

Automatic Vigilance: The Attention-Grabbing Power of Approach- and Avoidance-Related Social Information

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The automatic processing of information was investigated, varying valence (positive vs. negative) and relevance (other-relevant traits [ORT] vs. possessor-relevant traits [PRT]; G. Peeters, 1983) of stimuli. ORTs denote unconditionally positive or negative consequences for persons in the social environment of the holder of the trait (e.g., honest, brutal) whereas PRTs denote unconditionally positive or negative consequences for the trait holder (e.g., happy, depressive). In 2 experiments using the Stroop paradigm, larger interference effects were found for ORTs than PRTs. This is due to the behavior-relatedness of ORTs. In a go/no-go lexical decision task (Experiment 3), participants either had to withdraw their finger from a pressed key (i.e., "avoid") or had to press a key (i.e., "approach") if a word was presented. Responses to negative ORTs were relatively faster in the withdraw condition, whereas positive ORTs were relatively faster in the press condition.

Recent years have seen growing research on what is called automatic evaluation (for an overview, see Bargh, 1997). In a number of studies, it has been shown that stimuli are automatically categorized as either positive or negative (e.g., Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Murphy & Zajonc, 1993). Part of this research focused on the attention-demanding characteristics of evaluatively polarized stimuli (e.g., Pratto & John, 1991; Williams, Mathews, & MacLeod, 1996) and the relation of automatic evaluation to the behavioral tendencies of approach and avoidance (Cacioppo, Priester, & Berntson, 1993; Chen & Bargh, 1999; Solarz, 1960).

By and large, it can be said that the categories of "positive" and "negative" are not further subdivided in the automatic-evaluation research area. Ratings of "pleasantness" or "desirability" are taken as a basis for stimulus selection. Though it can be conceded that those measures are undoubtedly reliable with regard to the criteria of psychological measurement, it can be argued from a theoretical point of view that "positivity" and "negativity" depend on the perspective of the evaluators, and the existence of subcategories should be taken into account. In this article, we argue that such a differentiation of the concept of positivity and negativity is relevant for attentional processes and behavioral tendencies.

In this regard, the primary purpose of the present research is to introduce an important theoretical distinction made by Peeters (1983) into social-cognitive research on automatic processing of socially relevant information, especially on automatic vigilance processes. Peeters and colleagues (Peeters, 1983, 1992; Peeters & Czapinski, 1990) argued that the evaluation of a given trait depends on the perspective of the evaluators—whether they evaluate the trait from the perspective of someone who has to interact with the trait holder or from the perspective of the trait holder him- or herself. There are two basic questions tied to these perspectives: Is it good or bad for me that Person X possesses the Characteristic Y? (Question A) and Is it good or bad for Person X him- or herself to possess the Characteristic Y? (Question B).

Given the two perspectives, an interesting dimension emerges that is orthogonal to the positivity–negativity dimension. Take, for example "to be aggressive" and "to be depressive." Both are commonly evaluated as unequivocally negative (i.e., "unpleasant," "undesirable," etc.). But with regard to Question A only "aggressive" is strongly tied to the answer "It is bad for me to interact with someone who is aggressive!" whereas "depressive" is met with "Well, it depends." More interestingly, for Question B the pattern of answers switches. For "depressive" the answer will be unequivocally "That is bad for the possessor of the trait!" whereas "aggressive" is tied to an undecided answer because evaluators know that aggressiveness might sometimes lead to successes although it is negatively sanctioned under most circumstances.

The same asymmetry applies to positive concepts as well: Certainly, "intelligent" and "honest" denote positive traits—but positive from which perspective? In answering Question A, "honest" will certainly be evaluated as unconditionally positive. On the contrary, "intelligent" will be met with an "it depends" answer because evaluators know that an intelligent interaction partner will usually be more helpful or stimulating than a stupid one but only as long as he or she is not an adversary. In answering Question B, the converse is true. To be "intelligent" is unconditionally positive

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This research was supported by grants from the research fund of Rheinland-Pfalz, Germany, and from the Foundation for Promotion of the University of Münster (*Gesellschaft zur Förderung der Westfälischen Wilhelms-Universität*), Germany. We thank David Burmedi for his help in improving the English of this article.

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for the trait holder; but to be "honest" is not, because an honest person might be more easily taken advantage of.

At this point of discussion, it is necessary to prevent a misunderstanding. Obviously, it is not in *every* case bad to interact with an aggressive person. For example, an aggressive football player will be liked by his team. That is, though dominantly viewed as negative, aggressiveness has a certain ambivalence tied to it, as is certainly the case for most valent traits. But note, our analysis is not concerned with this kind of ambivalence. It is, however, concerned with the question, If a trait is dominantly seen as negative (positive), why is that so? Tying the negativity or positivity to a perspective will provide us with an answer: "Aggressiveness" is considered as dominantly negative because aggressive persons harm others (and not because these persons harm themselves). "Loneliness" is considered as dominantly negative because lonely persons lack the social support they wanted (and not because the loneliness of these persons makes others feel uncomfortable or guilty, etc.).

Following a distinction given by Peeters (1983), the terms *other-relevant* and *possessor-relevant* will be used for this asymmetry.¹ Traits that are *positively other-relevant* are (almost) unconditionally adaptive for the associates of the trait-holding person, whereas those that are *negatively other-relevant* are (almost) unconditionally maladaptive for him or her. Traits that are *positively possessor-relevant* are (almost) unconditionally adaptive for the trait-holding person, whereas those that are *negatively possessor-relevant* are (almost) unconditionally maladaptive for him or her. Examples from these four categories of traits are tolerant, generous, empathic (positively other-relevant), intolerant, selfish, untrustworthy (negatively other-relevant), powerful, ambitious, self-confident (positively possessor-relevant), weak, unambitious, shy (negatively possessor-relevant; see Peeters & Czapiński, 1990).

The question arises whether our cognitive-affective system is tuned to distinguish between other- and possessor-relevance in the sense given above. We argue that this is indeed the case. Let us first assume that in general, questions similar to Question A are more vital to us than questions similar to Question B. It is always important to know whether those around us behave in a way that is good or bad *for us* so that we can adjust our behavior accordingly. In contrast to this, it is of lesser importance to answer questions similar to Question B; that is, whether those around us behave in a way that is good or bad *for them*. Given this assumption, it can be argued that only the assignment of other-relevant trait terms to a person will provide us with an unequivocal answer to the more relevant type of question (i.e., those similar to Question A). The assignment of possessor-relevant trait terms instead will provide us with answers to less important questions (i.e., those similar to Question B). Thus, if there is an automatic vigilance process to scan the social environment for relevant information, it is highly plausible that this process will be more sensitive to other-relevant trait terms than to possessor-relevant ones. Only other-relevant terms signal opportunities or dangers in our social environment. In such situations, an organism must react immediately to escape the danger or to seize an opportunity. We therefore assume that other-relevant stimuli automatically capture attention because of their relevance for approach or avoidance behavior.

We used a modified version of the Stroop Color-Word Interference paradigm (Stroop, 1935), comparable to what is known as

the "emotional Stroop task" (Williams et al., 1996) to test our assumptions. Evaluatively polarized words were presented in one of several colors. Participants were instructed to name the color of the word while ignoring the meaning of the stimulus. Prolonged naming latencies (compared with a baseline) were taken as an indication of an unintentional shift of attention from the color to the meaning of the word. The emotional Stroop task has been widely used in research on emotional disorders to relate individual differences in, for example, trait anxiety or depression, to attentional biases (for a review, see Williams et al., 1996). In the field of social cognition, the well-known studies of Pratto (1994) and of Pratto and John (1991) can be taken as a model for our endeavor. They reported greater interference for negative trait words compared with positive ones. Our hypothesis in this study was that other-relevant stimuli will attract attention to a greater extent than possessor-relevant ones.

Experiment 1

In the following experiment, we introduced relevance (other vs. possessor) as a second orthogonal factor in addition to the valence factor (positive vs. negative) in the Stroop task. Our main hypothesis in Experiment 1 was that the color-naming latencies for other-relevant stimuli compared with possessor-relevant words are longer because of their attention-attracting characteristic. Above that, the design allows for an attempt to replicate the original effect found by Pratto and John (1991); that is, that color-naming latencies for negative words are longer compared with positive ones.

Method

Participants. Participants were 53 students (35 women, 18 men; mean age = 22.5 years) from the University of Trier, Germany. They were paid DM 10 (about U.S. \$5). The data of one other person were excluded because of a missing data rate of more than 15% because of errors or outlier responses.

Materials. The test materials consisted of 100 words (viz., 50 positive adjectives and 50 negative adjectives). In each class, half of the stimuli were other-relevant, the remaining half possessor-relevant (see Appendix for a list of the materials used). Selection of these materials was a three-step process. At first, adjectives were selected on the basis of their pleasantness values. To guarantee marked positivity and negativity of stimuli, the only words taken into account were those with absolute values of 50 and more on a scale ranging from -100 (*extremely negative*) to +100 (*extremely positive*) according to a norm list composed of 908 common German adjectives (Hager, Mecklenbräuker, Möller, & Westermann, 1985; Möller & Hager, 1991). This criterion selects the 165 (34%) most negative and the 134 (32%) most positive adjectives from the norm list. Then, this list was reduced to 157 stimuli (68 positive and 89 negative) according to the criteria of other- and possessor-relevance (as rated by the authors) and familiarity. Synonyms were avoided. Finally, classifications of stimuli as other- or possessor-relevant were generated in a pilot study. Following an oral explanation of the dichotomy of relevance, five judges (graduate psychology students) classified the selected adjectives as other- or possessor-relevant (or as nonclassifiable). On each trial, a stimulus was presented in the center of the screen, together with the statement "This trait

¹ Actually, Peeters (1983) used the terms *other-profitability* and *self-profitability*. Feedback from colleagues, reviewers, and the editor convinced us that the positive connotation of *profitability* makes it difficult to grasp the meaning of *negative other-profitable* or *negative self-profitable*.

has direct consequences for . . . the person him/herself (S) . . . persons of the environment (A) . . . not classifiable (0).” The judges had to press the respective keys (S, 0, A) to express their decision. Following four examples, the list of 157 stimuli was presented in an individually randomized sequence. Only 2% of all classifications fell into the category of “not classifiable.” Interrater reliability was considerably high ($Mdn \kappa = .71$). Coding a classification as other-relevant (1) and as possessor-relevant (-1) resulted in a marked bimodal distribution for the adjective score aggregated over raters (Cronbach’s $\alpha = .93$). Selection of the 100 experimental stimuli was in accordance with the degree of rater agreement (concerning relevance) under the restriction of equal-sized sets ($n = 25$).

Parameters of interest for the sets of stimuli are presented in Table 1. Besides the pleasantness values and the relevance classification scores, the indices for imageability (see Paivio, Yuille, & Madigan, 1968; German norms according to Hager et al., 1985; Möller & Hager, 1991), median frequency (per million; according to the German database of CELEX, Nijmegen, the Netherlands), as well as mean length are shown. Imageability, it has been suggested, is a predictor of Stroop interference (Davelaar & Besner, 1988). Stroop interference also seems to be correlated to the length of the stimulus (e.g., Pratto & John, 1991). Frequency, on the other hand, seems to be naturally correlated with valence. This covariation is well-known as the “Pollyanna hypothesis” (Boucher & Osgood, 1969); it is part of the more general “Pollyanna principle” (Matlin & Stang, 1978)—that is, the preference for the positive—and has been supported convincingly in empirical studies (see Blick, Riley, & Morrison, 1985; Rubin & Friendly, 1986). Furthermore, a reliable covariation with valence can be computed for the 908 adjectives from the complete German norm list (Hager et al., 1985; Möller & Hager, 1991).

By and large, the different lists of adjectives were closely parallel. There are some minor differences with regard to (absolute) pleasantness values for negative words. Other-relevant words have somewhat higher values than possessor-relevant ones. Because this presumably reflects a tendency to particularly devalue traits that transgress ethical standards, this result is not surprising. Besides, it is apparently not specific to the given selection: Inspection of norm data (Hager et al., 1985; Möller & Hager, 1991) reveals that the 38 traits with the highest ratings of unpleasantness are unequivocally (negatively) other-relevant. As expected, negative words have somewhat lower values for frequency. To account for these differences, we chose to conduct multiple regressions to assess the contribution of the various adjective parameters (see Lorch & Myers, 1990).

In addition to the 100 evaluatively nonneutral adjectives, 25 neutral words were selected (absolute pleasantness below 21; see Table 1). The

assignment of each adjective to one of four colors (see *Procedure*) follows a balanced design (Latin square), so that each stimulus was presented in another color for each of four samples of participants.

Design. Central to the hypotheses is the factorial combination of valence (positive vs. negative) and relevance (other vs. possessor). For additional comparisons with nonneutral stimuli, a neutral condition was added.

Procedure. The stimuli were presented in the center of a computer screen in one of four colors (red, yellow, green, blue) that were randomly chosen in each trial. Presentations of stimuli were in text mode. A letter was 5-mm high and 3-mm wide. Participants were instructed to name the color of the stimulus as quickly as possible. Naming latencies were registered by a voice-key apparatus to the nearest millisecond realized by means of a microphone connected to a sound blaster audio card. The screen was cleared immediately after the correct response was registered. The same was true if no response had been registered after 5,000 ms. The intertrial interval was always 1,500 ms.

Participants were given four practice trials, one in each color. Correct identification of the presented colors was checked. In the main phase the 125 adjectives were presented. The order of trials was determined randomly for each participant. In each trial the name of the color was presented to a second CRT screen allowing the experimenter to control correctness of response (i.e., incorrect naming or false triggering of the voice key).

Individual ratings concerning relevance and valence were obtained following the Stroop task. Following instructions, adjectives were presented one at a time on a CRT screen. Participants made a classification concerning relevance (“Is this an other-relevant or a possessor-relevant trait?”) followed by a rating of desirability (“How positive or negative is this trait . . .”) specified according to the preceding classification (“ . . . for other persons?” or “ . . . for the person him/herself?”). Scale range was from -100 (*extremely negative*) to +100 (*extremely positive*). Order of presentation of adjectives was determined randomly for each participant. Classification and rating were restricted to the a priori nonneutral adjectives ($n = 100$).

There were two aims for this procedure. First, the reliability of the relevance classification beyond expert rating should be tested. Second, given the definition of relevance, the degree of positivity or negativity of a given trait is conditional on perspective (i.e., a trait that is markedly negative for trait holders themselves will not be negative to the same degree for their associates, and so on). Because pleasantness ratings only

Table 1
Means (and Standard Deviations) for Parameters of the Stimulus Materials as a Function of Valence (Positive vs. Negative) and Relevance (Other vs. Possessor)

Parameter	Other-relevant				Possessor-relevant				Neutral	
	Negative		Positive		Negative		Positive			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Relevance score	1.00	0.00	0.88	0.21	-0.81	0.29	-0.89	0.18	—	—
Pleasantness	-65.6	9.8	63.6	8.3	-56.0	5.3	61.7	9.7	-1.0	10.5
Imageability	54.1	12.2	53.6	12.0	49.7	12.3	53.0	11.6	47.2	15.0
Length	10.0	2.4	9.8	3.5	9.0	2.3	9.4	2.7	9.2	2.2
Frequency ^a	1.7		8.3		3.5		20.0		12.2	

Note. Relevance score (scale -1 to 1) refers to the classification score aggregated over raters (see text for further explanation); pleasantness (scale -100 to 100) and imageability (scale 0 to 100) refer to norm lists of Hager et al., 1985, and Möller and Hager, 1991; length is given as the mean number of characters; frequency (per million) refers to the German database of CELEX, Nijmegen, the Netherlands; dashes indicate index not obtained (relevance restricted to nonneutral words).

^a Median values (taking account of the skewed distribution).

Table 2
Mean Color-Naming Times (in ms), Relevance Classification Scores, and Evaluation Ratings (and Standard Deviations) for Target Words as a Function of Valence (Positive vs. Negative) and Relevance (Other vs. Possessor): Experiment 1

Variable	Other-relevant				Possessor-relevant					
	Negative		Positive		Negative		Positive		Neutral	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Color-naming times	631	86	625	85	623	84	619	82	618	79
Relevance score	0.90	0.16	0.80	0.31	-0.70	0.34	-0.83	0.18	—	—
Evaluation	-76.8	13.2	75.0	12.3	-70.5	13.4	74.9	13.0	—	—

Note. Relevance score (scale -1 to 1) refers to the classification score aggregated over raters (see text for further explanation); evaluation refers to a scale ranging from -100 (*extremely negative*) to 100 (*extremely positive*); dashes indicate index not obtained (relevance and evaluation were restricted to nonneutral adjectives).

indicate the affective connotation of words, they fail to address this concern.

Results

Mean reaction times (RTs) were derived from correct responses only. The average error rate across participants was 2.5%. Because of this low rate, we did not analyze the error data. RTs that could be considered *outlier values* (i.e., those values that are 1.5 interquartile ranges above the third quartile or below the first quartile; Tukey, 1977) with respect to the individual distribution or were above 1,500 ms (3.2%) were discarded as well. The algorithm for individual randomization of trial sequence permitted color repetition in two consecutive trials. Preliminary data inspection, however, showed a large effect of color repetition (i.e., a facilitation of 67 ms). To eliminate this source of variation, RTs in the color repetition condition were adjusted (i.e., 67 ms were added). (Inclusion of a factor color repetition [same vs. different color in the pre-trial] yielded essentially the same results as reported in the following.) A significance level of $\alpha = .05$ was chosen for all analyses.

A 2 (valence) \times 2 (relevance) analysis of variance (ANOVA) yielded a significant main effect of relevance, $F(1, 52) = 7.40$, $MSE = 341$, $p < .01$. With a mean difference of 7 ms due to prolonged RTs in case of other-relevant words and a standard deviation of 18 ms, this main effect corresponds to an effect size of $d = 0.37$. Above that, there was a small increase of 5 ms ($SD = 20$ ms; $d = 0.25$) for negative (compared with positive) adjectives. In the ANOVA, the effect of valence just missed the conventional level of significance, $F(1, 52) = 3.21$, $MSE = 407$, $p = .08$. However, given the specific prediction by Pratto and John (1991), and the equivalence of an F test with one numerator degree of freedom to a two-tailed t test, the valence effect can be considered significant in a one-tailed test (Maxwell & Delaney, 1990). There was no indication of an interaction, $F(1, 52) < 1$. The pattern of means is shown in Table 2; the main effects (in d units, i.e., mean difference divided by the standard deviation of the difference; see Cohen, 1988) for relevance and valence are shown in Figure 1.

Response latencies for the neutral stimuli are comparable to those of the positive possessor-relevant items. Pairwise contrasts of the neutral stimuli with each of the four possible combinations

of valence and relevance were significant for the negatively other-relevant stimuli, $t(52) = 3.21$, $p < .01$, all other (absolute) $t(52) < 1.40$.

Multiple regression analyses. To assess the contribution of the various adjective parameters (see Table 1), a multiple regression approach for repeated measures data (see Lorch & Myers, 1990, for details) was used. To do so, a data file was created with single trials as "cases." To account for the variance between participants, in each analysis a vector of $N - 1$ dummy variables was entered first, followed by the predictors of interest. The last step involves entering Participant \times Predictor interaction variables to get the appropriate error terms. To illustrate, the analogue to the reported 2 (relevance) \times 2 (valence) ANOVA, for example, would be a multiple regression analysis with 52 dummy variables (to account for the between-subjects variability), as well as effect-coding variables for relevance, valence, and their interaction (see Cohen & Cohen, 1983) entered in step one, and a vector of 52 Participant Dummy \times Effect-Coding variables for each predictor of Step 1 entered in Step 2. The appropriate F statistic for each predictor is defined as the ratio of the corresponding MS in Step 1 to the MS of the corresponding vector in Step 2 (with 52 *df*).²

To examine the sole influence of the correlated predictors, four analyses were conducted. In each analysis, the RT was the dependent variable, whereas participant (i.e., a vector of $N - 1$ dummy variables), color of stimulus (i.e., a vector of three dummy variables to account for differences in naming the colors), a variable coding color repetition (to account for the effect of color repetition; see above) were entered as predictors. Additionally, in each analysis in Step 1, valence, relevance, and one of the four parameters (absolute) pleasantness, imageability, (log) frequency, and word length were entered, followed by the interaction coding Variable Relevance \times Valence in step two. Next, in Step 3, the Participant Dummies \times Predictor Variables for relevance, valence, and the respective additional parameter were entered, followed by

² Because the effect-coding variables might not be perfectly orthogonal because of missing data (i.e., incorrect or outlier responses), it is appropriate to enter the main effect-coding variables first and then the interaction-coding variable. Analogously, the corresponding Participant Dummy \times Effect-Coding vectors must be entered stepwise.

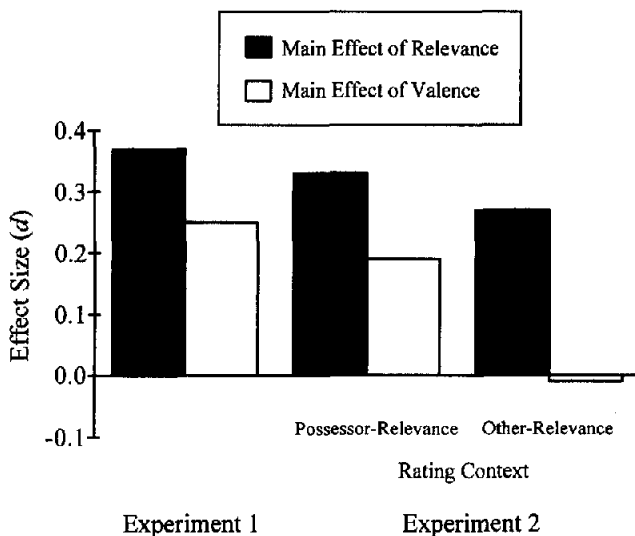


Figure 1. Main effects of relevance and valence (in *d* units) in Experiment 1 and Experiment 2.

the vector of Participant Dummies \times Relevance \times Valence in Step 4.

The effect of relevance was significant in each analysis, all $F(1, 52) > 5.09$, $p < .05$. The main effect of valence was not stable across analyses: Together with absolute pleasantness, $F(1, 52) < 1$, it was significant, $F(1, 52) = 4.60$, $p < .05$; together with imageability, $F(1, 52) < 1$, and length, $F(1, 52) < 1$, it just missed the conventional level of significance, $F(1, 52) = 3.81$ – 3.87 , $p = .06$; together with (log) frequency, $F(1, 52) = 3.70$, $p = .06$, there was no effect of valence, $F(1, 52) = 1.19$, *ns*. (The marginally significant effect of [log] frequency indicated longer response times for less frequent words.) The Relevance \times Valence interaction was not significant in any analysis, all $F(1, 52) < 1$.

Individual ratings and classifications. The first aim of the rating procedure was to get a second indication of the reliability of the relevance classification, this time obtained from nonexpert judges. Correspondence between relevance ratings and the a priori classification was high ($Mdn \kappa = .88$), as was the interrater agreement ($Mdn \kappa = .74$). Coding a classification as other-relevant (1) and as possessor-relevant (–1) results in a marked bimodal distribution for the adjective score aggregated over raters (Cronbach's $\alpha = .99$). A posteriori classification (i.e., taking mean values above zero as other-relevant and values below zero as possessor-relevant) matches the a priori classification perfectly (see Table 2 for the classification scores). The second aim was to assess perspective-bound evaluations. In Table 2 the mean evaluation ratings for the four sets of adjectives are shown.³ As can be seen, obtaining evaluations under the appropriate perspective makes ratings (a) more extreme compared with the pleasantness ratings (see Table 1) and (b) levels out differences between possessor- and other-relevant adjectives.

Discussion

The data support the importance of the relevance distinction. A reliable main effect of relevance emerged. Other-relevant trait

adjectives produced longer color-naming latencies compared with possessor-relevant adjectives. Careful a posteriori analyses (viz., the multiple regression analyses) did not remove or alter this effect. Independently of the relevance effect, a small negativity effect, corresponding in sign to that found by Pratto and John (1991), emerged (which, however, was not stable in the regression analyses). Above that, there was no indication of an interaction between relevance and valence.

Stroop tasks are usually chosen to show preconscious goal-independent automaticity (Bargh, 1989, 1992), that is, a process triggered by the mere presence of a certain stimulus. Because it is known, however, that Stroop effects are not entirely immune from strategic influences (see, e.g., Logan & Zbrodoff, 1979), it can be argued that the relevance effect found in Experiment 1 was dependent on the goal to evaluate the social environment with regard to signals of hostility or friendliness. Of course, if this was in fact the case, this goal must be a default because nothing in the experimental situation forced participants to adopt it. However, with Experiment 2, we directly addressed the question of whether the same pattern of results that was observed in Experiment 1 can be obtained under different goal perspectives. In Experiment 2, participants performed a twofold task. In each trial, the color-naming task was followed by a rating task. Participants were instructed to rate the stimuli (then presented in white color) with regard to other- or possessor-relevance. That is, participants would explicitly "take perspective" while doing the color-naming task. They were encouraged to evaluate stimuli from either the perspective of those in the social environment or from the perspective of the trait-holding person. Compared with the standard Stroop task, in which the meaning of the colored words does not play a role, this is a somewhat invasive procedure although the gist of the Stroop task was preserved.

Experiment 2

Experiment 2 was conducted to see whether "taking perspective" interacts with the relevance effect found in Experiment 1. For one block of color-naming trials, participants rated stimuli with regard to other-relevance; for a second block, with regard to possessor-relevance.

Method

Participants. Forty-eight students (32 women; 16 men; mean age = 22.8 years) at the University of Trier, Germany, participated in partial fulfillment of course requirements.

Materials and design. Materials and design were essentially the same as in Experiment 1 with one major exception: A within-subjects factor of perspective was added. One block of Stroop stimuli were administered while participants were explicitly focusing on other-relevance; a second block, while participants were explicitly focusing on possessor-relevance. The sequence of blocks was counterbalanced by a Latin square. A second Latin square determined whether a given stimulus was presented under the other-relevance perspective or the possessor-relevance perspective for a

³ Aggregation is restricted to cases of correct classification concerning a priori relevance. Beyond that, 1.9% of all valence ratings had a sign discrepant from a priori classification. Though inspection of these cases (i.e., extremity of ratings) unequivocally supported the conclusion that participants keyed in the wrong sign, we decided to drop those cases.

Table 3

Mean Color-Naming Times (in milliseconds; and Standard Deviations) for Target Words as a Function of Valence (Positive vs. Negative), Relevance (Possessor vs. Other), and Perspective (Other vs. Possessor): Experiment 2

Rating perspective	Other-relevant				Possessor-relevant			
	Negative		Positive		Negative		Positive	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Other-relevant	718	134	729	142	717	138	708	124
Possessor-relevant	721	138	712	127	709	133	698	127
Overall	720	131	721	126	713	130	703	116

Note. Perspective refers to the rating following each color-naming response ("Is it good or bad for the person him/herself to possess this characteristic?" for the possessor-relevance perspective; "Is it good or bad for someone in the social environment if a person possesses this characteristic?" for the other-relevance perspective).

given participant. A third Latin square determined in which of four colors a given stimulus was presented for a given participant. All three balancing schemes were orthogonal to each other. To get equal-sized lists for the second Latin square, the 2 (relevance: Other vs. possessor) \times 2 (valence: Positive vs. negative) stimulus lists were reduced from 25 to 24 stimuli each. The neutral stimuli were discarded.

Procedure. Color-naming responses were now gathered while participants were explicitly "taking perspective"; that is, besides color-naming they were instructed to rate each stimulus word with regard to either other-relevance or possessor-relevance. Half of the participants began with a block of other-relevance ratings. The instruction was

Imagine that a person has the characteristic named by the stimulus word. You should rate whether it is good or bad for someone in the social environment of the person that he or she possesses this characteristic. That is, to what extent do others suffer or profit by interacting with a person who possesses this characteristic?

The other half of the sample began with a block of possessor-relevance ratings. The instruction was: "... You should rate whether it is good or bad for the person him/herself to possess this characteristic. That is, to what extent does the person him/herself suffer or profit by possessing this characteristic?"

The exact sequence of events was as follows. A stimulus word appeared in one of four colors in the center of the screen. (In contrast to Experiment 1, color repetition now was prohibited.) Following the color-naming response, the screen was cleared immediately (as was the case when no response had been registered after 5,000 ms). After the experimenter's registration of whether the response and the voice-key triggering was correct and an additional 1,000 ms, the stimulus was presented a second time in white color together with the perspective-related question. Below the stimulus word, a scale was presented with endpoints -12 (very bad) and $+12$ (very good). The cursor appeared in the center of the scale. By keypresses, participants shifted the cursor to the right or left to express the degree of "goodness" or "badness" on a scale from -12 (very bad) to $+12$ (very good). On pressing the return key, the screen was cleared. The intertrial interval was 1,500 ms. After the first block of 2 (relevance: Other vs. possessor) \times 2 (valence: Positive vs. negative) \times 12 stimuli, the perspective was switched for each participant.

Results

Mean RTs were derived from correct responses only. The average error rate across participants was 3.4%. RTs which could be considered outlier values (Tukey, 1977) with respect to the indi-

vidual distribution or were above 1,500 ms were discarded as well (3.3%).

The sequence of perspective (other-relevance rating first or last) did not essentially change any results; this factor was therefore discarded. Table 3 presents the means for the remaining conditions. A 2 (perspective) \times 2 (valence) \times 2 (relevance) ANOVA yielded only a significant main effect of relevance, $F(1, 47) = 9.54$, $MSE = 1,535$, $p < .01$, all other F values < 1.54 . With a mean difference of 12 ms due to prolonged RTs in case of other-relevant words and a standard deviation of 28 ms, this main effect corresponds to an effect size of 0.43.

Though there was no significant interaction, it should be noted that there was a hint to a main effect of valence in the possessor-relevance rating context, corresponding in sign to the one found by Pratto and John (1991). RTs to negative words were somewhat higher than those to positive words; this difference, however, fell short of significance, $t(47) = 1.33$, ns . Figure 1 shows the main effects for relevance and valence broken down for rating context.

Fast and slow participants. A striking feature of the mean RTs in Experiment 2 is that they are more than 80 ms higher than those of Experiment 1. This might be dismissed as due to the more complicated character of the double-task. However, trials were self-paced, that is, participants knew that pressing the return key (to confirm the rating of the foregoing trial) initiated the next trial. Thus, there was nothing that prevented participants from responding as fast as in Experiment 1 to the colored stimulus. Therefore it might be suspected that some participants had more difficulty than others in disentangling the different task demands. That is, they might have attached some attention to the meaning of the word during the color-naming trial. To see whether the effect of relevance is robust with regard to overall response speed, the sample was split into "fast" ($n = 24$; mean overall RT = 622 ms, $SD = 60$ ms) and "slow" ($n = 24$; mean overall RT = 806 ms, $SD = 99$ ms) participants.

Most important, a 2 (speed) \times 2 (perspective) \times 2 (valence) \times 2 (relevance) ANOVA yielded a main effect of relevance, $F(1, 46) = 9.36$, $MSE = 1,566$, $p < .01$, that was not moderated by speed, $F(1, 46) < 1$. Above that, a noteworthy second significant result was found: The valence effect was moderated by speed, $F(1, 46) = 7.95$, $MSE = 2,030$, $p < .01$, for the two-way interaction of

speed and valence. Finally, a marginally significant four-way interaction, $F(1, 46) = 4.05$, $MSE = 1,612$, $p = .05$ emerged; all other $F(1, 46) < 1.51$, ns , besides the trivial main effect of speed.

Separate analyses for the two subsamples of fast and slow responders yielded a significant main effect of relevance, $F(1, 23) = 5.86$, $MSE = 1,029$, $p < .01$ (for fast responders); $F(1, 23) = 4.15$, $MSE = 2,103$, $p = .05$ (for slow responders). For the subsample of fast responders, no other effect approached significance, all $F(1, 23) < 2.17$, ns . For the subsample of slow responders, however, the main effect of valence was significant as well, $F(1, 23) = 5.90$, $MSE = 2,583$, $p < .05$, with higher response times for negative words. Finally, there was an indication of a three-way interaction in this subsample, $F(1, 23) = 3.90$, $MSE = 1,994$, $p = .06$, which we will not analyze further to keep the present exposition concise; all other $F(1, 23) < 2.35$.

As illustrated in Figure 2, we found no moderation of the relevance effect by response speed, but a marked difference for the negativity effect: Whereas fast responders did not show this effect, it was of same magnitude as the relevance effect for slow responders.

Rating data. Table 4 presents the means of the ratings for the conditions of interest. Naturally, there is a marked difference between positive and negative words. Above that, it can easily be seen that the extremity of the ratings is determined by the correspondence of relevance and perspective.

A 2 (perspective) $\times 2$ (valence) $\times 2$ (relevance) ANOVA yielded significant main effects of relevance, $F(1, 47) = 13.83$, $MSE = 1.47$, $p < .01$; of valence, $F(1, 47) = 1,282.51$, $MSE = 20.63$, $p < .001$; an interaction of perspective and valence, $F(1, 47) = 4.18$, $MSE = 4.78$, $p < .05$; as well as an interaction of relevance and valence, $F(1, 47) = 7.30$, $MSE = 5.04$, $p < .05$. However, all effects were further qualified by a significant three-way interaction, $F(1, 47) = 123.19$, $MSE = 4.25$, $p < .001$.

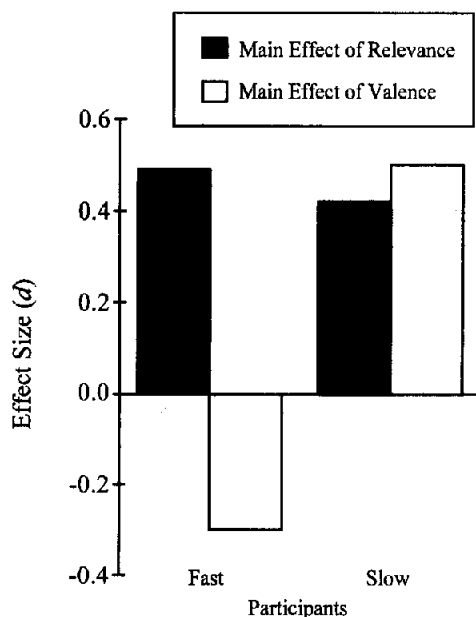


Figure 2. Main effects of relevance and valence (in d units) for "fast" and "slow" responders (Experiment 2).

Table 4

Mean Ratings (and Standard Deviations) for Target Words as a Function of Valence (Positive vs. Negative), Relevance (Other vs. Possessor) and Perspective (Possessor vs. Other): Experiment 2

	Other-relevant				Possessor-relevant			
	Negative		Positive		Negative		Positive	
Rating perspective	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Other-relevant	-10.11	1.33	8.99	2.02	-6.51	2.48	6.68	2.46
Possessor-relevant	-8.06	3.18	7.28	2.79	-9.50	1.57	9.27	1.64

Note. Perspective refers to the rating following each color-naming response ("Is it good or bad for the person him/herself to possess this characteristic?" for the possessor-relevance perspective; "Is it good or bad for someone in the social environment if a person possesses this characteristic?" for the other-relevance perspective); ratings were given on a scale ranging from -12 (very bad) to 12 (very good).

Comparing mean ratings for each word type with regard to perspective showed that in each case, ratings are more extreme if the rating perspective corresponds to the relevance of the adjective, $t(47) = 4.80$, $p < .001$ for negative other-relevant; $t(47) = -5.01$, $p < .001$ for positive other-relevant; $t(47) = -9.66$, $p < .001$ for negative possessor-relevant; and $t(47) = 9.46$, $p < .001$ for positive possessor-relevant.

Discussion

The results of Experiment 2 are clear-cut. The main effect of relevance was replicated. It seems to be a robust phenomenon that does not depend on the perspective taken by the participants while performing the color-naming task. Moreover, it shows up for fast and slow responders. This is noteworthy because it can be assumed that at least fast responders complied with the instruction of naming the color of the stimulus without attending to the meaning of it. Thus, automatic vigilance to other-relevant stimuli seems to be a goal-independent, preconscious type of automaticity (Bargh, 1994).

The negativity effect found by Pratto and John (1991) emerged reliably only for slow responders. One possible interpretation is that the slow participants might have given more priority to the goal of evaluating the stimulus words, such that the process of naming the color was disrupted. This assumption would turn the negativity effect into a goal-dependent automatic process. This interpretation is in line with recent findings by Rothermund, Wentura, and Bak (in press), who showed that automatic attention allocation to positively and negatively valent stimuli is moderated by different goal orientations.

We started with the hypothesis that attentional capture effects for other-relevant stimuli are due to their behavioral relevance, that is, their unequivocal association with approach behavior (in case of positive stimuli) and avoidance behavior (in case of negative stimuli). We can now go a step further by asking whether these attention-grabbing effects are due to automatically elicited response tendencies of approach and avoidance, respectively. There are two lines of research that corroborate this claim. First, recent models of the Stroop effect (Cohen, Dunbar, & McClelland, 1990;

see General Discussion) explain interferences by the competition of automatically instigated processing pathways, leading from stimuli to responses. Second, there is some evidence in the literature for subtle approach and avoidance tendencies that are automatically evoked by the mere presence of valenced stimuli (Brendl, 1997; Chen & Bargh, 1999; Solarz, 1960). If the assumption of automatically elicited response tendencies is correct, interference effects for the positive and negative other-relevant words should be due to an automatic activation of different response pathways—avoidance in the case of negative other-relevant words, approach in the case of positive other-relevant words.

The third experiment was conducted to differentiate between these two types of interference effects. For this purpose, we used a go/no-go lexical decision task, that is, a sequence of words and nonwords appeared on the screen and participants were instructed to react to words only. A key was stuck to the screen just below the area where the stimuli appeared. Half the participants had to press this key continually. Thus, their response to word stimuli was to withdraw their right index finger from the key. This response might be closely associated with avoidance because this is a common reaction to a noxious stimulus (e.g., touching a hotplate, an electric fence, or an aggressive animal). The other participants had to hold their index finger on the key (without pressing it) and then had to press it in case of a word stimulus. This reaction might be associated with approach because it is a common response to a pleasant stimulus (e.g., touching a harmless pet, touching a friend, etc.).

If a stimulus automatically evokes either an approach or avoidance response, a match of this behavioral tendency with the behavior that is required (i.e., withdraw or touch) will decrease the response time compared with a mismatch. That is, it can be hypothesized that negative other-relevant words will benefit from a withdraw reaction because of the match of the avoidance tendency and the avoidance reaction, whereas positive other-relevant words will benefit from a touch reaction because of the match of the approach tendency and the approach behavior.

Experiment 3

In Experiment 3, the hypothesis was tested that RTs to other-relevant words depend on valence and reaction type in a go/no-go lexical decision task. Because of their association with avoidance behavior, RTs to negative other-relevant words should be relatively faster if a "withdraw" response has to be given. On the other hand, because of their association with approach behavior RTs to positive other-relevant words should be relatively faster if a "press" response has to be given. Thus, in statistical terms, we expected an interaction of valence and reaction type.⁴ In contrast to other-relevant words, negative and positive possessor-relevant words should not produce different response-time patterns because they are not clearly tied in a differential manner to approach and avoidance behavior.

Method

Participants. Participants were 30 students (25 women, 5 men; mean age = 23.0 years) at the University of Münster, Germany. All of them were right-handed, native German speakers. They were paid DM 8 (about U.S. \$4).

Materials. The test materials were essentially the same as in Experiment 1. One stimulus word from each list was removed, that is, a total of 120 words, 24 per type (positive other, positive possessor, negative other, negative possessor, neutral) were used, so that each list could be divided into equal-sized sublists for a block-balancing scheme. A total of 120 nonwords were created, which were pronounceable and had endings like German adjectives. Mean length of nonwords as well as the distribution of length was the same as for the word stimuli.

Design. Besides the factorial combination of valence (positive vs. negative) and relevance (other vs. possessor)—supplemented by neutral words—the between-subjects factor of response type was added. One subsample ($n = 16$) of participants had to release the key, while the other one ($n = 14$) had to press the key (see below). Additionally a block-balancing scheme determined whether a given word was presented in the first half of the experiment to a given participant or in the second half.

Procedure. Participants received instructions about the task on the computer screen. They were instructed to respond whenever a word stimulus appeared on the screen. Both speed and accuracy were emphasized. The response key (connected via an Input/Output port to the computer) was stuck on the screen just below the area where the stimulus words appeared. Presentations of stimuli were in graphics mode. A letter was 7-mm high and 4-mm wide.

The "withdraw group" had to press the key permanently with their right index finger and had to withdraw it on presentation of a word stimulus. To enhance the association of this reaction with avoidance, following withdrawal an increase in distance was simulated by reducing the stimulus presentation in scale in two steps. In Step 1 a letter was 4-mm high and 3-mm wide; in Step 2 a letter was 3-mm high and 2-mm wide. Both presentations lasted 250 ms. After a blank period of an additional 250 ms, a plus sign was presented (in standard size). This sign was the signal to proceed with the permanent key press. Key presses before presentation of the plus sign did not restart the program to prevent participants from lifting their index finger only briefly. This procedure guaranteed that a clear and lasting withdraw reaction had to be executed.

The "touch group" had to hold their index finger on the response key, ready for pressing it, and had to press it when a word stimulus appeared. To enhance the association of this reaction with approach, following the key press a decrease in distance was simulated by enlarging the stimulus presentation in scale in two steps. In Step 1 a letter was 10-mm high and 6-mm wide; the presentation lasted 250 ms. In Step 2 a letter was 13-mm high and 9-mm wide; the presentation lasted 500 ms and was replaced by a plus sign in standard size. This sign was the signal to lift the index finger. Lifting the finger before presentation of the plus sign did not restart the program to prevent participants from pressing the key only briefly. This

⁴ For two reasons we did not predict simple effects for reaction type, that is, faster RTs to negative other-relevant words in the "withdraw" sample than in the "press" sample and faster RTs to positive other-relevant words in the "press" sample than in the "withdraw" sample. First, the huge amount of error variance provided by overall speed differences among participants dramatically lowers power for an independent samples *t* test. Second, we did not know whether it might be easier to press a key than to withdraw the finger from a key. Thus, overall response times in the press sample might have been lower than response times in the withdraw sample. The same logic applies to the within-subjects comparison of negative versus positive other-relevant words in the "withdraw" sample and the "press" sample, respectively. It is known that lexical decision responses to negative words are slower than those to positive words, supposedly because of differences in frequency. For example, in experiments by Wentura (2000; the following results were not reported there because of collapsing the factor), responses to negative targets were slower by 57 ms ($SE = 6$ ms; Experiment 1) and 32 ms ($SE = 3$ ms; Experiment 2) compared with positive targets (see also Klauer, Roßnagel, & Musch, 1997).

procedure guaranteed that a clear and lasting approach reaction had to be executed. If no response occurred, stimuli were deleted after 1,000 ms; the interstimulus interval (with blank screen) was 1,000 ms.

Results

For 0.6% of all word stimuli, no response was given, whereas for 1.4% of all nonwords an erroneous response was given. Exploration of response times revealed that the skewness of the individual distributions was dependent on stimulus relevance and response type, $F(1, 28) = 7.16$, $p < .05$, for the interaction (possessor-relevant stimuli showed a marked increase in skewness from "withdraw" to "touch" reactions, which was not the case for other-relevant words.) Although this might be an interesting fact in itself, its further exploration is beyond the scope of this text. This fact, however, makes the handling of outlier elimination and computation of means a delicate affair (see Ulrich & Miller, 1994). So it seemed appropriate to retreat from discarding outliers and to compute median RT values for each participant and word type. Means of median response times are shown in Figure 3. The block factor did not essentially change any results; this factor has therefore been discarded. The secondary between-subjects factor (for balancing the blocks) was retained in the analyses because sample sizes were not exactly the same.

In a 2 (relevance: Other vs. possessor) \times 2 (valence: Positive vs. negative) \times 2 (reaction type: Withdraw vs. touch) \times 2 (block balance) ANOVA, the triple interaction of reaction type, relevance, and valence was significant, $F(1, 26) = 3.09$, $MSE = 269$, $p < .05$ (one-tailed).⁵

Most dominantly, for other-relevant words the interaction of reaction type and valence was significant, $F(1, 26) = 4.44$, $MSE = 335$, $p < .05$. The pattern of means corresponded to the hypothesis. Responses to negative other-relevant words were relatively faster in the "withdraw" sample compared with the "touch" sample, whereas responses to positive other-relevant words were relatively faster in the "touch" sample compared with the "withdraw" sample. Above that, there was a main effect of valence, $F(1, 26) = 55.31$, $MSE = 335$, $p < .001$, corresponding in sign to our expectation with regard to other lexical decision studies (see Footnote 4), all other $F(1, 26) < 1.52$, (except $F(1, 26) = 3.03$, $MSE = 335$, $p < .10$, for the interaction of valence and balance

group factor, which is of no theoretical interest). On the contrary, for possessor-relevant words there was not the slightest evidence for an interaction of valence and reaction type, $F(1, 26) < 1$; $F(1, 26) = 21.10$, $MSE = 354$, $p < .001$, for the main effect of valence; all other $F(1, 26) < 1$.

The neutral words had a mean RT of 519 ms for both reaction types. ANOVAs with a 2 (reaction type) \times 2 (block balance) between-subjects design and a within-subjects factor contrasting the neutral words with one of the four other word types, respectively, yielded no significant interactions, all $F(1, 26) < 1.69$, *ns*.

Discussion

The hypothesis of a differential compatibility of positive and negative other-relevant words to approach and avoidance reactions can be maintained. Avoidance behavior (i.e., the "withdraw" reaction in our experiment) relatively favors the processing of negative other-relevant words whereas approach behavior (i.e., the "touch" reaction) favors the processing of positive other-relevant words. In contrast, within the category of possessor-relevant stimuli no interaction of valence and reaction type was found.

General Discussion

Negative and positive trait adjectives can be reliably classified into those signalling a potentially dangerous or safe social environment (other-relevant traits) and those describing negative or positive self-recognition (possessor-relevant traits). Varying this dimension of other- versus possessor-relevance (Peeters, 1983; Peeters & Czapinski, 1990) independently of the positive-negative distinction in a Stroop task shows that interference effects reliably emerged for other-relevant stimuli (compared with possessor-relevant traits). Above that, this vigilance mechanism seems to operate at a level of preconscious automaticity (Bargh, 1989) because it was not moderated by the cognitive set of participants performing the task (Experiment 2).

Our data indicate a specific attention mechanism sensitive to approach and avoidance cues, that is, to positive and negative adjectives used to characterize safe or risky social environments. Moreover, Experiment 3 gives evidence that interference by other-relevant stimuli are due to automatically instigated behavioral tendencies. Whereas positive other-relevant words seem to promote approach-related behavior and interfere with avoidance-related behavior, negative other-relevant words show the reverse pattern.

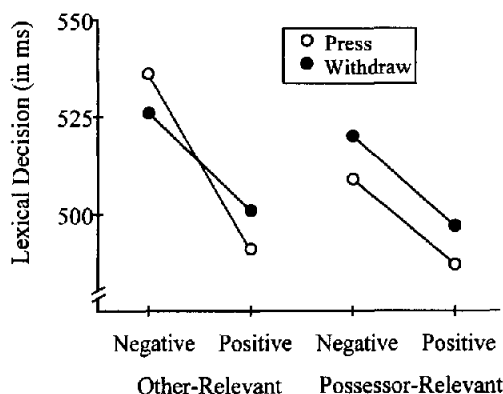


Figure 3. Mean lexical decision times as a function of relevance, valence, and response type ("withdraw" vs. "touch"; Experiment 3).

⁵ Methodologically, the F test for the triple interaction is equivalent to a t test with the reaction types as the independent variable and the difference (negative other – positive other) – (negative possessor – positive possessor) as the dependent one. Thus, given our specific predictions, a one-tailed test is allowed (see Maxwell & Delaney, 1990, p. 144). Above that, inspection of the distributions of this double difference variable reveals that it is somewhat distorted by outliers—some in favor of the hypothesis, some against it. In both groups, data show a tendency to depart from normality (Shapiro-Wilks for "withdraw" = .91, $p < .10$; Shapiro-Wilks for "touch" = .90, $p < .15$). Therefore a t test for trimmed means (see Wilcox, 1997, 1998) with a trimming of $\gamma = .20$ was done with the reaction types as the independent variable and the double difference as the dependent one, which yielded a significant result, $t(16.8) = 2.33$, $p < .05$ (two-tailed).

The data presented here fit into a larger body of research on automatic evaluation and evaluation-behavior links. Dating back to Lewin (1935), a recurrent theme has been that evaluation is linked to approach-avoidance behavior. In the field of social cognition, a lot of research has been done on the influence of approach- or avoidance-related behavior on the liking and disliking of neutral (Cacioppo, Priester, & Berntson, 1993; Priester, Cacioppo, & Petty, 1996) as well as nonneutral stimuli (Förster, 1998) and on the encoding of positive and negative words (Förster & Strack, 1996). In recent years, the forward link from stimulus to behavior has been explored by Chen and Bargh (1999; see also Brendl, 1997) in accordance with prominent theories in neurophysiology (e.g., Lang, 1995; LeDoux, 1989; see also Bargh, 1997). In this regard, our experiments add further differentiation to this work: It is not the positivity or negativity of stimuli per se that trigger approach or avoidance behavior. Peeters and Czapinski (1990) have argued on a theoretical level that other-relevant words only have a clear association with approach (in case of positive other-relevant words) or avoidance behavior (in case of negative other-relevant words) whereas possessor-relevant words have no clear link to response tendencies. Our experiments—especially Experiment 3—show that the information processing system is fine tuned to this distinction.

Above that, leaving the field of social psychology and taking a look at results with the emotional Stroop task in abnormal and personality psychology, it is remarkable that studies describing their negative materials as “threat,” “fear,” or “arousal” cues have often found an effect (i.e., longer color-naming latencies for negative compared with neutral stimuli) in normal control samples (Dawkins & Furnham, 1989; McNally, Riemann, Louro, Lukach, & Kim, 1992; Mogg, Kentish, & Bradley, 1993; Parker, Taylor, & Bagby, 1993; Richards & Millwood, 1989; see also Van den Hout, Tenney, Huygens, Merckelbach, & Kindt, 1995, for contrasting results),⁶ whereas those describing their materials as “anxiety” or “depression” related have found none (Bradley, Mogg, White, & Millar, 1995; Mogg, Bradley, Williams, & Mathews, 1993; Williams & Nulty, 1986).⁷ As should be evident, the distinction between threat- and depression-related materials resembles to some degree the relevance classification. Thus, our findings explain these contradictory results (see also Derryberry & Tucker, 1994): By virtue of using neutral stimuli in Experiment 1, we could show that negative other-relevant words but not negative possessor-relevant stimuli had longer color-naming latencies compared to neutral words.

However, our results are at variance with those found in studies by Pratto and John (1991). Although we found a small negativity effect in Experiment 1 (that, however, was not entirely robust in the regression analyses), Experiment 2 yielded the negativity effect for the slower participants only. Though our results cannot be interpreted as a failure to replicate, the generality of the negativity effect seems to be limited. Most interesting, the negativity effect was dissociated from the relevance effect in more than one respect. First, in statistical terms, the relevance effect and the negativity effect were observed independently. Second, although the relevance effect was not moderated by either goal-perspective or by overall response speed, the negativity effect showed up for slow responders but not for fast responders. Furthermore, the factor of perspective in Experiment 2 seems to moderate somewhat (though not significantly) the negativity effect but not the relevance effect

(see Figure 1). These dissociations suggest that different processes might be responsible for the two effects. To elucidate this point, we will relate our results to a larger theoretical framework for explaining Stroop interference effects.

An adaptation of a model by Cohen et al. (1990), which was originally formulated to explain Stroop effects in general, seems to be best-suited for our purpose. This model belongs to the category of parallel distributed models (see, e.g., McClelland, Rumelhart, & PDP Research Group, 1986; Rumelhart, McClelland, & PDP Research Group, 1986; for social psychology, see Smith, 1996) and was already adapted to explain emotional Stroop effects by Williams et al. (1996).

The model provides explanations for a wide range of Stroop-related effects in terms of the strength of processing pathways. To elucidate, the original Stroop interference effect, that is, the costs in naming the color of a (different) color word, is due to the competition between two pathways, one leading from the color (e.g., red) via intermediate processing stages to the response of saying “red,” the other from the word (e.g., green) via intermediate processing stages to the response of reading “green.” Both features of a stimulus (i.e., color and word) automatically trigger their respective pathways. Intersection of pathways (at any stage) leads to interference or facilitation effects depending on whether the patterns of activation generated by the two processes are dissimilar or similar. In this regard, the original Stroop effect is located at the response stage: The pathway from the color “red” generates an activation pattern of response units (corresponding to saying “red”) that is in conflict with the activation pattern generated by the word green (corresponding to reading “green”).

Given this backdrop, our data suggest that other-relevant stimuli are linked to approach and avoidance reactions that interfere with the color-naming response. In terms of the model, the strength of the pathway leading from perception to approach or avoidance tendencies is higher for other-relevant than for possessor-relevant words. That is, everything else being equal, only other-relevant words instigate a clear alternative response tendency that competes with color-naming.

This interpretation is corroborated by the results of Experiment 3. Task demands favor the pathway going from the (word) stimulus via its representation in the lexical memory to the “word” response thereby producing overall differences for the different types of stimuli. On presentation of an other-relevant word, however, a competing pathway instigates either a similar or dissimilar activation pattern at the response stage, depending on the match between valence and the required response (i.e., withdraw or touch).

Interestingly, explaining our results by the competition of pathways leading to approach or avoidance tendencies with the path-

⁶ In some studies separate statistical tests for the control sample were not given. A rough estimation based on given means and standard deviations, however, justifies the given synopsis.

⁷ Two noteworthy exceptions to this rule are studies by Mathews and MacLeod (1985) and Mogg, Mathews, and Weinman (1989), which showed no negativity effect although their materials were described as “threat”-related. Further inspection, however, reveals that adjectives listed under the heading “social threat” are clear examples of self-relevance (e.g., inept, lonely, foolish, pathetic, indecisive).

way demanded by the task (e.g., to name the color) leads to a number of further hypotheses. To give just two examples: First, the assumption of different approach–avoidance gradients dating back to Miller (1951, 1959) and recently resumed by Cacioppo and Berntson (1994) might be applied to the emotional Stroop task. If the increase of avoidance tendencies with diminishing distance to a goal object has a steeper slope than the corresponding approach curve, it might be assumed that subtle differences in the presentation mode of stimuli (e.g., height of letters, separation of word and color patch) might lead to differences in the interference of positive compared with negative other-relevant words. Second, the evaluative (or affective) priming effect (i.e., shorter evaluative decision latencies for affectively congruent prime–target pairs; Fazio et al., 1986) was recently explained by response path interferences of prime and target pathways (Klauer et al., 1997; Wentura, 1999a). Assuming differences in response pathways for other-relevant and possessor-relevant stimuli of the same valence—as is done here—leads to hypotheses that might extend our understanding of the phenomenon (see Wentura, 1999b, for initial evidence).

Of course, the competing pathways in the emotional Stroop task as well as in the lexical decision task produce only mild rivalry, that is, they seldom produce an erroneous response and typically prolong response times by only a few milliseconds. In this regard, Cohen et al. (1990) put much emphasis on the modulating role of attentional selection. This is done by introducing task demand units, which are a source of permanent activation during goal maintenance. Thereby they increase the responsiveness of processing units on goal-related pathways. This feature of the model explains the huge advantage of the pathway specified by intentional goal selection over some competing pathway, for example, the pathway of naming the color over reading the word in the standard Stroop task.

This feature might also be the clue to understanding our results concerning the negativity effect *sensu* according to Pratto and John (1991). Given the dissociation between the relevance effect and the negativity effect (see above), the location of the interference causing the negativity effect must be different from the location causing the relevance effect. The negativity effect can best be explained by interferences that are due to an activation of the word-reading pathway. This explains why a negativity effect according to Pratto and John (1991) was reliably observed only for slow responders in Experiment 2. Supposedly, for these participants, the goal of evaluating the stimuli stayed active during the color-naming trial thereby dominantly prolonging response times in general because of an interference of the word-reading pathway. That this interference is more pronounced in negative words can be related to work in person perception showing that negative stimuli are more heavily weighted and trigger more elaborate information processes (Kanouse & Hanson, 1972; Peeters & Czapinski, 1990; Taylor, 1991).

Of course, this does not explain the results reported by Pratto and John (1991), who observed marked negativity effects without the participants adopting an explicit evaluation goal. However, part of the difference might be due to a confound in their materials. Although Pratto and John took great care to cover a wide range of trait terms, they might have oversampled negative other-relevant and positive possessor-relevant stimuli because they did not consider the relevance factor. In fact, the 80 stimuli used in their

Experiments 1 and 2 include 28 negative other-relevant traits and 12 negative possessor-relevant traits but 17 positive other-relevant traits and 23 positive possessor-relevant traits.⁸ Thus, part of their negativity effect might be an effect of relevance.

What are the implications of the relevance distinction and its automatic processing for social cognition research? By introducing the relevance distinction, Peeters (1983) and Peeters and Czapinski (1990) defined the valence of traits with regard to their functional value for either the trait holders or the persons surrounding them. Our results show that this distinction is not only of theoretical significance but is built into our information processing system on a very basic level. This is easily understandable from an evolutionary perspective because answers to questions of the type, *Is it good or bad for me that Person X possesses the Characteristic Y?* are of more vital interest than answers to questions of the type, *Is it good or bad for Person X him/herself to possess the Characteristic Y?*

However, in recent social cognition research, a series of paradigms were used to study implicit evaluations in person perception by referring to valence in its undifferentiated version of distinguishing positive and negative stimuli only. To name just a few, there were studies on stereotypes with regard to ethnic groups (e.g., Fazio, Jackson, Dunton, & Williams, 1995) or age groups (e.g., Perdue, & Gurtman, 1990), studies on in-group favoritism and out-group derogation (e.g., Otten & Wentura, 1999; Perdue, Dovidio, Gurtman, & Tyler, 1990), studies on implicit self-evaluation (e.g., Greenwald et al., *in press*), or studies on the effect of subliminally presented emotional faces (e.g., Murphy & Zajonc, 1993), thereby using experimental techniques like the (evaluative) affective priming paradigm (Fazio et al., 1986), the implicit association test (Greenwald, McGhee, & Schwartz, 1998), or the (pleasantness rating) affective priming paradigm (Murphy & Zajonc, 1993). To learn that our information processing system distinguishes automatically between subtypes of valence—that is, between other- and possessor-relevance—might enrich the research in these domains. To spell out for just one domain: The link between social categorization and social discrimination has received a lot of interest in social psychological research on inter-group behavior. Results of experiments on “minimal” groups, first conducted by Rabbie and Horwitz (1969) and by Tajfel, Billig, Bundy, and Flament (1971) indicated that the mere categorization of individuals into arbitrary social categories can be sufficient to elicit in-group favoritism, even measurable at an implicit level (Otten & Wentura, 1999). Given the relevance distinction, it can be asked whether the potential negativity of the out-group is of the other-relevant type. That is, do we consider the out-group members—as a result of mere categorization—as persons that can potentially be harmful to us? In the same manner, it can be tested whether ageism (e.g., Perdue & Gurtman, 1990) or ethnic prejudices (e.g., Fazio et al., 1995) are based on implicit negative evaluations of either the other-relevant or possessor-relevant type. Finally, for the self-concept domain, Higgins (e.g., 1987) empha-

⁸ We thank Felicia Pratto for providing us with the list of stimuli. Classification of relevance was done by five raters ($Mdn \kappa = .76$). Assignment to other- versus self-relevance was in accordance to a split of the adjective score aggregated over raters (see Experiment 1; Cronbach's $\alpha = .93$).

sized the difference between ought–actual and ideal–actual self-discrepancies for explaining habitual emotional experiences. We might speculate whether negative self-evaluations assessable on an implicit level are of the other-relevant type for persons with ought–actual discrepancies and of the possessor-relevant type for persons with ideal–actual discrepancies.

All these examples are related to the valence of single stimuli. But above that, there is a long-standing tradition in social psychology to analyze impression formation as a function of the sequence of trait attributions (e.g., Anderson, 1965; Asch, 1946). As should be evident from the introduction, traits are often evaluated unequivocally from one perspective (i.e., either the perspective of the possessor or of the others) but equivocally from the other one. This is best illustrated by questionnaire items used by Peeters (1992), that is, “which kind of friend do you consider the best one: a lazy or an industrious one?” and “which kind of enemy do you consider the best one: a lazy or an industrious one?” Of course, although the answer will be “an industrious one” for the first question, we would prefer a lazy enemy. This indicates that the valence of the possessor-relevant traits “lazy” and “industrious” is context-dependent. The implication might be that if, for example, “intelligent” (a positive possessor-relevant word) follows “aggressive” (a negative other-relevant word) in a person description, the positivity of “intelligent” will be lowered. This reminds of the old “change-of-meaning” hypothesis to explain primacy effects in impression formation (see, e.g., Anderson, 1965; Asch, 1946; Chalmers, 1969; Wyer, 1974).⁹ It will be worthwhile to analyze (with, e.g., the affective priming paradigm; Fazio et al., 1986) whether such a change-of-valence process occurs automatically.

Summary and Conclusions

The results of the present experiments have important implications for social cognition research. It seems as if more than an undifferentiated positivity or negativity of trait information is processed automatically, goal-independently (Bargh, 1997), and at an early stage of information processing (Zajonc, 1980). That is, the results suggest that our information processing system is fine-tuned to distinguish automatically between other- and possessor-relevant traits (Peeters, 1983). Probably due to their clear and (almost) unconditional association to approach and avoidance, other-relevant trait words (e.g., *aggressive*, *honest*) but not possessor-relevant stimuli (e.g., *depressive*, *intelligent*) attract attention and trigger behavioral tendencies. Research on automatisms in impression formation, stereotypes, and group processes might profit from considering this conceptual distinction.

⁹ We would like to thank Patricia Devine for pointing out this aspect.

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Appendix

The Trait Terms

Other-relevant term		Possessor-relevant term		
Negative	Positive	Negative	Positive	Neutral
grausam (cruel)	friedliebend (peace-loving)	verbittert (embittered)	scharfsinnig (astute)	bedächtig (slow, careful)
bösartig (malignant, vicious)	gütig (kind, generous)	apathisch (apathetic)	unbeschwert (carefree)	anspruchlos (undemanding)
gewalttätig (violent)	rücksichtsvoll (considerate)	zwanghaft (compulsive)	entschlossen (determined)	anstrengend (strenuous)
heimtückisch (conniving)	mitfühlend (sympathetic)	verzweifelt (desperate)	lebhaft (lively)	genau (accurate)
niederträchtig (low, perfidious)	solidarisch (shows solidarity)	einsam (lonely)	ausdauernd (persistent)	harmlos (harmless)
erbarmungslos (merciless)	entgegenkommend (obliging)	unglücklich (unhappy)	selbstsicher (self-confident)	häuslich (domestic)
böswillig (malicious, willful)	kameradschaftlich (comradely)	deprimiert (depressed)	geschickt (skillful)	kompliziert (complicated)
boshaft (malicious)	gerecht (just)	unzufrieden (discontented)	flexibel (flexible)	modern (modern)
jähzornig (irascible)	kooperativ (cooperative)	frustriert (frustrated)	intelligent (intelligent)	neugierig (curious)
betrügerisch (deceitful)	fair (fair)	lahm (lame)	einfallreich (inventive)	normal (normal)
herablassend (condescending)	freundlich (friendly)	entmutigt (discouraged)	optimistisch (optimistic)	realistisch (realistic)
abweisend (dismissive)	treu (faithful, loyal)	willenlos (weak-willed)	vergnügt (cheerful)	sachlich (unemotional)
gemein (mean)	herzlich (cordial)	abhängig (dependent)	aktiv (active)	geschäftig (busy)
rücksichtslos (reckless, ruthless)	warmherzig (warm-hearted)	einfalllos (unimaginative, dull)	unabhängig (independent)	reserviert (reserved)
geizig (miserly, stingy)	hilfsbereit (helpful)	gelangweilt (bored)	vielseitig (versatile)	stämmig (stocky, burly)
streitsüchtig (quarrelsome)	gastfreundlich (hospitable)	kontaktarm (isolated)	froh (glad)	systematisch (systematic)
unfreundlich (unfriendly)	zuverlässig (reliable)	ohnmächtig (powerless)	klug (clever, smart)	unauffällig (unobtrusive)
beleidigend (insulting)	tolerant (tolerant)	lustlos (listless)	entspannt (relaxed)	unbekannt (unknown)
nachtragend (unforgiving)	einfühlsam (sensitive)	einseitig (one-sided)	zufrieden (content, satisfied)	theoretisch (theoretical)
aufdringlich (pushy)	lieb (dear, kind)	unselbständig (dependent)	ausgeglichen (well-balanced)	unordentlich (untidy)
unsozial (antisocial)	verständnisvoll (understanding)	feige (cowardly)	selbständig (autonomous)	zurückhaltend (guarded)
rabiät (rough, brutal)	ehrlich (honest)	unfähig (incapable)	kreativ (creative)	wählerisch (choosy)
feindselig (hostile)	aufrichtig (sincere)	träge (sluggish)	phantasievoll (imaginative)	zaghaf (gingerly)
aggressiv (aggressive)	zärtlich (affectionate)	depressiv (depressive)	gesund (healthy)	zerstreut (absent-minded)
intolerant (intolerant)	liebevoll (loving)	phantasielos (unimaginative)	glücklich (happy)	zögernd (hesitating)

Received March 10, 1997

Revision received October 30, 1999

Accepted November 1, 1999 ■