door	0.6	0.7	0.2	0.5
antelope–run	1.3	1.1	0.3	0.6	kitchen–stove	0.9	1.0	0.2	0.4
doodle–scribble	1.1	0.8	0.5	1.5	mail–box	0.9	1.0	0.2	0.5
bear–brown	1.1	1.0	0.6	0.8	button–shirt	0.8	0.9	0.2	0.5
stem–leaf	1.1	1.0	0.2	0.4	room–furniture	0.9	0.9	0.2	0.5
barn–farm	1.0	1.0	0.6	0.7	beaver–tail	0.8	1.0	0.2	0.4
even–level	1.0	1.0	0.3	0.6	lamp–shade	0.7	0.9	0.2	0.5
tall–high	1.0	0.9	0.4	0.6	wheel–cart	0.5	0.7	0.2	0.5

Appendix B

Decision Rules for Labeling of Word Pairs and Items

1. Pleasant pairs: Mean pleasantness minus mean unpleasantness is at least 1.5.
2. Unpleasant pairs: Mean unpleasantness minus mean pleasantness is at least 0.8.
3. Neutral pairs: Absolute value of mean pleasantness minus mean unpleasantness is less than 1.0.
4. Pleasant–unpleasant items: (a) Sum of mean pleasantness of the pleasant pair and mean unpleasantness of the unpleasant pair is greater than 3.0, and (b) neither the mean pleasantness of the unpleasant pair nor the mean unpleasantness of the pleasant pair is greater than 0.6.
5. Pleasant–neutral items: (a) Mean pleasantness of the pleasant pair is at least 1.5, (b) mean pleasantness of the pleasant pair is at least 0.6 greater than mean pleasantness of the neutral pair, and (c) neither pair has a mean unpleasantness of greater than 0.9.
6. Unpleasant–neutral items: (a) Mean unpleasantness of the unpleasant pair is at least 1.2, (b) mean unpleasantness of the unpleasant pair is at least 1.0 greater than mean unpleasantness of the neutral pair, and (c) neither pair has a mean pleasantness of greater than 1.4.

Note. Ratings were based on a 4-point scale (0 = *neutral,* 1 = *slightly,* 2 = *somewhat,* 3 = *very*). Decision rules were applied in a confirmatory manner rather than an exploratory one (i.e., stimuli were either accepted or rejected; they could not be placed in new categories).

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