Automatic Processing of Dominance and Submissiveness

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Abstract. We investigated whether people are able to detect in a relatively automatic manner the dominant or submissive status of persons engaged in social interactions. We used a nonaffective variant of the affective Simon paradigm of De Houwer and Eelen (1998) in which participants responded by saying either "dominant" or "submissive" depending on the right or left spatial position of a target person who was engaged as either the dominant or the submissive agent in a social interaction. We observed that responses were facilitated when the status connotation of the target person and the correct response corresponded. These results provide new information about the automatic nature of information related to emotion-antecedent appraisals.

Keywords: appraisal, antecedent, emotion, coping potential, dominant, submissive, status, automaticity, Simon task

The present study examined whether people are able to pick up information about dominance or submissiveness in the environment in a relatively automatic manner. This fits into our endeavor to systematically investigate the automatic nature of different components of appraisal that are postulated to play a causal role in the elicitation and differentiation of different specific emotions (e.g., Scherer, 1988). Appraisal theorists often assume that emotion-antecedent appraisal components such as goal relevance, intrinsic and motivational valence, and coping potential can be processed automatically. Former research lends support for the possibility of an automatic appraisal of goal relevance (e.g., Williams, Mathews, & MacLeod, 1996), intrinsic valence (Bargh, Chaiken, Govender, & Pratto, 1992; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Hermans, De Houwer, & Eelen, 1994), and motivational valence (Moors & De Houwer, 2001; Moors, De Houwer, & Eelen, 2004, Moors, De Houwer, Hermans, & Eelen, in press). Studying the possibility of an automatic assessment of dominance and submissiveness is a first step in investigating whether information related to coping potential can be processed in an automatic manner. The relation between dominance information and coping potential is especially apparent in certain interpersonal contexts. For example, in order to determine whether one can cope with an adversary, one should not only consider one's own capacity, but also the capacity of the adversary. In other words, one should be able to determine whether one is in a dominant or a submissive position with regard to the other person. But even in nonsocial examples, coping may be said to depend on dominance in a metaphorical sense. To be able to cope with a disease or a natural disaster implies that one dominates the situation.

Research supporting the possibility of an automatic assessment of dominance information is limited to studies in which the focus of interest was not the automatic nature of the assessment of dominance information per se but rather the influence of dominance information on subsequent processing and behavior. Bargh, Raymond, and Pryor (1995) set out to show that men who are likely to sexually aggress or harass have an association in memory between the concepts of power and sex and that activation automatically spreads from the former to the latter. One of the findings was that subliminal priming of power-related words facilitated responses to sex-related words. This finding also shows that the dominance or power connotation of words can be processed automatically, at least in the sense of unconscious. The study of Bargh et al. (1995) does not, however, inform us about the ability to automatically detect dominance in real life scenes of social interactions. The dominance relation between two people is usually not immediately given

Experimental Psychology 2005; Vol. 52(4):296–302
DOI: 10.1027/1618-3169.52.4.296

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(there are no labels stating which person is the dominant and which person is the submissive one), but may be revealed through nonverbal cues such as posture (Tiedens & Fragale, 2003), relative height of both persons, as well as verbal cues and other symbols (e.g., uniforms). What is true for the semantic activation of words may not necessarily be true for the extraction of dominance information from other cues in complex pictures of social interactions. It can be argued that the ability to automatically detect the dominance or submissiveness in scenes of people that are interacting is more relevant for the elicitation of emotions and for social interactions than is the ability to detect the dominance connotation expressed in words.

In another type of study, Tiedens and Fragale (2003) showed that participants who interacted with a confederate adopted a posture (expansion vs. constriction) that was complementary to the posture of the confederate (constriction vs. expansion), and that they were not aware of being influenced in this way. These data were interpreted as speaking in favor of the idea that observers respond to submissive and dominant behavior with contrasting behavior and that they do so in an automatic way. The data seem to suggest that the status of the confederate was initially processed in an automatic way as well. However, although the experimenters interpreted the postures of expansion and constriction as expressing dominance and submissiveness, one cannot be entirely confident that participants did so as well, nor is it clear to what extent the initial processing of dominance or submissiveness of the confederate was automatic.

We therefore investigated this issue further using a variant of the affective Simon task (De Houwer & Eelen, 1998). Before we describe our study, we will first explain the nature of the affective Simon task and why (affective) Simon effects can provide relevant information regarding the automatic nature of the underlying processes. In an affective Simon task, stimuli (e.g., words) are presented that differ with respect to valence as well as with respect to another feature that is unrelated to valence (e.g., grammatical category), and participants are asked to say "positive" or "negative" depending on that other feature (e.g., say "positive" to nouns and "negative" to adjectives). A Simon effect is found when performance is superior on trials with a match between the stimulus valence and the valence of the correct response (positive-positive or negative-negative) compared with trials with a mismatch between both types of valence (positive-negative or negative-positive).

Such an affective Simon effect shows that participants processed the valence of the stimuli under the conditions created in the experiment. An analysis of these conditions can inform us about the extent to which this processing was automatic and according to which features. In line with Bargh (1992), we believe that automaticity is best broken down into different features such as fast, unintentional, efficient, uncontrollable, and unconscious, and that support for each of these features must be considered separately. The short response times that are typically found in affective Simon studies indicate that the processing of stimulus valence was relatively fast and efficient, considering the fact that during this time participants also had to process and respond to the task-relevant feature (e.g., grammatical category). Certain aspects of a Simon procedure also support the hypothesis that stimulus valence can be processed unintentionally, or more accurately, without *conscious* intentions. To process something in a (consciously) intentional sense means that one has the (conscious) goal to process it and that this goal actually caused the processing (Moors & De Houwer, in press). In an affective Simon task, participants are asked to focus on a feature (e.g., grammatical category) that is unrelated to the valence of the stimuli. In this way, participants are not encouraged to pursue the goal to process the valence of the stimuli. On the other hand, it could be argued that because of the affective connotation of the responses in an affective Simon task the valence dimension is made salient, thereby inducing in participants the goal to process this dimension. Priming tasks in which participants are asked to give nonevaluative target responses (lexical decision or pronunciation) suffer less from this risk (e.g., Bargh, Chaiken, Raymond, & Hymes, 1996; Hermans et al., 1994). Two remarks are in place here. First, it must be noted that even in tasks where nothing in the instructions encourages participants to pursue the goal to evaluate stimuli, it cannot be totally excluded that participants pursued such a goal, either by default or due to other characteristics of the experimental setting besides the instructions (e.g., the fact that only stimuli with a clear positive or negative valence are presented). Second, in an affective Simon task, it seems more likely that participants would have the conscious goal to *avoid* processing of stimulus valence rather than to engage in it because they may experience that the processing of stimulus valence interferes with their main task of responding on the basis of the other feature of the stimulus. Hence, we believe that affective Simon effects do provide support for processing of stimulus valence without conscious intentions. To the extent that participants indeed have the goal to avoid processing of stimulus valence, one could even argue that affective Simon effects provide evidence for the idea that the processing of valence was uncontrolled (in the sense of avoid). It should be

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clear, however, that a Simon task is not suited to test hypotheses about other automaticity features. For instance, it cannot inform us about the processing of valence in the absence of conscious input, because stimuli are not presented subliminally.

In our variant of the Simon task, we presented two types of trials. On one type of trials, photographs were shown that depicted scenes of two interacting individuals (Person A and Person B). On each photograph, one person was dominant whereas the other was submissive (e.g., an army officer shouting at a soldier). On half of all pictures, Person A was dominant, on the other half, Person B was dominant. On half of the pictures on which a person (A or B) was dominant, this person was positioned on the left side; on the other half, this person was positioned on the right side. Participants were instructed to respond on the basis of the spatial position (right/left) of one of both persons. There were four response conditions. Participants in the first and the second response condition were instructed to focus on Person A, whereas participants in the third and fourth response condition were asked to focus on Person B. Participants in the first response condition had to say aloud "dominant" when Person A was positioned right, and "submissive" when Person A was positioned left. Participants in the second response condition received the reversed allocation of responses to spatial positions of Person A. Participants in the third response condition had to say "dominant" when Person B was positioned right, and "submissive" when Person B was positioned left. For participants in the fourth response condition, the allocation of responses to spatial positions of Person B was reversed. On another type of trials, words expressing dominance (e.g., ambitious) or submissiveness (e.g., helpless) were presented and participants were instructed to say aloud "dominant" to dominant words and "submissive" to submissive words as fast as possible. These word trials were included to strengthen the association between the verbal responses dominant and submissive, and the concepts dominant and submissive. By asking participants to occasionally use these responses to indicate dominance and submissiveness, we wanted to prevent these responses from losing their meaning (see Voss, Rothermund, & Wentura, 2003, for a similar approach). Picture and word trials were presented intermixed and participants were asked to respond as quickly as possible to both types of trials. We predicted that participants would be faster and more accurate to say "dominant" to pictures in which the target person was dominant and to say "submissive" to pictures in which the target person was submissive. Such a result would show that participants processed the status of the target person, even though they were instructed to focus and respond as quickly as possible to the spatial position of the target person and not to his status. As explained above, these aspects of the procedure deliver some support for the idea that the processing of status was automatic in the sense of fast, efficient, without conscious intentions, and uncontrolled (in the sense of avoid).

Method

Participants

Forty psychology undergraduates (3 men, 37 women) at Ghent University participated in exchange for course credits. All were native Dutch speakers.

Materials

For the practice trials, we used eight dominant and eight submissive words. For the experimental trials, we used eight other dominant and eight other submissive words (see Appendix). The letters extended 0.8° horizontally and 0.6° vertically. The scenes for the picture trials were set up and photographed by the first author. On the basis of a pilot study, we selected those pictures that were evaluated as being most clear with regard to which of both actors was dominant and which was submissive. In total, three different scenes served as the basis for the pictures in the practice trials and eight other scenes were used in the experimental trials (see Appendix for a description of all scenes). Each scene led to the construction of four pictures. In a first picture, Person A was dominant and positioned right. A second picture was identical to the first picture, except that the image was mirrored, so that Person A was now positioned left. In a third picture, Persons A and B switched clothes and roles, so that Person B was now dominant and positioned right, but other elements remained the same. In a fourth picture, the image of the third picture was mirrored so that Person B was now positioned left. As a result, for the practice trials, there were six pictures in which Person A was dominant and six pictures in which Person B was dominant. For the experimental trials, there were 16 pictures in which Person A was dominant and 16 pictures in which person B was dominant. On half of all pictures in which Person A was dominant, Person A was positioned right; on the other half, Person A was positioned left. On half of all pictures in which Person B was dominant, Person B was positioned right; on the other half, Person B was positioned left.

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The picture stimuli extended 19° horizontally and 28° vertically. All stimuli were presented on a 100 Hz SVGA 19-inch screen connected to a Pentium IV 2.8 Ghz computer. The verbal responses were registered by a voice key that was connected to the parallel port of the computer. Both the stimulus presentation and the registration of the response latencies were controlled by an Affect 3.0 program developed with C++ for the Windows platform (Hermans, Clarysse, Baeyens, & Spruyt, 2001).

Procedure

Participants were tested individually. After they filled in an informed consent form, the experimenter explained that they would receive two types of trials: word trials and picture trials. During the word trials, participants had to say aloud "dominant" to dominant words and "submissive" to submissive words as quickly as possible. Note that because our participants were native Dutch speakers, they actually responded with the Dutch words "dominant" (i.e., dominant) and "onderdanig" (i.e., submissive). The experimenter first demonstrated how to respond on two word trials, one in which the dominant word "compelling" was shown and one in which the submissive word "pliable" was presented. Next, it was explained that during the picture trials, pictures would be presented in which two persons (A and B, both men) would always be featuring. In order to introduce these persons to the participants, four photographs were shown on the computer screen: one side view and one frontal view of Person A, and one side view and one frontal view of Person B. Participants in Response Conditions 1 and 2 were asked to focus on Person A during the entire experiment; participants in Response Conditions 3 and 4 were asked to focus on Person B. Participants in Response Conditions 1 and 3 had to say "dominant" when the target person was positioned right and "submissive" when he was positioned left. Participants in Response Conditions 2 and 4 had to say "dominant" when the target person was positioned left and "submissive" when he was positioned right. The experimenter then demonstrated how to respond on two picture trials: one trial in which the target person was positioned left and another in which the target person was positioned right. Next, the participants completed 20 practice trials in which eight word trials and twelve picture trials were presented intermixed. Each of the eight practice words was presented once and so was each of the twelve practice pictures. After this, the participants received 2 blocks of 48 experimental trials. In each block, 16 word trials (all experimental words once) and 32 picture trials (all experimental pictures once) were presented intermixed. In all practice and experimental blocks, stimuli were presented in a random order.

Each practice and experimental trial consisted of the presentation of a word or a picture, which remained on screen until a response was registered or 3,500 ms elapsed. After the response was given, the experimenter pressed a code indicating which kind of response the participant had given ("dominant" or "submissive"), or a separate key for voice key failures. When the response was incorrect, the word "error" was displayed during 2,500 ms following the experimenter's keypress. The intertrial interval varied randomly between 1,000 and 1,500 ms. As dependent variables, we measured the response times (i.e., time between the onset of the picture and the response) as well as the number of incorrect responses on the picture trials only.

Results

Practice trials, word trials, trials on which reaction times were shorter than 150 ms or longer than 1,500 ms (3.40%), and trials on which the experimenter noticed problems with the voice key (2.50%) were excluded from all analyses. For each participant, mean reaction times as well as percentages of errors were calculated. Trials on which an incorrect response was given (11.30%) were also excluded from the calculation of the mean reaction times. ANOVAs were conducted on the mean reaction times and percentages of errors separately, using status of the target person (dominant vs. submissive) and status denoted by the to-be-given response (dominant vs. submissive) as within-subjects variables.

The ANOVA of the mean reaction times revealed a significant interaction between the two variables, $F(1, 39) = 31.94$, $MSE = 2072.91$, $p < .01$. Reaction times were shorter on trials on which the target person and the response had the same status connotation compared to trials on which both elements had a different status connotation (see Table 1). The ANOVA of the percentages of errors also revealed a significant interaction, $F(1, 39) = 17.78$, $MSE = 0.00$, $p < .01$, with less errors on trials on which the target person and the correct response had the same status connotation compared to trials on which both elements had a different status connotation (see Table 1). No other effect reached significance, all F values < 1.

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Table 1. Mean reaction times in *ms* and percentages of errors (*SD* in parentheses) as a function of the status of the target person and the status connotation of the correct response in the first experiment.

		Status of target person	
	Status connotation of correct response	Dominant	Submissive
Reaction times	Dominant	864 (103)	894 (120)
	Submissive	918 (102)	866 (112)
Percentage of errors	Dominant	4.50 (7.17)	10.33 (8.93)
	Submissive	8.78 (10.89)	4.43 (5.45)

Discussion

The results showed a Simon effect for both the reaction time data and the error data. These results demonstrate that participants were able to process the dominance or submissiveness of the target person in relation to another person under the conditions created in the experiment. That is, the dominance dimension was processed even though (a) response times were very short, (b) participants had to simultaneously engage in the demanding task of responding as quickly as possible on the basis of the spatial location, and (c) participants in all likelihood had the conscious goal to avoid processing the status of the persons rather than the conscious goal to process this information. For these reasons, the observed Simon effect provides evidence for the claim that the dominance dimension was processed automatically in the sense of fast, efficient, without conscious intentions, and uncontrolled (in the sense of the goal to avoid processing).

These conclusions need to be qualified in two ways. First, most of the above arguments do not provide conclusive evidence for the automaticity features discussed. With regard to efficiency, it must be noted that although in a Simon task there is no onset asynchrony between the irrelevant feature (e.g., status) and the task-relevant feature (e.g., spatial position), there are no guarantees that the processing of both features took place at exactly the same time. Only if they were indeed processed at the same time and on the supposition that processing and responding to the task-relevant feature consumes a rather large amount of attentional resources, processing of the dominance dimension can be said to make minimal use of these resources (i.e., efficient). With regard to the feature uncontrolled (in the sense of avoid), we did not actually verify whether the participants indeed tried to avoid processing the dominance dimension. With regard to the feature unintentional, one could argue that due to the fact that in our variant of the Simon task, the crucial trials were intermixed with trials on which words had to be categorized as dominant or submissive, it is possible that the goal to process the dominance dimension was consciously activated. To examine this hypothesis, we conducted a second experiment that was identical to the one reported except that the word trials were omitted and replaced by another set of 32 picture trials. The crucial interaction between status of the target person and status denoted by the correct response was again significant for both the reaction time data, $F(1, 23) = 8.85$, $MSE = 1690.05$, $p < .01$, and the error data, $F(1, 23) = 12.60$, $MSE = 0.00$, $p < .01$, with shorter response times and less errors on trials on which the target person and the response had the same status connotation compared to trials on which both elements had a different status connotation (see Table 2). These additional findings strengthen our conclusion that participants processed the status of the target person without the conscious goal to do so. In sum, although the arguments that we have furnished in favor of automaticity features do not permit definite conclusions, we believe they are nevertheless plausible.

A second caveat is related to the generality of our findings. As mentioned above, several characteristics of our Simon task render the dominance dimension salient: the word task (in the first experiment only), the nature of the responses (dominant/submissive), and the nature of the stimulus material (pictures showed situations in which one person is clearly dominant). One could argue that the dominance dimension was processed automatically in our studies because it was made salient by the task characteristics. It is difficult to refute this argument in a conclusive manner because the nature of the Simon task requires that the stimuli and responses are related to the feature under investigation. This is also true for most other tasks that have been used to examine automatic processes (e.g., Stroop, affective priming of evaluation re-

Table 2. Mean reaction times in *ms* and percentages of errors (*SD* in parentheses) as a function of the status of the target person and the status connotation of the correct response in the additional experiment.

		Status of target person	
	Status connotation of correct response	Dominant	Submissive
Reaction times	Dominant	818 (126)	827 (110)
	Submissive	854 (130)	814 (110)
Percentage of errors	Dominant	2.88 (3.89)	3.96 (4.83)
	Submissive	6.71 (5.90)	2.42 (3.53)

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sponses; see De Houwer, 2003). Hence, most evidence for automatic processing can be criticized on the basis of the argument that the feature under investigation was made salient by the nature of the responses or the stimuli (see also McKoon & Ratcliff, 1995). But even if our results were (in part) due to the fact that dominance was made salient, the fact remains that they provide support for the conclusion that humans are at least under certain conditions able to extract, in an automatic manner, dominance information from complex visual scenes that depict the interaction of two persons. Even if this ability is present only when the dominance dimension is made salient by the context, it would provide an important advantage when engaging in social interactions and could be a crucial element in the generation of emotions in such situations.

Acknowledgement

We would like to thank Adriaan Spruyt for his help with programming the experiment, and David Verhaeren and Hans Geyens for posing as Person A and Person B. The reported research was made possible by a grant of the Special Research Fund, Ghent University, BOF-01101203, to Jan De Houwer.

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Received November 8, 2004
Revision received January 14, 2005
Accepted January 17, 2005

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Appendix

Words for practice trials: dominant	*submissive*
zelfverzekerd (self-confident)	naïef (naive)
bikkelhard (rock-hard)	braaf (well-behaved)
brutaal (brutal)	onschuldig (innocent)
tiranniek (tyrannical)	bedeesd (diffident)

Words for experimental trials: dominant	*submissive*
bazig (bossy)	buigzaam (pliable)
autoritair (authoritarian)	onderdanig (submissive)
dominant (dominant)	afhankelijk (dependent)
heftig (fierce)	volgzaam (obedient)
ambitieus (ambitious)	verlegen (shy)
vastberaden (tenacious)	onzeker (uncertain)
geestdriftig (passionate)	slap (weak)
aanvallend (attacking)	nederig (humble)

Description of photographs for practice trials
Scene 1: One person dressed in a suit reprimands a cleaner holding a brume.
Scene 2: Two men are fighting and one person is ready to hit the other person.
Scene 3: Two men are fighting on the ground, one person is holding down the other person.

Description of photographs for experimental trials
Scene 1: An army officer is shouting at a soldier who looks tense.
Scene 2: An army officer holds a gun against the head of a soldier who is kneeling down.
Scene 3: A soldier points a gun at another soldier who is lying on the ground.
Scene 4: A football player is being shown the red card by a referee.
Scene 5: A policeman points a gun at a thief who is holding his hands up.
Scene 6: A policeman is body-searching a man who is standing against a car with his hands placed on the car.
Scene 7: A policeman stands beside a car while looking suspiciously through the identification papers of the driver. The driver sits in his car and looks worried.
Scene 8: An employer stands behind his desk and shouts at an employee while raising his finger. The employee bends his head and looks dismayed.

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