resources: Does self–control resemble a muscle? *Psychological Bulletin, 126,* 247–259.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self–control as limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology, 74,* 774–789.

Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology, 79,* 410–424.

Rosenthal, R. (1994). Interpersonal expectancy effects. *Current Directions in Psychological Science, 3,* 176 – 179.

Tice, D. M., Bratslavsky, E., & Baumeister, R. F. (2001) Emotional distress regulation takes precedence over impulse control: If you feel bad, do it! *Journal of Personality and Social Psychology, 53,* 5–13.

Webb, T. L., & Sheeran, P. (in press). Can implementation intentions help to overcome ego–depletion? *Journal of Experimental Social Psychology.*

Wegner, D. M., Erber, R., & Zanakos, S. (1993). Ironic processes in the mental control of mood and mood related thought. *Journal of Personality and Social Psychology, 65,* 1093–1107.

Social Cognition, Vol. 20, No. 6, 2002, pp. 461-481

# SYRIAN SCIENCE AND SMART SUPERMODELS: ON THE WHEN AND HOW OF PERCEPTION–BEHAVIOR EFFECTS

Geoffrey Haddock
*Cardiff University*

C. Neil Macrae
*Dartmouth College*

Steven Fleck
*University of Sheffield*

Although research has revealed that the activation of a social category can influence subsequent behavior, a number of unresolved issues remain. In Experiment 1, we investigated whether people's ability to learn new information would be influenced by accessible knowledge representations. Extending previous research, we predicted that behavior would differ as a function of the type and direction of primed information. The results supported the hypothesis: Test performance on a previously unfamiliar topic was enhanced when individuals had previously thought about either a category associated with intelligence or an exemplar from a category associated with unintelligence. In Experiment 2, we investigated whether a common set of priming stimuli can produce both assimilation and contrast effects. Based on Mussweiler's (in press) Selective Accessibility Model, we predicted that having participants focus on the similarities among a set of supermodels would elicit behavioral assimilation, whereas a dissimilarity focus would elicit behavioral contrast. The results supported the hypothesis: Participants behaved unintelligently under a similarity focus and intelligently under a dissimilarity focus. The implications of the findings for perception–behavior effects and the Selective Accessibility Model are discussed.

We wish to thank Jim Uleman, Thomas Mussweiler, and anonymous reviewers for their helpful comments on an earlier version of this paper.

Correspondence should be sent to Geoff Haddock, School of Psychology, P. O. Box 901, Cardiff, CF10 3YG, United Kingdom. E-mail: HaddockGG@cardiff.ac.uk

How perception affects behavior has long been a focal point of psychological research. Over a century ago, William James (1890) observed that when individuals perceive an object their actions are influenced by the contents of the activated knowledge representation. Confirming James' insight, contemporary research has demonstrated that the activation of knowledge structures influences behavior in a number of intriguing ways (e.g., Bargh, Chen, & Burrows, 1996; Dijksterhuis, & van Knippenberg, 1998; Dijksterhuis et al., 1998; see Dijksterhuis & Bargh, 2001, for a review). In perhaps the most elegant demonstration of the link between perception and action, Bargh et al. (1996) found that priming the stereotype of the elderly led participants to decrease their walking speed. Extending this work into the realm of cognitive responses, Dijksterhuis and van Knippenberg (1998) showed that performance on a general knowledge task (i.e., responses to Trivial Pursuit® questions) was enhanced when participants were primed with university professors, a group that is renown for its intellectual prowess.

A common feature of the aforementioned studies is that they showed priming to influence behavior in an assimilative fashion. That is, behavior moved in the direction of the contents of the activated knowledge structure. One explanation that is offered for this effect is based on the common coding of perceptual and behavioral representations (Berkowitz, 1984; Prinz, 1990). Dijksterhuis and van Knippenberg (1998) adopted this approach in their attempt to elucidate how exactly it is that priming stereotypes can influence complex cognitive behavior, such as people's performance on a general knowledge test. They argued that the activation of a stereotype leads to an unfolding of hierarchically structured events. Priming activates a trait relevant to the stereotype (e.g., intelligence), which in turn activates behavioral representations that are associated with the trait in question. These behavioral representations include typical category–related behaviors, so when the primed person is in a situation in which these behavioral responses are applicable, he or she is likely to behave in a manner consistent with the implications of the activated stereotype.

As a follow–up to their original set of studies, Dijksterhuis et al. (1998) examined whether there are circumstances in which behavioral contrast, rather than assimilation, might be expected to



emerge. For example, when primed with the concept of intelligence, is it possible to identify settings in which people's performance actually deteriorates? Contrast effects have been observed regularly within the social judgment domain (see e.g., Herr, 1986; Mussweiler, in press; Schwarz & Bless, 1992; Stapel & Koomen, 2001a, 2001b for reviews), thus it was reasonable to surmise that they may also extend to the elicitation of automatic action. In one study testing this proposal, participants were primed with either professors, Albert Einstein, supermodels, or Claudia Schiffer. Dijksterhuis et al. (1998) expected category priming to produce behavioral assimilation, such that participants primed with professors were expected to outperform (on a Trivial Pursuit® task) participants primed with supermodels. At the exemplar level, however, the reverse was expected to occur, such that participants primed with Claudia Schiffer were expected to outperform their counterparts who were primed with Albert Einstein. The results supported these predictions.

The experiments described in this paper were intended to build upon previous research on the perception–behavior link by asking important and unanswered questions regarding behavioral assimilation and contrast. In Experiment 1, we investigated whether intelligent or unintelligent behavior would occur when individuals were presented with information about an unfamiliar topic. That is, will people who had been thinking about categories or individuals associated with (un)intelligence differ in their ability to learn new information? In Experiment 2, we investigated whether the same priming stimuli can elicit *both* behavioral assimilation and contrast. That is, can priming individuals with a group of supermodels make them behave either intelligently or unintelligently?

## EXPERIMENT 1: HOW MUCH DO YOU KNOW ABOUT SCIENCE FUNDING IN SYRIA?

The method employed in the studies by Dijksterhuis and colleagues to measure intelligent behavior has been to assess participants' performance on Trivial Pursuit® questions. The rationale behind this strategy is that people tend to perform suboptimally on these tasks, leaving room for enhancement (or deterioration) in behavior. It is thought that the increase in performance occurs be-

cause the activation of intelligence leads individuals to behave more intelligently on the task, for example by using more intelligent strategies when answering the questions, or concentrating effectively on the task (see Dijksterhuis & Marchand, 2000). At the same time, however, the process mediating the intelligent behavior effect is still somewhat unclear. As Dijksterhuis and van Knippenberg (1998) pointed out, it is certainly not the case that participants became more knowledgeable after having been primed with professors. Dijksterhuis and van Knippenberg also rejected knowledge activation explanations, most notably that of spreading activation. It is not inconceivable, however, that some kind of retrieval facilitation or a stronger feeling of knowing (as discussed by Dijksterhuis & van Knippenberg, 1998) can account for performance differences, as the Trivial Pursuit® items have some level of familiarity among respondents.

In any case, it would be useful if the difficulties associated with the recall of familiar knowledge from memory could be removed from the interpretation of behavioral priming effects. Accordingly, Experiment 1 used a different strategy to assess knowledge effects: Specifically, the amount of new information people learn from reading a passage about an unfamiliar topic. If participants primed with the category professors (or a supermodel exemplar) perform better than others on a task designed to measure retained knowledge of novel information, one can be more confident that previous demonstrations of the Trivial Pursuit® effect are not simply due to enhanced retrieval of pre-existing knowledge. If, as expected, findings are robust, the effects obtained by Dijksterhuis et al. (1998) should be replicated. Thus, consistent with Dijksterhuis et al. (1998), it was hypothesized that people primed with professors would learn new information more effectively than participants primed with supermodels, whereas participants primed with Claudia Schiffer would outperform those primed with Albert Einstein.

## METHOD

### Pilot Studies

A first pilot study investigated whether the categories and exemplars used by Dijksterhuis et al. (1998) were associated with the same stereotypes among a UK undergraduate population. A



questionnaire was given to 12 students who rated professors, supermodels, Albert Einstein and Claudia Schiffer on a number of 7-point Likert scales (e.g., 1 = unintelligent, 7 = intelligent). Intelligence was mixed with other positive and negative traits taken from Anderson (1968). Professors ($M$ = 5.8) were seen as more intelligent than supermodels ($M$ = 3.0), $t$ (11) = 8.4, $p$ < .0001. The same pattern was found for Einstein ($M$ = 6.5) and Claudia Schiffer ($M$ = 3.2), $t$ (11) = 6.7, $p$ < .0001. Thus, the pilot study found the categories and exemplars to be associated with the same traits as those used by Dijksterhuis et al. (1998).[1]

Next, an appropriate passage was required, as well as questions based on its content. One prerequisite of the passage was that it dealt with a topic about which participants would be unfamiliar. The passage selected was an article from the *New Scientist* about science funding in Syria (Sardar, 1980). We developed 30 questions based on the article's content. Twenty individuals then participated in a second pilot study in which they read the passage before answering the 30 questions and indicating their prior familiarity with the topic (1 = not at all familiar, 9 = very familiar). Of the 30 questions presented, those that were answered correctly by roughly half of the participants were retained for the main study. This selection criterion resulted in the use of 14 questions. The mean familiarity rating was 1.2, indicating that this was indeed a topic about which our participants were unfamiliar.

### Main Study

*Participants and Design.* Forty-eight participants (17 males, 31 females, mean age = 19.2 years) were randomly assigned to one of four cells in a 2 (direction of prime: intelligent vs. unintelligent) × 2 (target: category vs. exemplar) between-subjects design. There were no gender effects, thus the data were collapsed across this factor.

*Materials and Procedure.* As the session started, participants were first asked to complete a quick pilot study on social perception (ostensibly for another researcher). This pilot study actually

1. Similar to Dijksterhuis et al. (1998), we are in no way asserting that supermodels or Claudia Schiffer are unintelligent. Among our participants, there was simply a *perception* linking that particular trait to both the exemplar and the category.

served as the priming manipulation, and was the same as that employed by Dijksterhuis et al. (1998). Participants spent five minutes listing the typical life–style, behavior, appearance, and attributes of the target. The pilot study materials were deliberately designed to appear different from the other materials used in the experiment. Furthermore, the priming materials and the materials for the knowledge acquisition task were kept in separate envelopes, and care was taken to ensure that the participants saw the two ostensibly different studies as coming from different envelopes.

After the completion of the priming task, the experimenter thanked the participant and indicated that the "real" study was about to begin. Participants were told that the study was investigating the difference between newspaper and magazine articles, and that they would be given one article to read. They were told to spend as much time as they needed to read the article. After having read the target article, participants were given a questionnaire containing the 14 questions about its contents.

Upon completing the questionnaire, participants were debriefed and asked to answer a couple of questions. The first question inquired for whom the pilot study had been conducted. All participants stated that it had been for another researcher. Next, they were asked whether they perceived any connection between the two studies. No participant drew a direct link between the two parts of the experimental session.

## RESULTS

Each participant's total number of correct answers was subjected to a 2 (direction of prime: intelligent vs. unintelligent) × 2 (target: category vs. exemplar) between–subjects ANOVA. Following the results of Dijksterhuis et al. (1998), it was predicted that the only reliable effect would be the two–way interaction. This prediction was confirmed, $F(1, 44) = 15.00$, $p < .0001$. As can be seen in Figure 1, participants primed with Professors ($M$ = 69% correct) performed significantly better than those primed with Supermodels ($M$ = 44% correct), $t(22) = 3.55$, $p < .001$. Conversely, among participants in the exemplar conditions, those primed with Claudia



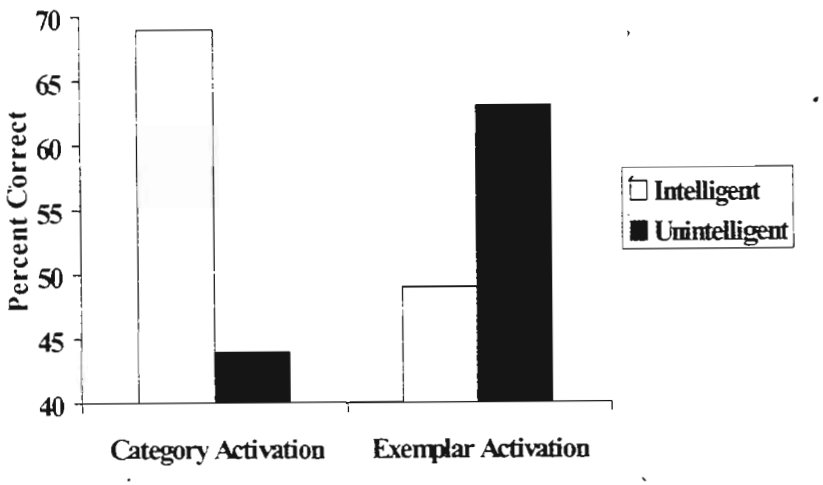


FIGURE 1. Experiment 1: The Impact of Direction of Prime and Target Level on Responses to Trivial Pursuit® Questions

Schiffer ($M$ = 63% correct) performed significantly better than those primed with Einstein ($M$ = 49% correct), $t(22) = 2.22$, $p < .01$.[2]

## DISCUSSION

Previous tests of the perception–behavior link in the domain of intellectual behavior were concerned with information that was, at some level, already accessible in memory. Rather than having participants answer questions about information that was already part of their "individual repertoire" (Dijksterhuis & van Knippenberg, 1998, p. 874), Experiment 1 asked whether the abil-

2. We also analyzed the speed with which participants read the article. These times were subjected to a 2 (direction of prime: intelligent vs. unintelligent) × 2 (target: category vs. exemplar) between-subjects ANOVA. The only reliable effect was the interaction, $F(1, 43) = 6.60$, $p < .01$. The mean reading time of participants in the professor condition ($M$ = 323 s) was significantly faster than the reading speed of those in the supermodel condition ($M$ = 407 s), $t(22) = 1.79$, $p < .05$. Among participants primed with exemplars, those primed with Einstein ($M$ = 389 s) read significantly slower than those primed with Claudia Schiffer ($M$ = 329 s), $t(21) = 2.06$, $p < .05$. Thus, the groups that performed best on the knowledge task took the shortest amount of time to read the passage.

ity to process and retrieve novel information would be influenced by the direction and target of activated knowledge. To the extent that the perception–behavior link is robust, it was predicted that individuals primed with the category professor or a supermodel exemplar would show enhanced behavioral performance when compared with individuals primed with the professor exemplar or supermodel category. The results supported this hypothesis.

There are important implications resulting from the observation that perception–behavior links are found when individuals are faced with previously unfamiliar information. Everyday, we are required to deal with different types of novel information. When presented with such a challenge, we encounter the daunting task of how best to proceed. How we confront such a challenge will play a large role in determining the degree of success through which we navigate our social world. The results of Experiment 1 suggest that relatively simple strategies, such as activating a particular concept, can improve the likelihood of remembering information that has been encountered.

Having demonstrated that the perception–behavior link in the domain of (un)intelligent behavior is not constrained by one's prior familiarity with the critical information, we turn our attention to another issue key to behavioral priming. In almost all previous studies (as well as Experiment 1 of this paper), different stimuli have been used to elicit either behavioral assimilation or contrast. Specifically, categorical stimuli have usually been adopted to elicit behavioral assimilation, whereas exemplars have usually been adopted to elicit behavioral contrast. In Experiment 2, we considered whether the presentation of multiple exemplars from a single category can produce both behavioral assimilation and contrast.

## EXPERIMENT 2: CAN THINKING ABOUT A GROUP OF SUPERMODELSMAKE YOU SMART OR DUMB?

Research by Dijksterhuis et al. (1998) provided initial evidence of behavioral assimilation and contrast. In subsequent work, Dijksterhuis, Spears, and Lépinasse (2001) sought to identify the processes that mediate the generation of behavioral assimilation and contrast. One variable that they speculated may be important was the nature of the target of perception; specifically, whether



participants were presented with multiple exemplars or a single exemplar from a category. Dijksterhuis et al. (2001) argued that when participants are presented with multiple exemplars, individuals would base their impressions on features shared by all the exemplars (i.e., stereotypic attributes), a process that should give rise to behavioral assimilation. However, when presented with a single exemplar, it is sensible (and easy) for them to compare themselves with the exemplar. In the context of behavioral priming, this should elicit a contrast effect. To test this prediction, Dijksterhuis et al. (2001; Study 1) had participants form an impression on the basis of 20 descriptive statements. For some participants, the statements referred to five different elderly individuals (i.e., four statements for each target). For other participants, the same statements referred to a single elderly exemplar. After finishing the impression formation phase of the study, participants completed a lexical decision task. As the elderly are associated with slowness (Bargh et al., 1996), Dijksterhuis et al. (2001) predicted that forming an impression of five elderly persons would impair lexical decision times (assimilation), whereas forming an impression of one elderly person would facilitate these same responses (contrast). The results supported this prediction.

But is it the case that behavioral elicitation is rigidly and inflexibly tied to the number of exemplars that are activated in memory? Are assimilation and contrast effects always prompted by the activation of multiple and single exemplars, respectively? We think this is unlikely for a number of reasons. Behavioral elicitation is a flexible affair that is shaped by a variety of endogenous and exogenous forces (Macrae & Johnston, 1998; Norman & Shallice, 1986). What may be more important than the actual mental representations that are activated in memory are the cognitive operations or decision processes that are undertaken on these entities. We believe that, depending on the decision processes that are implemented, multiple exemplars may give rise to *both* assimilation and contrast effects. In their research, Dijksterhuis et al. (2001) asked participants in the multiple exemplar condition to "form an impression of this group of people." Presumably, this instruction was used to make participants consider the similarity of the targets. However, what would have happened if participants had been instructed to consider how the targets differ from one other? In this

condition, would participants have been likely to think of the multiple exemplars as unique individuals, hence promoting the generation of a contrast effect? If this was indeed the case, it would imply that the presentation of multiple exemplars can produce diametrically opposite effects on behavior depending on how the information about the individual exemplars is processed by perceivers.

Research in the social judgment literature is consistent with the idea that different processing mindsets can elicit opposite judgmental effects. For example, work by Stapel and colleagues (e.g., Stapel & Koomen, 2001b; Stapel, Koomen, & van der Plight, 1997; Stapel & Spears, 1996; see Stapel & Koomen, 2001a for a review) has addressed how a number of variables, such as interpretative or comparative mindsets, can elicit judgmental assimilation or contrast. According to their interpretation/comparison model, the activation of an interpretative mindset leads to accessible information being used to construct a representation of the target, leading to assimilation. Conversely, when a comparative mindset is activated, accessible information is used to construct a comparative standard, producing contrast. In one such demonstration, Stapel and Koomen (2001b; Experiment 3) first primed participants at either the trait or exemplar level. Upon completing a filler task, participants were further primed with either an interpretation or comparison mindset. Upon completing a second filler task, participants then completed a person judgment task in which they evaluated an ambiguous behavior. The results of this study revealed that assimilation occurred under an interpretation mindset, while contrast occurred under a comparison mindset. Furthermore, these effects were produced in both the trait and person exemplar knowledge conditions, leading Stapel and Koomen (2001b, p. 145) to suggest that "interpretation versus comparison mindsets may navigate the direction of knowledge accessibility effects across a variety of priming stimuli."

Of perhaps even greater relevance to our own research is work that has directly considered how a similarity versus difference focus can elicit opposite judgmental effects. In his Selective Accessibility Model (SAM), Mussweiler (2001a, 2001b, in press) argues that the occurrence of judgmental assimilation or contrast is dependent upon whether individuals focus on similarities versus differences within the activated information. The model states



that when individuals engage in similarity testing (the default strategy), this processing mindset produces selective accessibility of standard–consistent target knowledge, which is postulated to evoke evaluative assimilation. Conversely, when individuals engage in dissimilarity testing, this processing mindset produces selective accessibility of standard–inconsistent target knowledge, which is postulated to evoke evaluative contrast. In one study testing the SAM, Mussweiler (2001b) first presented participants with sketches of two scenes. Some participants listed similarities between the two scenes, whereas other participants listed differences. After completing this task, participants read a description about a student who had experienced an easy (or difficult) time adjusting to college, prior to reporting their own adjustment. Consistent with the SAM, a similarity processing mindset elicited judgmental assimilation, whereas a dissimilarity mindset elicited judgmental contrast.

Experiment 2 incorporated previous research on processing goals and the Selective Accessibility Mechanism to test whether the presentation of the same priming stimuli can produce both behavioral assimilation and contrast. In a within–subject, single–factor design, participants were shown three sets of photographs. One set of stimuli comprised pictures of four supermodels. Participants indicated how the persons depicted in the photographs were similar to each other (i.e., the similarity–focus processing condition). A second set of stimuli comprised pictures of four other supermodels. Participants indicated how the persons depicted in this set of pictures differed from one another (i.e., the difference–focus processing condition). A third set of stimuli comprised pictures of four different flowers, which participants also described (i.e., the control condition). Immediately after describing each individual set of photographs, participants completed a series of questions from the game Trivial Pursuit®. Consistent with the SAM, it was predicted that performance on the Trivial Pursuit® task would differ across conditions, with performance in the difference–focus condition being significantly better than that in the similarity–focus condition, with performance in the control condition falling in between.

## METHOD

### Participants

Thirty undergraduate students (15 females, 15 males, mean age = 21 years) participated in the experiment. Three participants failed to complete the task, leaving 27 participants available for analysis. Gender did not impact the results, thus the data were collapsed across this factor.

### Materials

Three sets of photographs were used. One set included pictures of Kate Moss, Claudia Schiffer, Linda Evangelista, and Naomi Campbell. The second set included pictures of Elizabeth Hurley, Denise Richardson, Tara Banks, and Cindy Crawford. The third set included pictures of four different flowers. Each individual picture was in color, and approximately 6cm wide by 8cm high (2½ inches wide by 3½ inches high). The four pictures within each set were printed on a single sheet of laminated paper.

Thirty–six questions were taken from the game Trivial Pursuit®. For each question, participants were given four responses; their task was to indicate the correct answer. The items were selected on the basis of a pilot study that contained a large pool of items, with the main provision that the selected questions could be answered correctly by approximately 50% of pilot study participants. The 36 items were then grouped into three sets of 12 questions. Among pilot study participants, there were no differences in percentage of correct responses across the sets of questions.

### Procedure

Participants volunteered for an experiment on impression formation. They were told that the experiment was interested in assessing how people describe pictures, and that during the study they would be asked to describe the contents of three sets of pictures. They were then told that because one set of descriptions could influence subsequent responses, a different task would be included between each set of pictures. They were told that this task, which was associated with another researcher, involved answering general knowledge questions.



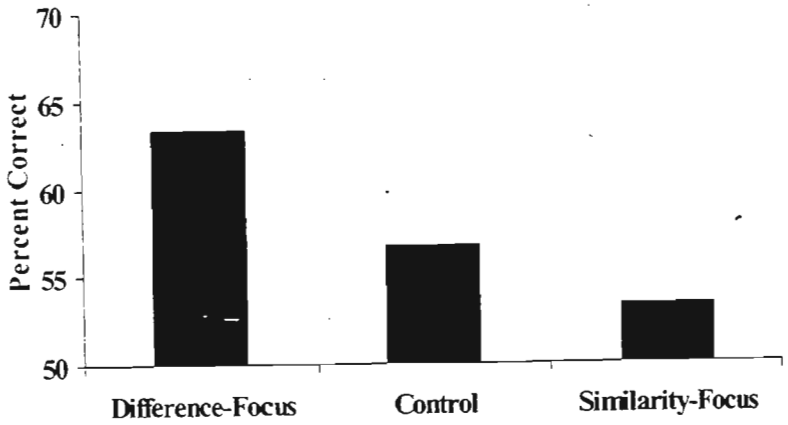


FIGURE 2. Experiment 2: The Impact of Processing Mindset on Responses to Trivial Pursuit® Questions

After the verbal instructions, the experiment commenced. Participants were given a first set of photos.[3] In the *similarity–focus* condition, participants were asked to "describe how the objects in the following set of pictures are similar to each other. That is, describe how they are alike." They were then presented with one of the sets of supermodel pictures and given three minutes to complete the task. On finishing the task, they were given a set of Trivial Pursuit® questions. In the *difference–focus* condition, participants were asked to "describe how the objects in the following set of pictures are different from each other. That is, describe how they are unique." They were presented with the second set of supermodel pictures and given three minutes to complete the task. On finishing the task, they were given a second set of Trivial Pursuit® questions. In the *control* condition, participants were asked to "describe the objects in the following set of pictures." They were presented with the pictures of flowers and given three minutes to complete the task. On

3. The order in which participants completed the three conditions was counterbalanced. Each set of Trivial Pursuit® questions was associated with each condition an equal number of times. The order in which participants were presented with the three conditions did not impact the results, consequently the results are collapsed across this factor.

finishing the task, they were given a third set of Trivial Pursuit® questions. The experiment was over after participants completed the final set of Trivial Pursuit® questions. At this point, participants were debriefed as to the nature of the experiment. No participant expressed suspicion about the nature of the research or detected an association between the tasks.

## RESULTS

### Analysis of Written Descriptions

The descriptions provided in the experimental conditions were compared to establish whether they concentrated on the similarities versus differences among the exemplars. A judge, who was blind with respect to the nature of the research, rated each description in terms of the degree to which it emphasized similarities versus differences (1 = focused mainly on differences; 9 = focused mainly on similarities). An analysis of these ratings revealed that descriptions in the similarity–focus condition ($M$ = 8.1) referred to similarities among the exemplars, whereas descriptions in the difference–focus condition ($M$ = 1.6) referred to differences. These mean ratings were significantly different from each other, $t$ (26) = 22.30, $p < .001$.

### Trivial Pursuit® Performance

The number of correct responses within each condition was subjected to a repeated–measures ANOVA. As expected, the analysis yielded a significant effect, $F$ (2, 25) = 4.56, $p < .05$. The mean percentage of correct responses within each condition is presented in Figure 2. As expected, performance in the difference–focus condition ($M$ = 63% correct) was significantly better than that in the similarity–focus condition ($M$ = 53%), $t$ (26) = 3.07, $p < .01$. There was also a significant difference between performance in the difference–focus ($M$ = 63%) and control conditions ($M$ = 57%), $t$ (26) = 1.94, $p < .03$. The difference between performance in the similarity–focus and control conditions was in the predicted direction, but did not reach significance, $t$ (26) = 1.15, $p < .13$.



## DISCUSSION

Research has revealed that the activation of knowledge structures has a direct impact on behavior (see Dijksterhuis & Bargh, 2001). Furthermore, these effects can influence behavior in either an assimilative or contrastive direction, and recent work has sought to identify the factors that produce behavioral assimilation and contrast. One factor that has been shown to influence the direction of behavioral priming is the nature of the mental representation that is activated. Dijksterhuis et al. (2001) argued that when individuals are presented with a group of individuals from a social category, the resultant impression that is formed of these multiple exemplars focuses on shared features (i.e., stereotypic attributes), leading to behavioral assimilation. Conversely, when individuals form an impression of a single exemplar, they compare themselves against the exemplar in question and behavioral contrast emerges. But are these effects immutable? In particular, do multiple exemplars always prompt the generation of behavioral assimilation?

Based on an application of Mussweiler's (2001a, 2001b, in press) Selective Accessibility Model, the present study considered whether the presentation of multiple exemplars can produce *both* behavioral assimilation and contrast. Consistent with the SAM, when participants described how four supermodels were alike, they subsequently behaved less intelligently than in the control condition. However, when participants described how four supermodels were different, performance was greater than that observed in the control condition. These results are theoretically important as they suggest that the presentation of multiple exemplars does not necessarily lead to assimilation effects (see also Schubert & Häfner, in press, for a similar argument). Rather, what is important in the generation of automatic action is *how* the exemplars are processed by perceivers. In this sense, behavioral elicitation reflects a complex interplay between the structures that are activated in memory and the processing operations that are undertaken by perceivers on these cognitive representations (see also Aarts & Dijksterhuis, 2002; Stapel & Koomen, 2001b).

## GENERAL DISCUSSION

Activated knowledge structures influence behavior, whether it be the speed with which we walk, our willingness to help someone in need, or our inclination to conform to the actions of others. Indeed, even our tendency to engage in intelligent behavior has been shown to differ as a function of the information that is accessible in memory. However, while we know that perception influences action, there are still many unanswered questions regarding how and when these effects occur. In the studies described in this paper, we sought to resolve two important issues that have not been adequately addressed in the literature: whether people's ability to learn new information is influenced by activated knowledge, and whether the same priming stimuli can produce both behavioral assimilation and contrast.

In Experiment 1, we looked to extend previous research by considering whether people's ability to learn novel information would depend upon activated knowledge structures. Consistent with Dijksterhuis et al. (1998), participants were primed with either an exemplar or category associated with either intelligence or unintelligence before reading about an unfamiliar topic. When subsequently tested on the passage, the results revealed that those primed with the intelligent category (professors) or the unintelligent exemplar (Claudia Schiffer) performed significantly better than those primed with the intelligent exemplar (Albert Einstein) or unintelligent category (supermodels). Thus, not only does accessible information influence people's performance on material that is within their repertoire of prior knowledge, it also affects their ability to answer correctly questions about unfamiliar topics.

In Experiment 2, we sought to extend previous research by considering the processes underlying perception–behavior effects. In this study we explored whether the same priming stimuli can elicit both behavioral assimilation and contrast. Specifically, participants were presented with pictures of four supermodels and requested to list how the supermodels were either alike or different. Adapting Mussweiler's (in press) Selective Accessibility Model, it was predicted that a similarity focus would lead to behavioral assimilation, while a dissimilarity focus would lead to behavioral contrast. Our predictions were supported: performance on the Trivial Pursuit® task was significantly better in the difference–focus than the similarity–focus condition.



The results of the current set of studies have a number of important implications. First, the results of Experiment 1 speak to the generality of perception–behavior effects. Previous research that has investigated the determinants of intelligent behavior has emphasized how people respond to questions about knowledge that is already available in memory. In Experiment 1, after having been primed with an exemplar or category associated with either intelligence or unintelligence, participants read a passage about an unfamiliar topic. Having read the passage, they were unexpectedly tested on its contents. Similar to Dijksterhuis et al. (1998), the results revealed that test performance was enhanced among those primed with the intelligent category or exemplar from the unintelligent category. Interestingly, it was found that people who had been primed with professors read the passage more quickly than people who had been primed with supermodels. Conversely, among those activated with an exemplar, those primed with Einstein read the passage more slowly than those primed with Claudia Schiffer. Thus, the groups that performed best on the intellectual performance task required the least amount of time to read the passage. These reading time data are consistent with the recent finding that rendering accessible the stereotype of the category professors leads to greater concentration (Dijksterhuis & Marchand, 2000). Examining the test performance and reading latency data together, it suggests that priming individuals with either an intelligent stereotype or a stupid exemplar does not merely facilitate information retrieval, but leads people to process information both faster and deeper.

The results of the current research also provide new insights in the mechanisms underlying the relation between knowledge accessibility and behavior. In a consideration of the circumstances that produce behavioral assimilation and contrast, Dijksterhuis et al. (2001) suggested that when forming an impression of multiple exemplars, the impression, by default, concentrates on features that are *shared* by the targets (i.e., stereotypic features), which then elicits behavioral assimilation. When, however, individuals fail to form an impression based on shared features, assimilation effects should be eliminated. Instead, thinking about unique qualities of

the activated stimuli should prompt the emergence of contrast effects. As such, the results of Experiment 2 can readily be integrated within Dijksterhuis et al.'s (2001) conceptual framework. In our study, when participants thought about the extent to which a group of supermodels were similar, behavioral assimilation was observed. This changed to a contrast effect however when the task instructions required participants to consider how the exemplars differed. Consistent with this flexible account of behavioral priming are correlations that were observed in Experiment 2 between the content of participants' descriptions of the supermodels and their performance on the Trivial Pursuit® task. When participants were instructed to consider similarities among the supermodels, greater emphasis on similarity led to worse task performance ($r = -.31$, $p < .06$). Along the same lines, when participants were instructed to consider differences among the supermodels, greater emphasis on the exemplars' unique features led to better task performance ($r = -.30$, $p < .06$). Thus, within both experimental conditions, as the processing operations undertaken on exemplars changed, so too did participants' subsequent behavior.

The results of the present study should also be considered in relation to other research that has considered how different processing motives can elicit either assimilation or contrast (see e.g., Moskowitz & Skurnik, 1999; Schubert & Häfner, in press; Stapel & Koomen, 2001b). For instance, at the level of judgments, Stapel and Koomen (2001b) demonstrated that an interpretation mindset elicited judgmental assimilation, whereas a comparison mindset elicited judgmental contrast. This effect was found for both trait and person exemplar primes. At the behavioral level, Schubert and Häfner (in press) demonstrated that the activation of a stereotype elicited either behavioral assimilation or contrast depending upon (a) whether there was an explicit categorization of the target as an out-group or (b) whether the self was activated. Our own research (most notably Experiment 2) provides additional evidence suggesting that the cognitive operations that are undertaken on accessible information might be as important as the information's content in determining the direction of any subsequent effect.

Finally, in addition to their implications for current thinking on the link between perception and behavior, the results of the current research also speak to the flexibility of the Selective Accessibility Model. To the best of our knowledge, previous research testing this model has emphasized judgmental outcomes, such as individuals' self-perceptions, numerical judgments, and categorical judgments (see Mussweiler, in press, for a review). The findings of the present study indicate that the SAM is also applicable to circumstances in which actions result from a similarity versus dissimilarity focus. When asked to consider similarities among multiple exemplars, individuals' subsequent behavior assimilates toward the activated information. However, when asked to consider differences among multiple exemplars, individuals' subsequent behavior contrasts against the activated information.



## CONCLUSION

The present results speak to the flexibility of mental life and the complex nature of behavioral elicitation. Experiment 1 demonstrated that perception can also influence behavior when individuals are faced with novel information, while Experiment 2 showed that a subtle manipulation of participants' processing objective was sufficient to elicit opposite effects on their subsequent behavior. These studies, along with other research and theorizing (e.g., Macrae & Johnston, 1998; Norman & Shallice, 1986), suggest that automatic priming effects are moderated by a variety of internal and external factors, and generalize to a number of situations. That said, let us conclude with a piece of advice. The next time you are a contestant on a lucrative network television show and encounter a group of supermodels, be sure to (a) perceive them as unique individuals and (b) take a chance on unfamiliar questions – there will be no necessity to phone a friend.

## REFERENCES

Aarts, H., & Dijksterhuis, A. (2002). Category activation effects in judgment and behavior: The moderating role of perceived comparability. *British Journal of Social Psychology, 41*, 123–138.

Anderson, N. H. (1968). Likeableness ratings of 555 personality-trait words. *Journal of Personality and Social Psychology, 9*, 272–279.

Bargh, J. A., Chen, M., & Burrows, L. (1996). The automaticity of social behavior:

Direct effects of trait concept and stereotype activation on action. *Journal of Personality and Social Psychology, 71*, 230–244.

Berkowitz, L. (1984). Some effects of thoughts on anti- and pro-social influences of media events: A cognitive–neoassociative analysis. *Psychological Bulletin, 95*, 410–427.

Dijksterhuis, A., & Bargh, J. A. (2001). The perception–behavior expressway: Automatic effects of social perception on social behavior. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (vol. 33, pp. 1–39). San Diego: Academic Press.

Dijksterhuis, A., & Marchand, M. (2000). The route from stereotype activation to overt behavior. Unpublished manuscript.

Dijksterhuis, A., Spears, R., & Lépinasse, V. (2001). Reflecting and deflecting stereotypes: Assimilation and contrast in impression formation and automatic behavior. *Journal of Experimental Social Psychology, 37*, 286–299.

Dijksterhuis, A., Spears, R., Postmes, T., Stapel, D. A., Koomen, W., van Knippenberg, A., & Scheepers, D. (1998). Seeing one thing and doing another: Contrast effects in automatic behavior. *Journal of Personality and Social Psychology, 75*, 862–871.

Dijksterhuis, A., & van Knippenberg, A. (1998). The relation between perception and behavior or how to win a game of Trivial Pursuit®. *Journal of Personality and Social Psychology, 74*, 865–877.

Herr, P. (1986). Consequences of priming: Judgment and behavior. *Journal of Personality and Social Psychology, 51*, 1106–1121.

James, W. (1890). *Principles of psychology*. New York: Holt.

Macrae, C. N., & Johnston, L. (1998). Help, I need somebody: Automatic action and inaction. *Social Cognition, 16*, 400–417.

Moskowitz, G., & Skurnik, I. (1999). Contrast effects as determined by the type of prime: Trait versus exemplar initiate processing strategies that differ in how accessible constructs are used. *Journal of Personality and Social Psychology, 76*, 911–927.

Mussweiler, T. (2001a). Focus of comparison as determinant of assimilation versus contrast in social comparison. *Personality and Social Psychology Bulletin, 27*, 38–47.

Mussweiler, T. (2001b). "Seek and Ye shall find": Antecedents of assimilation and contrast in social comparison. *European Journal of Social Psychology, 31*, 499–509.

Mussweiler, T. (in press). Comparison processes in social judgment: Mechanisms and consequences. *Psychological Review*.

Norman, D. A., & Shallice, T. (1986). Attention to action: Willed and automatic control of behavior. In R. J. Davidson, G. E. Schwartz, & D. Shapiro (Eds.), *Consciousness and self-regulation: Advances in research and theory* (Vol. 4, pp. 1–18). New York: Plenum.

Prinz, W. (1990). A common coding approach to perception and action. In O. Neumann & W. Prinz (Eds.), *Relationships between perception and action* (pp. 167–201). Berlin: Springer-Verlag.

Sardar, Z. (1980). Shake-up in Syrian Science imminent. *New Scientist, 3 July*.



Schubert, T. W. & Häfner, M. (in press). Contrast from social stereotypes in automatic behavior. *Journal of Experimental Social Psychology*.

Schwarz, N., & Bless, H. (1992). Constructing reality and its alternatives: An inclusion/exclusion model of assimilation and contrast effects in social judgment. In L. L. Martin & A. Tesser (Eds.), *The construction of social judgments* (pp. 217–245). Hillsdale: Erlbaum.

Stapel, D. A., & Koomen, W. (2001a). Let's not forget the past when we go the future: On our knowledge of knowledge accessibility effects. In G. Moskowitz (Ed.), Cognitive social psychology: The Princeton symposium on the legacy and future of social cognition (pp. 229–246). Mahwah, NJ: Erlbaum.

Stapel, D. A., & Koomen, W. (2001b). The impact of interpretative versus comparison mindsets on knowledge accessibility effects. *Journal of Experimental Social Psychology, 37*, 134–149.

Stapel, D. A., Koomen, W., & van der Plight, J. (1997). Categories of category accessibility: The impact of trait versus exemplar priming on person judgments. *Journal of Experimental Social Psychology, 33*, 44–76.

Stapel, D. A., & Spears, R. (1996). Event accessibility and context effects in causal inference: Judgment of a different order. *Personality and Social Psychology Bulletin, 22*, 979–992.