



Category activation effects in judgment and behaviour: The moderating role of perceived comparability

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Previous research on category activation effects demonstrates that extreme exemplar priming can lead to contrast effects as well as assimilation effects in target judgments. Two experiments extended this line of research by investigating the moderating role of perceived comparability, that is, the extent to which the exemplar and target are believed to belong to the same category and thus can be compared. In both experiments, participants judged the speed of a person displayed on a picture following priming with animals exemplifying either extreme speed ('cheetah') or extreme slowness ('turtle'). In addition, in the second experiment a behavioural measure was included. In the first experiment individual differences concerning the perceived comparability between animals and humans were assessed. In the second experiment perceived comparability was experimentally varied. Results showed that the direction of category activation effects (i.e. assimilation versus contrast) depended on the extent to which the prime and target categories were seen as comparable. Contrast effects on both judgments and behaviour emerged when the prime and the target category were perceived as comparable. However, assimilation effects on judgment and behaviour ensued when the prime and target category were not perceived as comparable.

Research in social cognition and social judgment shows that our perceptions of other people are affected by knowledge activated previously. In the process of constructing a representation and forming an evaluation of a person, people use categories that are mentally accessible at the time of judgment (Bruner, 1957; Higgins, 1989). Although this is not the place to discuss all the research available on this topic (see, for reviews, e.g. Higgins, 1996; Moskowitz & Skurnik, 1999), let us briefly consider two studies that are relevant to the present research.

Srull and Wyer (1979, 1980) used a priming task in which they exposed participants to trait categories to increase the accessibility of the concepts of hostility or kindness. Later, in an ostensibly unrelated task, they were requested to evaluate the friendliness of a target person (Donald), whose behaviour was 'ambiguous' on this trait (that is, his behaviour could be interpreted as being either friendly or unfriendly). Results

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showed that Donald was rated as more unfriendly following the priming of hostility, and more friendly following the priming of kindness. In other words, target judgments were assimilated, displaced towards activated categories (see also Higgins, Rholes, & Jones, 1977, for a first demonstration of this effect). Higgins *et al.* (1977) also showed that the trait category activated must be applicable to the trait dimension on which the target person is judged. Thus, when one has to evaluate the friendliness of Donald, the accessibility of applicable traits (nice vs. rude) may yield assimilation effects, whereas the accessibility of inapplicable traits (poor vs. rich) will exert no effects.

In another study on category activation effects, Herr (1986) primed his participants with either person exemplars of extreme friendliness (e.g. Peter Pan) or extreme hostility (e.g. Mike Tyson). Subsequently, participants were asked to evaluate the friendliness of a target person (again named Donald). Results showed that evaluations of Donald were displaced away from the traits that were exemplified by the categories. Participants primed with extremely friendly exemplars evaluated Donald as more hostile, while those primed with extremely hostile exemplars judged Donald as more friendly, reflecting a contrast effect. The emergence of contrast effect after extreme exemplar priming has been established in other studies on social judgment (e.g. Herr, Sherman, & Fazio, 1983; Manis, Nelson, & Shedler, 1988; Stapel, Koomen, & Van Der Pligt, 1997).

In reinterpreting previous findings of assimilation and contrast, Wyer and Srull (1989) argued that categories that simultaneously prime both a trait as well as an object (e.g. 'hostile' and 'person') are likely to lead to high accessibility of a distinct representation that invites a comparative judgment. Extreme person exemplars (Mike Tyson) are indeed distinct categories that simultaneously prime both a trait as well as the object ('a very hostile person') and hence, such categories can be utilized as comparison standards as we judge other people (Festinger, 1954; Kahneman & Miller, 1986; Sherif & Hovland, 1961). Consequently (and given that the trait typifying the exemplar is applicable to the trait dimension on which the target is judged), extreme exemplars result in comparison-based contrast (e.g. 'In comparison to the very hostile person, Mike Tyson, Donald is a nice guy').

Trait categories ('hostile'), on the other hand, are indistinct and abstract categories in the sense that they do not refer to an object or person. Thus, traits lack sufficient distinctness to serve as comparison standards for target judgments of objects or persons. Instead, primed trait categories may cause perceptual input to be interpreted in line with the accessible information, resulting in an assimilative response. Thus, if the trait hostile is primed before we evaluate Donald's hostility, we may perceive him in line with the accessible concept of hostility, and subsequently conclude that he is indeed hostile.

The message emanating from research on category activation effects in person judgment is clear: activation of a category exerts impact on the way we interpret and evaluate the behaviour of other people. However, the direction of this effect seems to be dependent on whether the accessible category serves as a standard of comparison or not. In the present contribution, we attempt to provide further evidence that the emergence of contrast or assimilation is conditional on the extent to which the prime and target categories are perceived as comparable or not. More specifically, we would like to investigate whether the same *extreme exemplars* can lead to both *contrast* effects as well as to *assimilation* effects, depending on the *perceived comparability* between the prime and the target.

Exemplar priming and assimilation and contrast effects

In a highly systematic line of research on category activation effects in person judgment (and again using a person named Donald), Stapel and colleagues (e.g. Stapel & Koomen, 1997; Stapel, Koomen, & Van Der Pligt, 1997) found that person exemplars exemplifying extreme hostility or kindness resulted in contrast effects on a friendliness dimension, whereas extreme non-person exemplars representing these traits led to assimilation effects. That is, they obtained evidence demonstrating that extreme exemplars do not always lead to judgmental contrast.

To explain their findings, Stapel and co-workers take a stage perspective, in which they assume that exemplars that are dimensionally relevant for the trait to be judged may be used as an interpretation frame in the encoding stage or as a comparison standard in the judgment stage of impression formation of a target (see for a similar distinction, Schwarz & Bless, 1992; Wyer & Srull, 1989). Furthermore, they argue that extreme person exemplars, in addition to being distinctive, provide a comparison relevant for the target (another person, such as Donald) to be judged against. That is, the exemplar and target are perceived to be comparable as they are believed to share conceptually-based similarities (in this case, both are human). More plainly, they embrace the general logic that items that belong to the same category more readily elicit comparison processes than items that belong to dissimilar categories (see also Brown, 1953; Coren & Enns, 1993; Manis, Biernat, & Nelson, 1991; Suls & Wills, 1991). This suggests that contrast effects occur because the extreme exemplar (e.g. Mike Tyson) is used as a comparison standard with which the target (Donald) is contrasted, thereby overriding assimilative interpretation effects that otherwise leave their trace in the encoding stage as a result of the spontaneous activation of traits (e.g. 'hostility') exemplified by the exemplars (e.g. Smith & Zarate, 1990). Importantly, Stapel and colleagues also showed that when the primed person exemplars were moderately extreme (e.g. Margaret Thatcher), assimilation was more likely to ensue (see also Herr, 1986; Koomen, Stapel, Jansen, & In 't Veld, 1998). This result indicates that the magnitude of dissimilarity between exemplar and target on the trait dimension to be judged also matters for a comparison-based judgment to occur: The more extreme the person exemplar, the more likely it is to be used as a comparison standard, and hence, the target is displaced away from the trait that is exemplified by the exemplar (cf. the idea of comparison-based alignable differences along a common dimension of two items belonging to the same category; Markman & Gentner, 1993; Medin, Goldstone, & Markman, 1995).

When non-person exemplars are primed, however, a different process is presumed to happen. Although distinctive, extreme non-person exemplars may not serve as a comparison standard for person judgments because (at least in the eyes of Stapel and colleagues' research participants) they are not believed to share sufficient conceptually-based similarities to belong to the same category. However, extreme non-person exemplars (e.g. grizzly bear) do still spontaneously evoke traits (e.g. aggressive) associated with them that are relevant for the trait dimension to be judged. Consequently, the trait activated by exemplars can be used to interpret the ambiguous target. Thus, when being asked to evaluate Donald we may perceive him in line with the trait that is highly accessible at the time of constructing a representation of him. In that case, comparison irrelevant exemplars lead to assimilation (cf. Higgins, 1989; Wyer & Srull, 1989).

In a recent study, Stapel and Winkielman (1998) extended these findings. Their participants were either exposed to a friendly or hostile ape (named Ralph). In order to manipulate the exemplar-target similarity, for one half of the participants Ralph was

described in ‘human’ terms, and it was emphasized that researchers observed Ralph in order to gain insight into human behaviour. In a second condition, Ralph was clearly described as a non-human animal. In this condition it was emphasized that researchers studied Ralph in order to shed light on animal behaviour. After participants explicitly evaluated Ralph, which was required in order to enhance the distinctness of Ralph as a comparison standard (cf. Sherman, Ahlm, Berman, & Lynn, 1978), they were asked to evaluate a stimulus person named Donald. The results showed that under conditions of high exemplar–target similarity (the ape is a person) contrast effects emerged, while under conditions of low exemplar–target similarity (the ape is an animal) assimilation effects were more likely to ensue. Thus, the primed exemplar caused contrast effects only when the exemplar–target similarity (or comparability) was high, and the comparison standard (that is, the exemplar) was made distinct by evaluating it first.

To recap, the available data suggest that after extreme exemplar priming, assimilation effects occur, namely when the traits exemplified by the exemplars are applicable for the interpretation of the ambiguous behaviour of a target, but the category that the exemplar itself represents is not perceived as comparison relevant for the target. However, after the priming of extreme exemplars that are comparison relevant, these processes are overruled by contrastive comparison judgment. Therefore, whether an extreme exemplar produces assimilation or contrast in judgments of a target depends on whether the exemplar and target share sufficient conceptual similarity to belong to the same category and are thus perceived as comparable.

The present research

In the present research we would like to extend the evidence obtained by Stapel and Winkielman (1998) on the crucial role of perceived comparability between the exemplar and target itself. In our studies we primed participants with extreme animal exemplars and subsequently observed effects on person judgments. In line with the ideas discussed above, we assume that the perception of certain animal exemplars (e.g. cheetah) leads to spontaneous activation of specific behavioural traits (e.g. very fast) that can be used to interpret an ambiguous person target (e.g. a person’s walking speed). However, since extreme animal exemplars simultaneously prime both a trait as well as an object (e.g. a very fast animal), and thus are distinct they can, in principle, serve as a comparison standard (cf. Wyer & Srull, 1989). That is, extreme animal exemplars can be compared to a person target or even to oneself (see also Eddy, Gallop, & Povinelli, 1993; Mitchell & Hamm, 1997). Whether an animal is used as a comparison standard, however, should depend on whether the animal and the person to be judged are—in the eyes of the experimental participants—comparable, and hence, whether assimilation or contrast will ensue is also dependent on this perceived comparability.

In scrutinizing the role of perceived comparability, our studies diverge from the Stapel and Winkielman (1998) investigation in two ways. First of all, we try to investigate contrast and assimilation effects in person judgment after the mere priming of extreme animal exemplars as a function of individual differences in perceived comparability between animals and humans. It is very likely that some people categorize humans as animals (and hence think that they are to some extent comparable) while others may be more reluctant to do so (and think they are not comparable). According to the reasoning presented above, this individual difference in perceived comparability should determine whether animal priming leads to assimilation or to contrast. Second,

in Expt. 2, we manipulate perceived comparability by either encouraging or discouraging participants to use animals as a comparison standard, and aim to demonstrate that the animal priming not only affects person judgments, but that it can also affect participants' own overt behaviour (Dijksterhuis *et al.*, 1998).

EXPERIMENT 1

In the first experiment participants were primed with animal exemplars associated with extreme slowness or fastness by employing a scrambled sentence task. Previous research on category priming has clearly established that this experimental technique activates mental representations in one context and exerts an unintended and unconscious influence on subsequent judgments or actions (see Bargh & Chartrand, 2000).¹ After participants had been primed, they rated the walking speed of a man displayed on paper.

As an important addition to previous studies on extreme exemplar priming we assessed individual differences regarding to the perceived comparability between animals and humans. People differ in their beliefs as to whether animals and humans share conceptual similarity and are comparable, because of differences in educational background, values, profession and so on (e.g. Kafer, Lago, Wamboldt, & Harrington, 1992; Plous, 1993; Wagstaff, 1991). That is, some people will see animals and humans as comparable, while others will see them as non-comparable. This means that some people will use a primed animal as a comparison standard in judging a person, while others will not. We expected that for participants who believe that animals and humans are comparable, extreme animal exemplars are used as comparison standards and will therefore lead to contrast effects in person judgment. However, for participants who do not think animals and humans are comparable, such an effect is less likely to emerge. Under such conditions, the exemplars will not serve as comparison standards, but the activated and applicable trait category that is exemplified by the animals may guide the interpretation of the ambiguous target, i.e. walking speed of a man, and produce assimilation.

Method

Participants and design

A group of 106 Dutch undergraduate students from various departments and disciplines were randomly assigned to one of the two experimental conditions: slow animal exemplars and fast animal exemplars. They were paid 10 Dutch Guilders for their participation in the experiment.

Stimulus material

A pretest was conducted to obtain two groups of animals that were perceived as exemplifying extreme slowness or fastness. A sample group of 25 students filled out a questionnaire in which

¹Previous research on category activation effects has established that awareness of the influence of priming stimuli on subsequent judgment may modify context effects. Being aware of the influence of the priming stimuli on later judgments may evoke an (over)correction process that attenuates or reverses the usually obtained assimilation or contrast effect, resulting in, respectively, contrast or assimilation (e.g. Lombardi, Higgins, & Bargh, 1987; Martin, 1986; Petty & Wegener, 1993; Strack, Schwarz, Bless, Kübler, & Wänke, 1993). Therefore, for the present purposes it is important that participants are unaware that their exposure to the primed categories may influence their later impression of the target person.

they responded to several animals. They were requested to evaluate each animal on a 9-point scale that ranged from extremely slow (1) to extremely fast (9). Three names in each group were selected on the basis of this pretest. The three slow animal exemplars were snail, caterpillar and turtle ($M=1.4$, $SD=0.46$). The three fast animal exemplars were antelope, greyhound and cheetah ($M=7.8$, $SD=0.84$). Thus, we established two types of animal exemplars: extremely slow animals, and extremely fast animals.

Experimental task and procedure

Participants were told that the study was concerned with several aspects of human judgment and decision-making in daily life. The experiment was embedded in a larger questionnaire. Participants' sessions were run in groups in a regular classroom. For the sake of organization, an experimenter monitored the sessions in such a way that all participants went through the questionnaire at the same pace and in the same order. In the first part of the questionnaire participants responded to various 9-point Likert-type (ranging from strongly disagree (1) to strongly agree (9)) opinion statements dealing with all kinds of issues. Participants were told that we wanted to obtain issues on which students' opinions differ a lot, and that these issues were allegedly needed for forthcoming research. The experimenter stressed the importance of providing 'straight' answers and told that all answers would be treated confidentially. Among these opinion statements there were two items embedded that assessed the extent to which participants believe that animals and human beings are comparable, namely: 'The behaviour of animals can easily be compared to the behaviour of humans', and 'Animals share many similarities with humans' (cf. Plous, 1993). By averaging the responses to these two items ($r=.50$, $p<.001$), and on the basis of a median split, participants were categorized as either 'low' or 'high' concerning their perception of the comparability between animals and humans.

After these items had been administered, participants performed several unrelated filler tasks (e.g. decision-making task on gambling, inventory on self-reported frequency of mundane activities) designed by other research teams in the department. These filler tasks required much mental effort and participants took quite a long time to complete the tasks (approximately 30 min).

After completion of the filler tasks, participants were presented with the scrambled sentence task. This task consisted of eight items, comprising six words, five of which could be rearranged to make grammatically correct sentences (Srull & Wyer, 1979). Participants were required to write these sentences on a space provided below the six words. In the fast animal exemplar condition three of the eight sentences contained the animal names associated with fastness (e.g. 'pet, is, greyhound, the, allow, a' becomes 'the greyhound is a pet'). Five neutral sentences were included for embedding so that the activation of slow or fast animals did not become too obvious. Similarly, in the slow animal exemplar condition, three of the eight sentences contained the animal names associated with slowness.

Finally, after all participants had completed the scrambled sentence task, the experimenter introduced the judgment task. Contrary to previous research on category activation effects (e.g. Herr, 1986; Srull & Wyer, 1979; Stapel *et al.*, 1997), in which the person judgment task usually comprises a story describing a person whose behaviour can be interpreted in several ways (e.g. either hostile or friendly), we confronted our participants with a picture of a man whose behaviour could be interpreted as either slow or fast walking. Although stimuli in pictorial tasks are more readily processed and encoded (Johnson, Paivio, & Clark, 1996), we assumed that assimilation or contrast effects may still emerge, depending on the perceived comparability between the animal exemplars and the person target. Accordingly, a picture of a man walking down the street was exhibited on the next page, and participants were requested to evaluate different aspects of the picture by responding to four judgmental questions accompanied by 20-point answer scales. Two of these questions implied either a low (1) or high (20) degree of perceived speed ('How slow or fast is the man in the picture?', 'How much pace does the man in the picture exhibit?'). In addition, the two other questions were unrelated to judgments of speed ('How clearly can you see the man in the picture?', 'How well do you recognize the man in the picture?'). We decided that inclusion of the latter questions would decrease the possibility that participants would become suspicious that we were only interested in the concept of speed. Related and unrelated questions were interspersed with each other.

Table 1. Mean ratings of speed as a function of perceived comparability and type of prime

Perceived comparability	Low	High
Slow animals	10.02	11.87
Fast animals	11.79	10.06

Results and discussion

Participants' mean ratings on the two items concerning judgments of speed of the walking man ($r=.82$, $p<.001$) were subjected to a 2 (comparability: low vs. high) \times 2 (type of animal prime: slow vs. fast) between-participants analysis of variance (ANOVA). The only reliable effect was the two-way interaction between comparability and type of prime, $F(1,102)=7.09$, $p<.01$. This indicates that the type of prime evoked differential judgmental effects in the two (low vs. high) conditions of comparability.² Furthermore, there were no reliable main and interaction effects on the judgments unrelated to speed. Table 1 displays participants' mean ratings of speed.

Planned comparisons showed that participants who believed that animals and humans are comparable judged the moving speed as higher when they were primed with slow animal exemplars and as lower when they were primed with fast animal exemplars, $F(1,102)=4.95$, $p<.03$. This pattern of results indicates a contrast effect. In the low comparability condition, the animal exemplars evoked an assimilation effect, $F(1,102)=4.29$, $p<.05$. Participants primed with slow animal exemplars tended to judge the moving speed of the man lower compared with participants primed with fast animal exemplars.

The results of Expt 1 provided support for our predictions. The judgmental consequences of exemplar priming depended on individual differences as to the perceived comparability between prime and target. A common set of extreme animal exemplars led to a contrast effect in person judgments for participants who perceived the comparability between animals and humans to be high, and to an assimilation effect for participants who perceived the comparability as relatively low. These findings support the assumption that extreme exemplars are readily used as comparison standards (and hence lead to contrastive comparison effects) when these exemplars are perceived to belong to the same category as the target to be judged, and conversely, that exemplars will not be used as comparison standards (and hence lead to assimilative interpretation effects), when the exemplars are perceived to belong to a different category.

EXPERIMENT 2

In Expt 2, we investigate whether the results obtained in Expt 1 can be translated to a different domain. Recent research shows that the activation of traits and stereotypes

²These findings were corroborated in a multiple regression analysis, in which the rating of speed was predicted by the speed conditions, perceived comparability measure, and the speed \times perceived comparability interaction term. In order to reduce multicollinearity bias, all variables were standardized before the cross-product was computed (Dunlap & Kemery, 1987). This analysis showed that the rating of speed was significantly predicted by the interaction term ($\beta = -.24$, $p<.02$), while the main effects of speed and perceived comparability were non-significant (β -speed = $-.03$, ns., and β -perceived comparability = $-.01$, ns.).

not only leads to judgmental assimilation, but also to behavioural assimilation (Bargh, Chen, & Burrows, 1996; Chen & Bargh, 1997; Dijksterhuis & van Knippenberg, 1998; Macrae & Johnston, 1998). For instance, it has been shown that activation of the stereotype of the elderly leads to a slower walking pace, while activation of the stereotype of professors leads to improved performance on a general knowledge test. These effects emerge because the behavioural trait activated by the stereotype is capable of tuning behaviour that one is—for whatever reason—already engaging in. That is, the mere ideation about, or perception of, behaviour (e.g. being slow, being clever) is sufficient to cause one to adjust ongoing behaviours without a consciously expressed fiat or mandate to do so, also known as the *ideo-motor principle* (see also Carpenter, 1874; James, 1890).

Recently, it has also been shown that the activation of exemplars leads to behavioural contrast instead of behavioural assimilation. Priming the 89-year old Dutch Queen Mother led participants to walk faster, while priming Albert Einstein led to deteriorated performance on a general knowledge test (Dijksterhuis *et al.*, 1998). These behavioural effects largely parallel the judgmental effects of construct activation: more abstract traits (and stereotypes) lead to assimilation, while more concrete exemplars lead to contrast. These behavioural contrast effects are also explained by the presence or absence of a comparison process. While priming an abstract stereotype does not lead to a comparison between the primed stereotype and the self (and hence, results in behavioural assimilation), priming a person exemplar does evoke such a comparison and therefore leads to behavioural contrast. In other words, activation of Einstein leads to a comparison between Einstein and the self ('In comparison with Einstein, I'm pretty stupid') and this comparison in turn produces an ideation which tunes our behaviour, and thus leads to behavioural contrast.

The only evidence for person exemplar priming effects on behaviour to date is provided by the study of Dijksterhuis *et al.* (1998; but see also Herr, 1986, for extreme person exemplar priming effects on choices in a prisoner's dilemma game). Therefore, in the present experiment we attempt to extend these findings and investigate whether priming of an animal exemplar also affects overt behaviour, and whether these effects are moderated by perceived comparability. Hence, we used a behavioural measure in addition to a judgmental measure in Expt 2.

In Expt 2, participants were presented with one of two different texts including the animal exemplar primes. These texts were supposedly derived from a scientific article describing either conceptual differences or similarities between (extremely slow or fast) animals and humans on the basis on the most fundamental aspect, i.e. their genetic material. In the current literature, theorists are quite ambivalent about the genetic similarities and differences between animals and human beings, because the genetic material of animals may not be applicable to humans, and therefore, teaches us little if anything about the functioning of human beings (e.g. Harrison, 1994; Medicus, 1992). By adopting this ongoing debate about genetic (dis)similarity, we were able to directly manipulate the perceived comparability by emphasizing that animals and humans belong to different categories (i.e. animals and humans) or to the same category (i.e. animals). In this way, we hoped to either discourage or encourage participants to use the extreme animal exemplars as a standard of comparison, and thus to prevent or facilitate a comparison process (cf. Stapel & Winkielman, 1998).

Method

Participants and design

A sample group of 165 Dutch undergraduate students from various departments and disciplines participated in the experiment, each received 5 Dutch Guilders in return. They were randomly assigned to the cells of a 2 (comparability: low vs. high) \times 2 (type of animal prime: slow vs. fast) between-participants factorial design.

Experimental task and procedure

On arrival at the laboratory, participants were placed in separate cubicles. The experiment was run on computers. Participants learned that they would take part in research conducted by the Department of Psychology, and that the computer program provided all the instructions. Moreover, they were told that the study consisted of separate tasks, designed by different research teams in the department. In reality, the first task served as the manipulation phase for the perceived comparability (low vs. high) and type of animal prime (slow vs. fast) while the second task was designed to study the effects of these two factors on the speed estimates of the walking man and on the walking speed of the participants themselves.

Manipulation of perceived comparability

The first task was introduced as a study on the content and readability of research in scientific journals. First, participants were told that a team of science writers would like to gain more information concerning students' opinions about research in scientific journals. Furthermore, they were told that the team was currently working on a very important review of the work of a group of experimental biologists interested in genetics. This research had recently been published in a prominent scientific journal. To keep up this cover story, participants were told that an abstract of this article would be presented on the computer screen. They were requested to read this abstract carefully and to answer some questions afterwards. The abstract focused on fundamental research in experimental biology, regarding the genetic material of animals and humans.

In the *low comparability* condition, participants read that there are hardly any similarities between animals and humans concerning their genetic material, and hence, that animals cannot be compared with humans. Furthermore, it was stressed that recent results of a series of experiments on (the names of either three slow or three fast animal exemplars were listed here) supported this important claim. The abstract concluded with the assertion that (the names of either three slow or three fast animal exemplars were again given here) belong to the category of animals, and we belong to the category of humans.

In the *high comparability* condition, participants read that there are many similarities between animals and humans concerning their genetic material, and hence, that animals can easily be compared with humans. As in the low comparability condition, it was stressed that recent results of a series of experiments on (the names of either three slow or three fast animal exemplars were listed here) supported this important claim. However, unlike the low comparability condition, the abstract concluded with the assertion that we belong to the same category as (the names of either three slow or three fast animal exemplars were listed here), namely the category of animals.

The names of the three slow (or fast) animals used in the previous experiment were again used in this experiment.

After the reading task, participants responded to the following two questions: 'How plausible are the results of the presented research?', 'How familiar are you with the presented research?'. The first item served as a check on the perceived plausibility of the abstract, while the last item captured the participants' knowledgeability about the research. Both items were accompanied by unipolar 10-point answer scales ranging from 'not at all' (1) to 'very much' (10).

Behavioural measure of speed

The two questions were followed by a short unrelated task in which we unobtrusively assessed our behavioural measure of walking speed. For this task participants were requested to leave their cubicle in order to collect an envelope containing instructions for a task that had to be performed later in the experiment. The envelope was placed on a table 5 metres away from the computer in the cubicle. All participants were instructed to press the 'enter' button, to collect

the envelope and to return to their cubicle. Upon re-entering the cubicle, they were requested to press the 'enter' button again in order to proceed with the experiment. The computer measured the time (in seconds) that had elapsed between the two times the 'enter' button was pressed (that is, between the moment the participant left the computer and the moment he or she proceeded with the experiment back at the computer). Pilot tests showed that completion of this task required at most 30 seconds. Hence, the computer program allowed a time limit of 30 seconds for the completion of the 'walking task'.

Estimation measure of speed

After completion of the walking task, participants completed the judgment task. The same picture as that used in the previous experiment was presented on the screen, accompanied by three questions. The first two questions were unrelated to judgment of speed, while a third question asked for an estimate of the moving speed of the man. Unlike the previous experiment, in which we assessed perceptions of speed on rating scales, we now simply asked participants to estimate the speed of the walking man in km/h. This estimation measure served as the dependent variable.

At the end of the experimental session, participants responded to two Likert-type disagree-agree opinion statements (accompanied by a 10-point scale). These statements assessed the perceived comparability between humans and animals (see Expt 1). These two items served as checks on the manipulation of perceived comparability.

After participants had answered all questions they were debriefed, thanked and paid. Due to a computer program error, one participant did not read the text (and thus was not exposed to the perceived comparability and animal exemplar manipulations). This participant was excluded from further analyses. Furthermore, the debriefing indicated that participants were unaware of the hypotheses under investigation. None of the participants indicated suspicion as to the actual relation between the tasks.

Results and discussion

Manipulation checks

First it was checked whether there were any differences between conditions regarding the perceived plausibility of, and knowledgeability of, the animal research presented in the abstract. Participants in all conditions believed to the same extent that the presented research on animals made sense ($M=7.43$, $SD=1.72$), as was indicated by non-significant effects of comparability, type of animal prime, and the interaction between them. Furthermore, there were no significant differences between conditions with respect to participants' knowledgeability of the research ($M=2.30$, $SD=1.65$). Taken together, then, the pattern of means indicates that all participants were relatively unfamiliar with the presented research and perceived the results of the research as highly plausible, regardless of the manipulations of comparability and the type of animal primes.

Furthermore, to check whether we succeeded in creating a relatively low and high level of perceived comparability between animals and humans, we averaged the responses to the two items that were measured after the estimation task ($r=.54$, $p<.001$). Subsequently, this measure (representing the extent to which animals and humans were perceived to be comparable) was subjected to an analysis of variance (ANOVA). The analysis revealed only a significant main effect of comparability, $F(1,160)=5.08$, $p<.03$. Participants in the high comparability condition agreed more strongly with statements that animals and humans are comparable ($M=6.58$) than those in the low comparability condition ($M=6.03$).

Estimation measure of speed

Participants' estimations of speed (in km/h) were subjected to a 2 (comparability: low vs. high) \times 2 (type of animal prime: slow vs. fast) between-participants analysis of

Table 2. Mean estimation of speed (km/h) and walking speed (seconds) as a function of perceived comparability and type of prime

Dependent measure	Estimation of speed	Walking speed
Perceived comparability low		
Slow animals	5.58	17.10
Fast animals	6.41	15.40
Perceived comparability high		
Slow animals	7.46	15.05
Fast animals	5.73	17.02

variance (ANOVA). The analysis revealed the predicted two-way interaction between comparability and type of prime, $F(1,160)=7.54$, $p<.01$. No other significant effects were found. Furthermore, there were no reliable main and interaction effects on the judgments unrelated to speed. Table 2 shows participants' mean estimations of speed.

The pattern of means supported our expectations. Planned comparisons revealed that the estimation of speed in the high comparability condition was higher when slow animal exemplars were primed and lower when fast animal exemplars were primed, $F(1,160)=4.68$, $p<.05$. This pattern of results indicates a contrast effect. In the low comparability condition the type of animal exemplars evoked an assimilation effect, $f(1,160)=6.07$, $p<.02$: Participants' estimations of speed were lower when slow animals were primed and higher when fast animals were primed. This pattern of results replicates the results obtained in Expt 1.

Behavioural measure of speed

The behavioural measure of speed consisted of the time (in seconds) that participants needed to complete the walking task. All participants completed the walking task within the time-limit (30 seconds). The walking speed was subjected to a 2 (comparability: low vs. high) \times 2 (type of animal prime: slow vs. fast) between-participants analysis of variance (ANOVA). The analysis yielded a significant two-way interaction between comparability and type of prime, $F(1,160)=4.58$, $p<.04$. No other significant main effects were found. The significant interaction indicates that the type of prime evoked differential effects in the two (low vs. high) comparability conditions. Table 2 shows participants' mean walking speed.

As can be seen in Table 2, the pattern of means resembles the previously reported effects on the estimation measure. In the high comparability condition, participants walked faster when they were primed with slow animal exemplars than when they were primed with fast animal exemplars, $F(1,160)=2.93$, $p<.09$. This pattern of results reflects a behavioural contrast effect. In the low comparability condition, the type of animal exemplars tended to evoke a behavioural assimilation effect, $F(1,160)=3.28$, $p<.08$. Participants primed with slow animal exemplars walked slower than participants primed with fast animal exemplars.

GENERAL DISCUSSION

The present research extends earlier studies emphasizing the importance of comparison processes for the emergence of contrast and assimilation effects after the

mere activation of extreme exemplars. Previous research showed that the priming of person exemplars representing extreme friendliness (e.g. Lady Diana, Princess of Wales) leads to a contrast effect, while non-person exemplars representing this trait (e.g. dolphin) cause assimilation effects in person judgments (e.g. Stapel & Koomen, 1997; Stapel *et al.*, 1997). That is, when an extreme exemplar is comparison relevant for target judgments, contrast emerged, but when an extreme exemplar is not seemingly comparison relevant, assimilation effects were established. Accordingly, it is assumed that the differential effects of category activation (contrast or assimilation) are the result of different processes (the presence or absence of a comparison). Of course, it makes sense that, for person judgments, extreme person exemplars are more likely to function as a comparison standard than non-person exemplars. We probably do more readily compare Donald with Lady Diana than with a dolphin when evaluating his friendliness.

The research presented here, however, investigated category activation effects in person judgment after priming animal (i.e. non-person) exemplars, and demonstrated that the emergence of contrast and assimilation is a function of the perceived comparability between animals and humans. Our results resemble recent findings by Stapel and Winkielman (1998), who tested the effects of animal exemplar activation (an ape called Ralph, who behaved in either a friendly or hostile manner) on person judgment as a function of exemplar–target similarity. It should be noted, however, that in the present studies the extreme exemplars did not require additional efforts to render them distinct as a comparison standard (e.g. by explicitly requesting participants to evaluate the exemplar first). As have been argued before, extreme exemplars are likely to lead to high accessibility of a distinct representation that invites a comparison process when requested to evaluate a person target (see also Wyer & Srull, 1989). However, whether the extreme exemplar is used as a comparison standard should depend on whether the exemplar and the person to be judged are subjectively believed to be comparable. In the case of a low perceived comparability, the trait (e.g. high-speed moving) activated by the exemplars (e.g. cheetah) can be used to interpret the behaviour of an ambiguous target (e.g. a person's walking speed) in the encoding stage. This especially pertains to situations in which the activated trait that typify the exemplar is extreme (see Moskowitz & Skurnik, 1999), as was the case in the present series of studies. However, when the perceived comparability between the extreme exemplar and target is high, the assimilative interpretation effects are overruled by a contrastive comparison judgment. Thus, it is the presence or absence of the *perceived comparability* that provide individuals with a comparison standard or not, leading to contrastive comparison or assimilative interpretation effects, respectively.

As has been maintained previously, we believe that individuals differ in the extent to which they believe that humans and animals (and perhaps even other non-person exemplars, such as computers, or cars) share conceptually-based similarities and can be compared, and this is because of differences in personal experiences with the domain of interest, or because of specific situations that either encourage or discourage people to use exemplars as a comparison standard (for a review of differences in similarity and comparability judgments as a function of person and situational factors, see Goldstone, 1994). Therefore, whether exemplar priming leads to contrast or assimilation in person judgments is in the eye of the beholder. Following this line of reasoning, in Expt 1 the moderating effects of perceived comparability were established by using the variance between individuals as to the perceived comparability between animals and humans. In Expt 2 these effects were replicated by

experimentally varying the perceived comparability between animals and humans before participants made person judgments. So, when asked to evaluate the friendliness of Donald we may be more inclined to compare him with a dolphin when we work with these extremely amiable animals on a daily basis, or when we have just finished the seminal work on the origin of species by Darwin (1859).

In addition to demonstrating effects of exemplar activation on judgments, we also obtained evidence for effects of exemplar activation on behaviour. These findings resembled the effects on the target judgments, and are important for two reasons. First, they bolster the current evidence that effects of accessible information (e.g. traits, stereotypes, exemplars) on behaviour are (largely) comparable with the effects of accessible information on judgments. This is important as it indicates that the well-documented processes in the social judgment domain can be successfully applied to predict the effects of accessible information on behaviour. Second, the current investigation is the first to provide evidence for the moderating role of perceived comparability in effects of (non-person) animal exemplars on behaviour (but see Dijksterhuis *et al.*, 1998). As the present data showed, when the animal exemplars were not used as comparison standards, behavioural assimilation became apparent. When requested to perform a self-pacing task, the relevant behavioural trait (and corresponding action representation) introduced by the extreme exemplar (e.g. high-speed moving) establishes a passive effect on subsequent action. However, when the animal exemplars were used as comparison standards (i.e. when they were seen as comparable), these exemplars led to contrast, while activation of fast animals led to a lower walking speed than activation of slow exemplars. This behavioural contrast effect is presumed to occur because of a comparison between the exemplars and the self upon the perception of the exemplars (e.g. 'In comparison to the cheetah, I move quite slowly') an event which is believed to be a rather automatic and spontaneous effect (e.g. Dijksterhuis *et al.*, 1998; Gilbert, Giesler, & Morris, 1995). In this case, the comparison reveals its effect as the action representation ideated from the comparison process (e.g. 'I move quite slowly') directs subsequent tuning of self-pacing action.

Of particular interest here is the study conducted by Macrae and colleagues (Macrae, Bodenhausen *et al.*, 1998, Study 4). They primed their participants with an extremely fast person exemplar (Michael Schumacher, a Formula-One racing driver), and established behavioural assimilation effects on a self-pacing task. At first sight, this may appear surprising. After all, the exemplar is a person, and hence, provokes a comparison with the self. Therefore, a contrast effect rather than an assimilation effect was to be expected. However, it should be noted that Macrae *et al.* used the speed of reading a piece of text as their dependent variable. Assuming that the exemplar was used as a standard of comparison, it may therefore be that the comparison process resulted in an ideation that did not 'match' the content of the dependent variable (cf. the concept of dimensional relevance, Schwarz & Bless, 1992; Stapel & Winkielman, 1998). That is, the behavioural representation instantiated by the comparison process ('I am a slow car-driver') is incompatible with the representation that guides the subsequent action (reading a piece of text). Since the abstract trait of high speed is still activated by the exemplar (after all, a Formula-One car driver is very fast), it can exert an overall assimilative effect on behaviour in which a self-pacing activity is involved (cf. the behavioural assimilation effect of trait priming; e.g. Bargh *et al.*, 1996; Dijksterhuis & van Knippenberg, 1998). In the present research (and in the Dijksterhuis *et al.* studies), however, the cognitive product of the comparison between the exemplar and the self, and the task assessing the behavioural effects comprised more or less the same

action representation (e.g. moving speed during locomotion), resulting in behavioural contrast rather than assimilation effects. Thus, Macrae's participants were actually behaviourally ready to drive slowly, and had we asked them to drive a car they might have exhibited the behavioural contrast effect as well. Since this line of reasoning is highly speculative, scrutinizing behavioural contrast and assimilation effects of exemplar priming as a function of comparison processes in terms of compatibility of action representations may therefore constitute a fruitful avenue for further exploration.

To recap, the present research focused on the moderating role of perceived comparability between category prime and target in contrast and assimilation effects on person judgments and behaviour. We have demonstrated that the same category of extreme exemplars can produce contrast as well as assimilation effects in target judgments and in behaviour, depending on whether the exemplar and target are perceived as comparable. We also showed that people differ in their habitual tendency to compare people (including themselves) with other (non)person exemplars. In addition, some situations more readily instigate people to use exemplars as a comparison standard (and hence, evoke a comparison process) than other situations (e.g. Gibbons & Buunk, 1999; Gilbert *et al.*, 1995). In our view, investigating differences in habitual or chronic tendencies to compare, and situations that encourage or discourage comparison (and their possible interplay) is important, as it may shed more light on the question when and how exemplar category activation determines how we think about others as well as ourselves. Moreover, it may not only shed light on how we think about ourselves, but also on what we do.

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