

UC Davis

UC Davis Previously Published Works

Title

Stereotype efficiency reconsidered: encoding flexibility under cognitive load?

Permalink

<https://escholarship.org/uc/item/6qv8d7pf>

Journal

Journal of personality and social psychology, 75(3)

ISSN

0022-3514

Authors

Sherman, JW
Lee, AY
Bessenoff, GR
et al.

Publication Date

1998-09-01

DOI

10.1037//0022-3514.75.3.589

Peer reviewed

Stereotype Efficiency Reconsidered: Encoding Flexibility Under Cognitive Load

Jeffrey W. Sherman, Angela Y. Lee, Gayle R. Bessenoff, and Leigh A. Frost
Northwestern University

According to the encoding flexibility model, stereotypes are efficient because they facilitate, in different ways, the encoding of both stereotype-consistent and stereotype-inconsistent information when capacity is low. Because stereotypical information is conceptually fluent, it may be easily understood, even when resources are scant. As a result, processing resources may shift from stereotypical toward counterstereotypical information, which is difficult to comprehend under such conditions. Thus, whereas inconsistent information receives greater attention (Experiments 1–3) and perceptual encoding (Experiment 4) when resources are depleted, the conceptual meaning of consistent information is extracted to a greater degree under such conditions (Experiment 5). Potential moderating roles of stereotype strength and perceiver motivations are discussed, as are the implications of these results for dual process models of stereotyping.

In his seminal analysis of stereotypes, Lippmann (1922) argued that "there is neither time nor opportunity for intimate acquaintance. Instead we notice a trait which marks a well known type, and fill in the rest of the picture by means of the stereotypes we carry about in our heads" (p. 59). According to this functional analysis, the world is simply too complicated to attend to every detail, particularly given the attentional constraints imposed by people's busy environments. As a result, the perceiver relies on stereotypes to simplify social perception.

Stereotyping is efficient in a number of ways. First, the act of social categorization that precedes stereotyping reduces the amount of information to which perceivers must attend. Social stimuli that have been grouped together can be treated as functionally equivalent, reducing the need to form individualized impressions of each category member (Allport, 1954; Brewer, 1988; Fiske & Neuberg, 1990; Hamilton & Sherman, 1994; Lippmann, 1922). Second, stereotypes increase efficiency by expanding the perceiver's base of knowledge. On the basis of a person's group membership and accompanying stereotype, a perceiver may infer the person's personality attributes without having to attend care-

fully to the person's behavior (Brewer, 1988; Fiske & Neuberg, 1990; Hamilton & Sherman, 1994; Medin, 1988; Sherman, 1996). Via the relatively simple act of social categorization, a perceiver gains a large amount of "functionally accurate" (Swann, 1984) information. Therefore, stereotypes provide a beneficial ratio of information gained to effort expended.

Despite its long-standing prominence in the field, empirical tests of Lippmann's theory have appeared only in recent years. This research has largely supported Lippmann's functional analysis. For example, perceivers tend to rely on stereotypes to a greater extent when processing capacity is constrained. Whether as a result of physical depletion (e.g., Bodenhausen, 1990; Kim & Baron, 1988), task difficulty (e.g., Bodenhausen & Lichtenstein, 1987; Kruglanski & Freund, 1983; Pratto & Bargh, 1991), multiple task demands (Gilbert & Hixon, 1991; Macrae, Hewstone, & Griffiths, 1993), anxiety-induced arousal (e.g., Wilder & Shapiro, 1989), or positive moods (e.g., Stroessner & Mackie, 1993), situations that decrease the availability of processing resources have been shown to increase the stereotypicality of perceivers' judgments. Consistent with Lippmann's analysis, these data suggest that stereotypes are particularly useful when accurate social perception is difficult to achieve.

These findings often have been interpreted as evidence that humans are "cognitive misers," that they rely on mental heuristics such as stereotypes to avoid having to think carefully. However, recent evidence suggests a much more productive model of stereotype use. Macrae, Milne, and Bodenhausen (1994) showed that the resources that are saved by applying a stereotype in a cognitively demanding situation may be redirected toward other current concerns. In one study, participants were asked to form an impression of a target person based on a series of trait

Jeffrey W. Sherman, Angela Y. Lee, Gayle R. Bessenoff, and Leigh A. Frost, Department of Psychology, Northwestern University.

This research was supported by National Institute of Mental Health Grant 55037. We thank Galen Bodenhausen, Alice Eagly, Wendi Gardner, Dedre Gentner, Doug Medin, Neal Roese, Jim Sherman, and Steve Stroessner for their thoughtful comments on this research.

Correspondence concerning this article should be addressed to Jeffrey W. Sherman, Department of Psychology, Northwestern University, 2029 Sheridan Road, Evanston, Illinois 60208-2710. Electronic mail may be sent to sherm@nwu.edu.

descriptors. At the same time, participants were also asked to monitor a tape recording that described the geography and economy of Indonesia. Some participants were provided with a stereotype-related category label (e.g., doctor or skinhead) to help them with the impression formation task. The results demonstrated that participants provided with the category labels could recall more of the stereotype-consistent trait information than participants who did not have the labels. Moreover, participants with the labels also performed better on a multiple-choice test on the geography and economy of Indonesia. Thus, not only did the presence of an available stereotype increase retention of information from the primary impression formation task, but it also preserved resources that were applied to the secondary lesson on Indonesia. These data suggest that perceivers use stereotypes not out of laziness but out of a need for efficiency. The goal of the present research was to expand on this conception of stereotype efficiency and to investigate some nonintuitive implications for social perception.

Schema Filter Models of Stereotyping

We begin with an analysis of the cognitive processes that are thought to underlie stereotype efficiency. Through what mechanisms do stereotypes ease the attentional demands that are placed on the social perceiver? Relying on schematic principles of memory (e.g., Minsky, 1975; Neisser, 1976), a number of researchers have argued that stereotypes confer efficiency by acting as filters that facilitate the encoding and representation of consistent relative to inconsistent information in memory (e.g., Bodenhausen, 1988; Bodenhausen & Lichtenstein, 1987; Bodenhausen, Macrae, & Garst, 1997; Hamilton & Sherman, 1994; Macrae et al., 1993; Macrae, Milne, & Bodenhausen, 1994; Macrae, Stangor, & Milne, 1994; Miller & Turnbull, 1986; Stangor & Duan, 1991; Stangor & McMillan, 1992; Taylor & Crocker, 1981). There are two varieties of this basic "filter" model. The "weak" version posits that, because it fits with an existing expectancy, stereotype-consistent information is simply easier to comprehend than stereotype-inconsistent information. By providing conceptual fluency to consistent information, stereotypes reduce the amount of capacity necessary to encode that information, freeing up processing resources for other tasks. In contrast, inconsistent information is more difficult to comprehend and consumes greater processing capacity during encoding. There is wide agreement that these comprehension processes account, in part, for the efficiency of stereotypes.

However, a number of researchers have suggested that the filtering of consistent and inconsistent information may extend beyond these comprehension effects. In addition to acting as conceptual filters, it has been suggested that stereotypes may also act as attentional filters by directing encoding efforts toward consistent information and away from inconsistent information (Bodenhausen, 1988; Bodenhausen & Lichtenstein, 1987; Bodenhausen et al., 1997; Fiske & Neuberg, 1990; Hamilton & Sherman, 1994; Macrae, Milne, & Bodenhausen, 1994; Stangor & Duan, 1991; Taylor & Crocker, 1981). According to this "strong" filtering hypothesis, because the encoding of inconsistent information requires a relatively large commitment of resources, such efforts may be unattractive to the "cognitive-miserly" social perceiver, and inconsistent information may sim-

ply be ignored. Thus, resources are further preserved by directing attention toward the information that is most easily understood and away from the information that is most difficult to encode.

An important assumption of these models is that stereotypic filtering mechanisms are most likely to be observed when processing resources are limited in some way. It is in these conditions that the conceptual advantage enjoyed by consistent information should be most apparent (e.g., Bodenhausen, 1988; Bodenhausen & Lichtenstein, 1987; Bodenhausen et al., 1997; Fiske & Neuberg, 1990; Macrae et al., 1993; Macrae, Milne, & Bodenhausen, 1994; Macrae, Stangor, & Milne, 1994; Stangor & Duan, 1991). Because consistent information fits with a schematic framework, it may be understood relatively easily, even when capacity is low. In contrast, inconsistent information should be particularly difficult to comprehend under such conditions. This conceptual advantage for consistent information may be exacerbated by the possibility that perceivers will be especially likely to refer to their stereotypes as explanations for behaviors when resources are low. When capacity is plentiful, there is less of a need to rely on the stereotype to interpret incoming information. However, when capacity is low, the usefulness of stereotypes as simplifying devices is maximized. Finally, according to strong filter models, it is in these conditions that attentional filtering processes are most likely to direct attention away from inconsistent information and toward consistent information. If the resources are not available to sufficiently explain inconsistent information, then that information may receive little attention (Bodenhausen, 1988; Bodenhausen & Lichtenstein, 1987; Bodenhausen et al., 1997; Macrae, Milne, & Bodenhausen, 1994; Stangor & Duan, 1991). Thus, when attentional capacity is limited, stereotypes are efficient because they provide a conceptual filter that facilitates the processing of confirmatory information and an attentional filter that filters out inconsistent information that is difficult to process.

Efficient Mental Systems and the Value of Unexpected Information

In this article, we argue that a strong, attentional filter model of stereotype efficiency is an inaccurate depiction for many situations. We also argue that, although a conceptual filter model has its merits, it is incomplete in some important ways. One basic drawback with these filter models is that they propose a cognitive system that is inherently very conservative. The attentional filter model posits that, when capacity is depleted, perceivers simply do not want to know about information that challenges their expectancies. According to the conceptual filter model, perceivers may want to encode inconsistent information in these conditions, but their expectancies simply do not allow it. Thus, in both models, the overwhelming trend is toward maintaining stability in people's expectations.

In modeling an efficient cognitive system, however, one must ask what such a system should do for people. Certainly, one important function is to support the establishment of stable expectancies that allow people to predict their environments (e.g., Olson, Roese, & Zanna, 1996). However, in recent years, there has been growing consensus that an efficient system must also provide for considerable plasticity in these expectancies

(e.g., Johnston & Hawley, 1994; McClelland, McNaughton, & O'Reilly, 1995; Nosofsky, Palmeri, & McKinley, 1994; Schank, 1982; Sherry & Schacter, 1987; Tulving, Markowitsch, Kapur, Habib, & Houle, 1994). Thus, systems that are either too unstable or too rigid are thought to be maladaptive (e.g., Johnston & Hawley, 1994; Sherry & Schacter, 1987; Tulving et al., 1994). For maximum predictive value, efficient systems must encode not only invariances in the environment, which encourage the development of expectancies, but also variances (unexpected events), which suggest that the expectancy may not be entirely accurate and that reorientation may be necessary.

In fact, a number of recent findings support the idea that humans have specialized mechanisms for detecting novel or unexpected information. For example, Johnston, Hawley, Plewe, Elliott, and DeWitt (1990) demonstrated that attention is automatically oriented away from expected information and toward unexpected information in the perceptual field. There is also electrophysiological evidence that the brain is hard wired for such novelty detection (e.g., Cacioppo, Crites, Gardner, & Bertson, 1994; Donchin & Coles, 1988). Finally, both positron emission tomography (PET) imaging (Tulving et al., 1994) and neurophysiological (McClelland et al., 1995) data suggest that there are particular neuroanatomical structures that control the detection and encoding of unexpected information. Thus, the maintenance of knowledge plasticity is well supported in the cognitive system. This research implies that, when resources are low, information processing may not be entirely biased toward consistency, as suggested by filter models. Rather, given the importance of unexpected information, it might be anticipated that certain processes would enhance the encoding of stereotype-inconsistent information in these conditions.

Conceptual Fluency and Attentional Flexibility

Ironically, one factor that may contribute to the encoding of inconsistent information under conditions of low capacity is the conceptual fluency of consistent information. According to von Hippel and his colleagues (von Hippel, Jonides, Hilton, & Narayan, 1993; von Hippel, Sekaquaptewa, & Vargas, 1995), because expectancies facilitate the encoding of consistent information, perceivers who have an applicable schema need not pay careful attention to the perceptual details of these stimuli. In support of this view, von Hippel et al. (1993) demonstrated that perceivers possessing an applicable schema had greater conceptual but poorer perceptual encoding of schema-consistent information than perceivers who did not possess an applicable schema. Thus, the schema facilitated conceptual processing but inhibited perceptual processing of the schematic information. One implication of this research is that the resources saved by not carefully encoding the perceptual details of expected information may be redirected to aid in the encoding of unexpected information. However, neither the encoding of schema-inconsistent information nor the influence of processing capacity was considered in this research.

Johnston and Hawley's (1994) mismatch theory of novel pop out is directly concerned with differences in the encoding of schema-consistent and schema-inconsistent information. According to this theory, the mind does not waste time and energy on familiar stimuli that may be efficiently encoded by conceptu-

ally driven processing (see also Bobrow & Norman, 1975; Schank, 1982; Schank & Abelson, 1977). Instead, once expected information has been initially matched to an appropriate conceptual framework, attention to that information decreases. A by-product of this process is an increase in the attentional resources directed at encoding unexpected stimuli. Thus, Johnston and Hawley (1994) argued that, whereas conceptually driven processing (encoding for gist or meaning) favors expected information, attentional allocation and perceptual processing (encoding for details) favor unexpected information. Evidence from both experimental research (Johnston et al., 1990) and computer simulations (Johnston & Hawley, 1994) supports their predictions about the allocation of attentional resources. However, Johnston and his colleagues have not examined the distinction between conceptual and perceptual encoding and have not considered how the availability of cognitive resources would influence these processes.

Encoding Flexibility and Stereotype Efficiency

Drawing on the dual ideas that inconsistent information has high informational value for people's cognitive systems (e.g., Bobrow & Norman, 1975; Johnston & Hawley, 1994; McClelland et al., 1995; Nosofsky et al., 1994; Olson et al., 1996; Schank, 1982; Schank & Abelson, 1977; Sherry & Schacter, 1987; Tulving et al., 1994) and that the conceptual fluency of consistent information frees up attentional resources (Johnston & Hawley, 1994; Macrae, Milne, & Bodenhausen, 1994; von Hippel et al., 1993, 1995), we propose an encoding flexibility model of stereotype efficiency. According to our model, the efficiency of stereotypes lies in their ability to facilitate, in different ways, the encoding of both expected and unexpected behaviors when capacity is low. Stereotypes facilitate the processing of consistent information by rendering that information conceptually fluent. Because it fits with a stereotypic framework, this information may be well comprehended, even when resources are scant. However, as a result of this fluency, substantial attention is not devoted to encoding the details of stereotype-confirming information. Instead, these resources may be used to assist in other concurrent tasks, including the encoding of inconsistent information. This does not, however, suggest that the conceptual meaning of these inconsistent acts will be fully understood; rather, it suggests only that the effort will be made. Thus, when capacity is low, conceptual encoding favors consistent information, whereas attentional allocation and perceptual encoding favor inconsistent information. According to this model, stereotypes do not merely simplify information processing for lazy perceivers with limited capacity; they also permit the flexible distribution of encoding resources in a way that maximizes the amount of information gained for the effort expended. This encoding flexibility is functional because it promotes both stability and plasticity in the mental system.¹

¹ Filter models have not specified the extent to which filtering mechanisms are thought to be relatively controlled and strategic versus automatic processes. Our own view is that encoding flexibility processes are goal directed but relatively automatic (Bargh & Barndollar, 1996). When perceivers have the goal of learning about another person but have limited resources to do so, the system is especially likely to enact efficiency-conferring processes. Preexisting knowledge that is easy to access and use (e.g., stereotypes) is more likely to be recruited to explain ongoing

This model shares some important assumptions with conceptual filter models. In particular, the role of stereotypes in providing conceptual fluency to consistent information is critical to our model, as is the assumption that this conceptual filter will be most active when processing resources are scarce. However, our model also differs from these filter models in important ways. In contrast to conceptual filter models, our model suggests that certain aspects of encoding also will favor inconsistent information under low capacity conditions. In particular, greater attention will be paid to inconsistent information, and the perceptual details of that information will be extracted to a greater degree.

These attentional hypotheses are directly at odds with attentional filter models. Those models suggest that, because consistent information is particularly easy to encode, attention will be directed toward that information when capacity is depleted. Inconsistent information that is difficult to encode will be ignored or filtered out under such conditions. In contrast, we expect that perceivers will attend more carefully to inconsistent information than to consistent information when resources are scant. In fact, we predict that perceivers will take advantage of the conceptual fluency of consistent information to shift attention away from that information to aid in the encoding of inconsistent information when capacity is low. Indirect support for this hypothesis has been provided by the work of White and Carlston (1983; see also Hilton, Klein, & von Hippel, 1991), who showed that participants engaged in a difficult social perception task shifted their attention away from expectancy-consistent and toward expectancy-inconsistent target behavior. However, the availability of cognitive resources was not manipulated in this research.

The goal of the present research was to test directly our model of stereotype efficiency. Experiments 1–3 tested our attentional hypotheses. Experiments 4 and 5 tested our predictions regarding the perceptual and conceptual encoding of consistent and inconsistent information as a function of cognitive capacity.

Experiment 1

Overview and Predictions

The most basic distinction between the encoding flexibility model and filter models has to do with the amount of attention devoted to encoding consistent and inconsistent information as a function of available processing capacity. According to our model, perceivers will attend more carefully to inconsistent than consistent information when resources are low. In contrast, attentional filter models predict that greater attention will be paid to consistent than inconsistent information under such conditions. Experiment 1 examined this question.

Participants were asked to form impressions of a target who belonged to a stereotyped group. The information about the target

included 10 behaviors that were consistent with the target's stereotype and 10 behaviors that were inconsistent with the stereotype. Participants paced themselves through the stimuli, reading about each behavior as quickly or as slowly as they wished and then pressing their space bars to advance the stimuli. As they formed their impressions of the target, half of the participants were also placed under a cognitive load. The dependent measure was the reading times for the different types of behaviors.

Previous research has demonstrated that perceivers typically spend more time reading expectancy-inconsistent than expectancy-consistent information (e.g., Stern, Marrs, Millar, & Cole, 1984). We predicted that this tendency would be particularly evident when processing capacity is limited. As resources are diminished, relatively more attention will be devoted to encoding inconsistent than consistent information. In contrast, attentional filter models predict that perceivers should spend less time reading inconsistent information when capacity is low.

Method

Participants. For their participation, 54 students at Northwestern University were given partial course credit in an introductory psychology course. Sessions included 1–4 participants.

Materials and procedure. Participants were asked to engage in an experiment on impression formation. They were told that they would be reading some information that had been drawn from a magazine article about a person named Bob Hamilton. Participants were told that Bob was either a skinhead or a priest who lived in Chicago. The description of Bob consisted of 30 behaviors, 10 of which were pretested to be kind (e.g., "gave a stranger a quarter to make a phone call"), 10 of which were pretested to be unkind (e.g., "shoved his way to the center seat in the movie theater"), and 10 of which were pretested to be irrelevant to the kind–unkind dimension (e.g., "bought a new shirt"). For participants in the skinhead condition, the unkind behaviors were stereotype consistent, and the kind behaviors were stereotype inconsistent. For participants in the priest condition, the kind behaviors were stereotype consistent, and the unkind behaviors were stereotype inconsistent. Thus, the same behaviors served as both stereotype-consistent and stereotype-inconsistent stimuli, depending on the target. Participants paced themselves through the stimuli, pressing their space bars when they were ready to advance to the next behavior. The behaviors were presented randomly. The amount of time spent reading each item was recorded and served as the dependent measure.

As they formed their impressions, some participants were also placed in a low processing capacity condition. These participants were further informed that the experiment was concerned with people's ability to do multiple tasks at the same time. A cognitive load was manipulated by asking these participants to hold an eight-digit number in memory as they performed the impression formation task. This task has been used successfully in past research (e.g., Gilbert & Hixon, 1991) to deprive participants of processing resources. As a means of assessing compliance, these participants were asked to write down the eight-digit number on a slip of paper at the end of the impression formation task.²

² Gilbert (e.g., Gilbert & Hixon, 1991) has noted the difficulties of using participants' responses as a manipulation check. If participants are unable to report the number, it may mean that they neglected to engage in the memory task. Alternatively, it may be an indication that the dual-task manipulation was highly effective in depleting processing capacity. As suggested by Gilbert and Hixon (1991), a cutoff point was established such that participants who incorrectly reported four or more of the digits were considered to have made large errors and were excluded from the data set. No participants made more than four errors in Experiments 1 and 2. One participant made more than four errors in

behavior. Moreover, the system is particularly likely to take advantage of the conceptual fluency of consistent information afforded by stereotypes to direct resources toward inconsistent information that is difficult to comprehend without substantial resources. Although these processes are thought to be goal dependent, they are not presumed to be conscious strategies in any way. Rather, they are instigated by situational necessity.

Results

Item reading times greater than two standard deviations above the mean were removed from the analysis. This resulted in the removal of 56 of the 1,080 reading times (5%).³ The remaining times were averaged to form consistent and inconsistent reading time indexes for each participant. For purposes of data normalization, all analyses were based on log transformations of the reading times. All means are reported in milliseconds.

A 2 (capacity: high vs. low) \times 2 (target type: skinhead vs. priest) \times 2 (stimulus type: consistent vs. inconsistent) analysis of variance (ANOVA), with repeated measures on the last variable, was conducted on the item reading times. This analysis yielded a significant interaction between processing capacity and stimulus type, $F(1, 50) = 7.31, p < .05$. Whereas participants in the high capacity condition spent an equal amount of time reading consistent ($M = 3,113$) and inconsistent ($M = 3,078$) behaviors, $F(1, 50) = 1.17, ns$, participants in the low capacity condition spent a longer amount of time reading inconsistent ($M = 3,694$) than consistent ($M = 3,371$) behaviors, $F(1, 50) = 7.40, p < .05$ (see Figure 1).⁴

Not unexpectedly, there was also a significant Target \times Stimulus Type interaction demonstrating that participants spent a longer amount of time reading unkind behaviors (skinhead consistent and priest inconsistent) than kind behaviors (priest consistent and skinhead inconsistent), $F(1, 50) = 5.06, p < .05$. Because negative behaviors are somewhat rare, they tend to draw people's attention (e.g., Fiske, 1980).

Discussion

The results of Experiment 1 are consistent with our model of stereotype efficiency. When capacity was high, participants spent an equal amount of time reading consistent and inconsistent information. However, when capacity was depleted, participants spent more time reading inconsistent than consistent information. This demonstrates that participants did not simply ignore or filter out the inconsistent information when resources were low. Rather, the data show that participants devoted greater resources to encoding the inconsistent than consistent items in the low capacity condition.

Experiment 2

Overview and Predictions

Although low capacity participants in Experiment 1 had limited processing resources, they also had unlimited time to read the stimuli. Thus, the effects of the cognitive load could have been circumvented if participants were motivated to spend extra time reading the stimuli. That is, the load did not force participants to attend selectively to certain kinds of information. It was possible for participants to process all information as carefully as they liked if they were motivated to do so. Thus, it could be

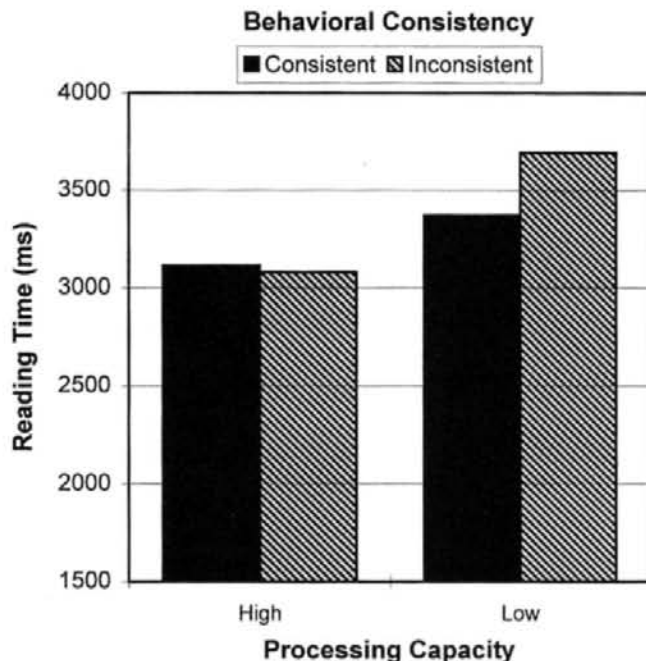


Figure 1. Experiment 1: Reading times as a function of stereotype consistency and processing capacity.

argued that there was no reason for a filtering mechanism to be engaged. In Experiment 2, participants had no such luxury. Participants formed impressions of the same stereotyped targets and behaviors as in Experiment 1 under conditions of high or low processing capacity. However, in this experiment, participants were given only 3.5 s to read each stimulus behavior. This rate was approximately the average rate chosen by participants in the low capacity conditions of Experiment 1. Thus, participants in the low capacity condition of Experiment 2 could not circumvent their cognitive load by simply spending a longer amount of time reading certain behavioral stimuli. They were forced to deal with the stimuli in a brief period of time.

In addition, as participants read about the target and formed their impressions, they were asked to monitor auditory tones emitted by the computer. A tone was emitted during the presentation of certain consistent and inconsistent behaviors. When they heard a tone, participants' task was to press the space bar on their computers. By analyzing the amount of time it took participants to respond to the tones, it was possible to determine

³ Two goodness-of-fit chi-square analyses were conducted on the frequency of consistent and inconsistent outliers in the high and low cognitive load conditions. Neither the high load analysis $\chi^2(1) = 2.38, ns$, nor the low load analysis, $\chi^2(1) = 1.14, ns$, was significant, demonstrating that, in both conditions, consistent and inconsistent outliers were equally likely to occur. A chi-square test of independence was also conducted to ensure that the patterns of consistent and inconsistent outliers did not vary as a function of cognitive load. This analysis was also insignificant, $\chi^2(1) = 2.91, ns$.

⁴ All simple effects comparisons of consistent and inconsistent items in all experiments were based on the mean square error from the full ANOVA.

Experiment 5. As a result of experimenter error, participants' responses were lost for Experiments 3 and 4. However, given that very few errors were made in the other three experiments, all participants were included in Experiments 3 and 4.

how much attention participants were paying to the behavioral stimuli concurrently on their screen. The more attention participants gave to the behaviors on the screen, the longer it should have taken them to respond to the tones. This kind of dual-task paradigm is a standard measure of attentional allocation (e.g., Britton, Westbrook, & Holdredge, 1978; Hashtroudi, Mutter, Cole, & Green, 1984; Kerr, 1973; see Johnston & Dark, 1986, for a review).

Because inconsistent information requires more processing capacity than consistent information, participants should take as long or longer to respond to the tones occurring during the inconsistent than consistent behaviors. According to our model, this tendency should be even stronger in the low capacity condition. As capacity decreases, greater attention should be paid to inconsistent than consistent behaviors. Once again, these predictions may be contrasted with those of attentional filter models, which suggest that, as capacity is depleted, greater attention will be devoted to consistent information, and inconsistent information will be ignored.

Method

Participants. For their participation, 78 students at Northwestern University were given partial course credit in an introductory psychology course. Sessions included 1–4 participants.

Materials and procedure. Participants with either high or low processing capacity were asked to form impressions of the same targets given the same stimulus behaviors as in Experiment 1. An eight-digit memory task was used to decrease attentional capacity. As they formed their impressions, participants were also asked to monitor auditory signals produced by the computers. They were instructed to press their space bars as quickly as possible whenever a tone sounded. The computers were programmed to emit a tone during six preselected kind and unkind behaviors. Each tone sounded 2 s after the chosen behavior had appeared on the screen. Based on the reading times in Experiment 1, this timing helped to ensure that participants were still actively engaged in encoding the stimulus items when the tone sounded. After participants responded by pressing their space bars, the behavior remained on the screen for 1 s longer. Behaviors that were not presented in conjunction with a tone were on the screen for 3.5 s. Thus, all behaviors were presented for approximately 3.5 s. The behaviors containing the auditory signals were presented in one of two random orders. The response latencies to the auditory signals were recorded and served as the dependent measure.

Results

Response latencies greater than two standard deviations above the mean were removed from the analysis. This resulted in the removal of 7 of the 468 response times (1.5%).⁵ The remaining times were averaged to form consistent and inconsistent response time indexes for each participant. For purposes of data normalization, all analyses were based on log transformations of the response times. All means are reported in milliseconds.

A 2 (capacity: high vs. low) \times 2 (target type: skinhead vs. priest) \times 2 (order: 1 vs. 2) \times 2 (stimulus type: consistent vs. inconsistent) ANOVA, with repeated measures on the last variable, was conducted on the tone response times. This analysis yielded a significant main effect for processing capacity demonstrating that response times were faster in the high ($M = 304$) than in the low ($M = 347$) capacity condition, $F(1,$

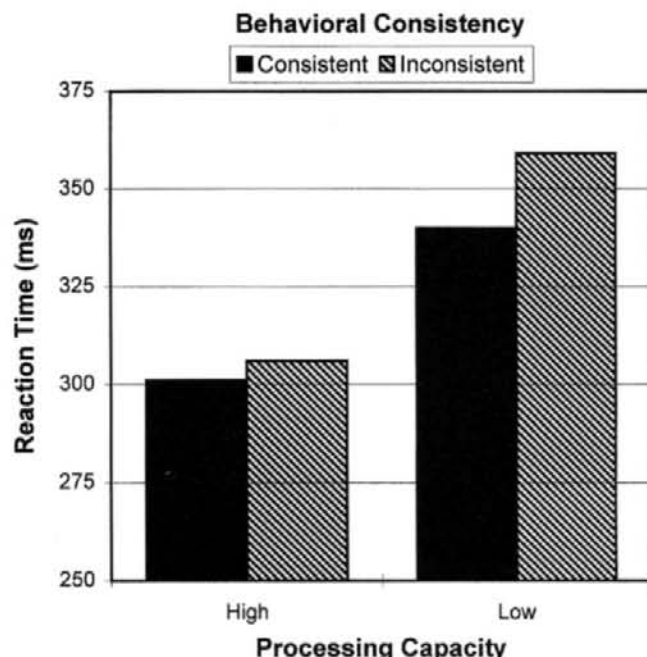


Figure 2. Experiment 2: Tone response times as a function of stereotype consistency and processing capacity.

70) = 4.43, $p < .05$. There was also a marginally significant main effect for stimulus type demonstrating that response times were slower when the auditory signals occurred during inconsistent ($M = 332$) than consistent ($M = 319$) behaviors, $F(1, 70) = 3.47$, $p < .07$. However, simple effects analyses showed that this tendency held only in the low capacity condition. In the low capacity condition, participants responded more slowly to tones occurring during inconsistent ($M = 357$) than consistent ($M = 337$) behaviors, $F(1, 70) = 4.11$, $p < .05$. By contrast, in the high capacity condition, response times were equally fast, regardless of whether the tones occurred during inconsistent ($M = 308$) or consistent ($M = 300$) behaviors, $F < 1$ (see Figure 2). The interaction between processing capacity and stimulus type was not significant ($F < 1$).

Finally, there was a three-way interaction among processing capacity, stimulus type, and order, $F(1, 70) = 5.18$, $p < .05$. Under conditions of limited capacity, it took participants longer to respond to tones occurring during inconsistent than consistent behaviors in both order conditions. In the high capacity conditions, response times were longer for tones that sounded during consistent items in one order and were longer for tones occurring during inconsistent items in the other order.

⁵ Two goodness-of-fit chi-square analyses were conducted on the frequency of consistent and inconsistent outliers in the high and low cognitive load conditions. Neither the high load analysis, $\chi^2(1) = 0.50$, *ns*, nor the low load analysis $\chi^2(1) = 0.33$, *ns*, was significant, demonstrating that, in both conditions, consistent and inconsistent outliers were equally likely to occur. A chi-square test of independence was also conducted to ensure that the patterns of consistent and inconsistent outliers did not vary as a function of cognitive load. This analysis was also insignificant, $\chi^2(1) = 0.06$, *ns*.

Discussion

The results of Experiment 2 provide further support for our model. In contrast to Experiment 1, participants in the low capacity condition of this experiment could not circumvent the effects of the cognitive load. Nevertheless, these participants devoted greater attentional resources to inconsistent than consistent behaviors, as demonstrated by their tone response latencies. In contrast, high capacity participants devoted an equal amount of attention to consistent and inconsistent behaviors. Thus, as resources dwindled, more attention was devoted to information that was inconsistent with the stereotype.

Experiment 3

Overview and Predictions

Experiment 3 was designed to test further attentional implications of our model. We have argued that, as a result of the importance of encoding inconsistent information and the conceptual fluency of consistent information, attention will actually shift from consistent to inconsistent information when capacity is limited. Therefore, the strongest test of our model would be a situation in which participants were forced to choose between attending to either consistent or inconsistent information under different cognitive loads. Because Experiments 1 and 2 presented stimuli sequentially, there was never an occasion in which participants had to choose between attending to consistent or inconsistent stimuli. Thus, we could not test our shifting attention hypothesis in those experiments. In Experiment 3, during the impression formation task, two behaviors appeared on the screen at the same time. Participants were given only 4 s to read both behaviors. Based on the reading times from Experiment 1, this was clearly less time than participants needed to study both behaviors as carefully as they would have liked. Thus, participants were forced to choose which information to attend to more carefully. Recognition accuracy served as the measure of encoding effort. This measure is a sensitive test of whether or not a given piece of information has been encoded into memory (e.g., Graesser, 1981; Srull, 1984; Stangor & McMillan, 1992).

Of most direct interest was recognition performance for consistent versus inconsistent behaviors that appeared on-screen concurrently. Previous research suggests that recognition for inconsistent behaviors should be equal to or greater than recognition for consistent behaviors (e.g., Stangor & McMillan, 1992). Our model argues that the recognition advantage for inconsistent behaviors should be particularly strong in the low capacity condition. This is because participants will shift resources away from conceptually fluent consistent behaviors toward inconsistent behaviors under these conditions. In contrast, attentional filter models suggest that recognition should be greater for consistent than inconsistent behaviors in the low capacity condition because participants will preferentially attend to the consistent item in the pair and ignore the inconsistent item.

Method

Participants. For their participation, 50 students at Northwestern University were given partial course credit in an introductory psychology course. Sessions included 1–4 participants.

Materials and procedure. Participants with either high or low processing capacity were asked to form impressions of the same targets given the same stimulus behaviors as in Experiments 1 and 2. Once again, an eight-digit memory task was used to induce cognitive load. Fifteen different pairings of the 30 stimulus behaviors were created. Five target pairs consisted of a consistent and an inconsistent behavior. An attempt was made to arrange the pairs so that the 2 behaviors were of equal length. The pairs of behaviors appeared on the computer screens for 4 s each, with 1 behavior about 2 inches (5 cm) above the other. Two versions of the stimuli were created that counterbalanced the presentation of the pairs such that a behavior was on top in one version and on the bottom in the other version.

After completion of the impression formation task, participants engaged in a 5-min filler task to clear the behavioral stimuli from short-term memory. Subsequently, participants performed a recognition test. For this task, all 30 behavioral stimuli and 30 foil behaviors (10 kind, 10 unkind, and 10 irrelevant) were presented to participants. On the presentation of each item, participants were instructed to press buttons marked "yes" and "no" on their keyboards, depending on whether or not the item had been used to describe Bob in the impression formation task. On the basis of these responses, A' indexes of recognition accuracy for consistent and inconsistent items were computed for each participant and served as the dependent measures (see subsequent discussion).

Results

The nonparametric measure A' (Grier, 1971) was chosen as the index of memory discrimination. It is necessary to use nonparametric measures (as opposed to measures such as d') when participants occasionally produce perfect memory discrimination (i.e., proportion of hits = 1, proportion of false alarms = 0), as they did in the present experiment. A' takes into account both hit rates (the proportion of times participants correctly identify that a previously presented item is old) and false alarm rates (the proportion of times participants incorrectly call foil items old) in its assessment of recognition accuracy (see Grier, 1971, for the exact formula), thereby controlling for the influence of guessing strategies and response biases.

A 2 (capacity: high vs. low) \times 2 (target type: skinhead vs. priest) \times 2 (order: 1 vs. 2) \times 2 (stimulus type: consistent vs. inconsistent) ANOVA, with repeated measures on the last variable, was conducted on the A' recognition accuracy measures for consistent and inconsistent behaviors that appeared on-screen concurrently. This analysis yielded a significant main effect for processing capacity indicating that recognition accuracy was greater in the high ($M = .913$) than low ($M = .844$) capacity condition, $F(1, 42) = 8.69, p < .05$. There was also a significant main effect for stimulus type indicating that inconsistent items ($M = .899$) were recognized more accurately than consistent items ($M = .858$), $F(1, 42) = 6.61, p < .05$. However, analyses of simple effects showed that this tendency held only in the low capacity condition, in which inconsistent behaviors were recognized more accurately ($M = .876$) than consistent ($M = .812$) behaviors, $F(1, 42) = 8.04, p < .05$. In the high capacity condition, inconsistent ($M = .921$) and consistent ($M = .905$) behaviors were recognized equally well, $F < 1$ (see Figure 3). The interaction between processing capacity and stimulus type did not reach standard levels of significance, $F(1, 42) = 2.36, p = .13$. Finally, there was a significant Target \times Stimulus Type interaction demonstrating that unkind behaviors were recognized more accurately than kind behaviors, $F(1, 42) = 5.78, p < .05$.

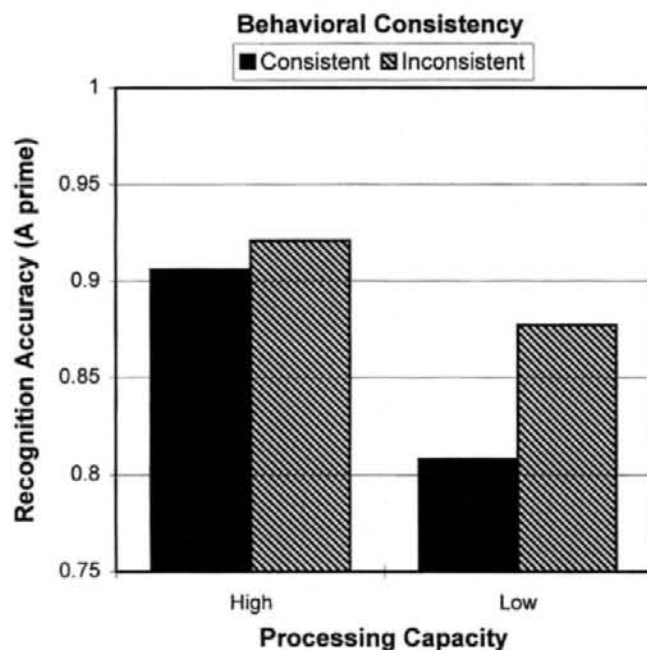


Figure 3. Experiment 3: Recognition accuracy of concurrently presented behaviors as a function of stereotype consistency and processing capacity.

Discussion

The results of Experiment 3 provide clear support for our model of stereotype efficiency. In the high capacity condition, simultaneously presented consistent and inconsistent behaviors were recognized equally well. In contrast, in the low capacity condition, inconsistent behaviors were recognized with significantly greater accuracy than consistent behaviors presented concurrently. This shows that, when consistent information and inconsistent information were put in direct competition, participants with limited resources attended to and encoded the inconsistent information more thoroughly than the consistent information. Because consistent behaviors are conceptually fluent, they could be satisfactorily encoded with little effort, thereby freeing resources that could be redirected toward the encoding of inconsistent behaviors.

Together, Experiments 1-3 provide strong support for the attentional hypotheses of our encoding flexibility model. Relying on three different dependent measures, these studies provide converging evidence that, when processing capacity is limited, greater attention is paid to stereotype-inconsistent information than to stereotype-consistent information. To gain further support for this conclusion, we conducted a blocked meta-analysis in which the raw data from Experiments 1-3 (which all predicted the same interaction between processing capacity and stimulus congruence) were converted to *z* scores within each experiment and then combined into an overall ANOVA, with experiment number (1-3) as a between-subjects variable (Rosenthal, 1991). This analysis showed that the predicted interaction between processing capacity and stimulus congruence was strong when collapsed across the three experiments, $F(1, 170)$

$= 7.84, p < .05$, and was not moderated by any other variables. Moreover, in each experiment, the crucial low capacity contrast between consistent and inconsistent items was significant. Attentional filter models suggesting that inconsistent information is ignored and that resources shift toward consistent information when resources are low cannot account for these data.

Encoding Flexibility, Perceptual Encoding, and Conceptual Encoding

Our model of stereotype efficiency has implications that extend beyond these attentional processes. The "flexible encoding" of stereotype-relevant information in our model also refers to the hypothesis that different aspects of consistent and inconsistent information are extracted during encoding. Here an important distinction is made between the encoding of the perceptual and the conceptual features of a stimulus. Perceptual encoding refers to the extraction of information about the physical details of a stimulus. In contrast, conceptual encoding refers to the extraction of the gist or meaning of a stimulus (for reviews of the perceptual-conceptual distinction, see Richardson-Klavehn & Bjork, 1988; Roediger, 1990; von Hippel et al., 1995). According to our model, the perceptual details and conceptual meanings of stereotype-consistent and stereotype-inconsistent behaviors are encoded to differing degrees as a function of available processing capacity.

Because consistent behaviors are conceptually fluent, their conceptual meaning may be extracted rather easily in comparison with inconsistent behaviors. This is particularly true when resources are depleted and the conceptual encoding of inconsistent information is especially difficult. Hence, there should be a particularly strong conceptual advantage for consistent information under conditions of low capacity (e.g., Bodenhausen, 1988; Bodenhausen & Lichtenstein, 1987; Bodenhausen et al., 1997; Fiske & Neuberg, 1990; Macrae et al., 1993; Macrae, Milne, & Bodenhausen, 1994; Macrae, Stangor, & Milne, 1994; Stangor & Duan, 1991).

However, because the conceptual meaning of consistent behaviors is extracted so easily, processing of the perceptual details of that information may be truncated (Ehrlich & Rayner, 1981; Jacoby, 1983; Johnston & Hawley, 1994; Johnston et al., 1990; von Hippel et al., 1993, 1995). There is no need to thoroughly encode the perceptual features once the basic gist has been extracted. In contrast, comprehending the conceptual meaning of an inconsistent behavior requires that perceivers process the perceptual features of that behavior more extensively (Ehrlich & Rayner, 1981; Jacoby, 1983; Johnston & Hawley, 1994; Johnston et al., 1990; von Hippel et al., 1993, 1995). Such variations in encoding effort (e.g., "depth of processing") should produce greater perceptual encoding for inconsistent than consistent behaviors in conditions of both high and low processing capacity (Challis & Brodbeck, 1992).

The question of whether or not the perceptual advantage for inconsistent information will be stronger under low capacity conditions is not entirely clear. On the one hand, it might be expected that, as capacity is depleted, relatively greater effort will be devoted to encoding the perceptual details of inconsistent than consistent information. This suggests that the perceptual advantage for inconsistent information may well increase in the

low capacity condition. On the other hand, recent research that has directly manipulated processing capacity has shown that perceptual encoding processes are generally unaffected by the availability of cognitive resources (e.g., Mulligan, 1998; Mulligan & Hartman, 1996). This research suggests that one may not expect to find differential perceptual advantages for inconsistent information under high and low capacity conditions.⁶ Thus, there are reasons to expect that the perceptual advantage for inconsistent information may or may not increase when resources are depleted. What is most important from our perspective is that there should be a perceptual advantage for inconsistent information and that this advantage should hold under conditions of limited capacity.

To test these hypotheses, we relied on the principle of transfer-appropriate processing (Morris, Bransford, & Franks, 1977; Roediger, 1990; Tulving & Thomson, 1973). According to this principle, performance on a memory test is a function of the degree of overlap in the cognitive processes that occur at learning and at test. Thus, if encoding is primarily oriented toward extracting the perceptual details rather than the conceptual meaning of a stimulus, then memory for that stimulus will be stronger on measures that benefit from the use of perceptual knowledge during retrieval than on measures that benefit from the use of conceptual knowledge during retrieval. Conversely, if encoding is primarily oriented toward extracting the conceptual meaning rather than the perceptual details of a stimulus, then memory for that stimulus will be stronger on measures that benefit from the use of conceptual knowledge during retrieval than on measures that benefit from the use of perceptual knowledge during retrieval. Therefore, one way to determine the extent to which perceptual and conceptual encoding of a stimulus have occurred is to examine memory for the stimulus with measures that rely on either perceptual or conceptual processing (see Roediger, 1990, for a review).

Experiment 4

Overview and Predictions

In Experiment 4, we tested our predictions about the perceptual encoding of stereotype-consistent and stereotype-inconsistent information. After forming impressions of the same stereotyped targets given the same behaviors as in Experiments 1–3 under conditions of high or low processing capacity, participants engaged in a word identification task. During this task, words were flashed for a very brief (33-ms) interval on participants' computer screens. After each presentation, participants' task was to type into the computer the word they thought had just been flashed. The target words of interest were 20 words taken from the stereotype-consistent and stereotype-inconsistent descriptions of the impression target. For example, the word *salesgirl* was taken from the behavior "swore at the salesgirl." Participants' ability to identify these words is a measure of perceptual priming. To the extent that the perceptual details of the consistent and inconsistent behaviors have been encoded during the impression formation task, participants should be better able to identify words taken from those behaviors, because their physical properties will have been activated (e.g., Richardson-Klavehn & Bjork, 1988; Roediger, 1990; von Hippel et al.,

1993). It is important to note that the target words were not related to the overall meaning of the sentences (e.g., the word *salesgirl* is unrelated to unfriendliness). Thus, ability to identify these words is unrelated to the extraction of the conceptual gist of the original stimulus sentences.

We predicted that there would be greater perceptual encoding of inconsistent than consistent behaviors. Because consistent items are conceptually fluent, processing of the perceptual details of that information should be truncated. In contrast, processing perceptual details is necessary for the encoding of inconsistent information (Ehrlich & Rayner, 1981; Jacoby, 1983; Johnston & Hawley, 1994; Johnston et al., 1990; von Hippel et al., 1993, 1995). Thus, we expected that words taken from inconsistent behaviors would be identified more successfully than words taken from consistent behaviors under conditions of both high and low processing capacity. As described earlier, there are reasons to expect that this advantage may or may not be stronger when resources are depleted.

Method

Participants. For their participation, 57 students at Northwestern University were given partial course credit in an introductory psychology course. Sessions included 1–4 participants. All participants were native English speakers.

Materials and procedure. Participants with either high or low processing capacity (manipulated with an eight-digit memory task) were asked to form impressions of the same targets given the same stimulus behaviors as in Experiments 1–3. In this experiment, the behaviors were presented one at a time on the computer screen for 6 s. After the impression formation task, participants were taken to new rooms and seated at new computers. This part of the experiment was described as a pretest for another researcher who was interested in perceptual abilities. Thus, participants were led to believe that the second task was a new experiment unrelated to the initial impression formation task. The second task consisted of a word identification task in which words were flashed one at a time on a computer screen for 33 ms. The presentation of these words was preceded and followed by a mask consisting of a row of pound (#) signs. Participants were asked to type their best guess as to what word was presented. They were encouraged to type a word even if they believed that they had seen nothing on their screen.

One hundred ten trials were presented. For these trials, 10 items were words taken from the 10 stereotype-consistent behaviors, 10 were words taken from the 10 stereotype-inconsistent behaviors, and 90 were filler words. The 90 filler words included a variety of nouns, verbs, and adjectives. As a means of providing participants some practice with the task before the critical trials, the first 20 trials always consisted of the same filler items. The remaining 90 trials were divided into 10 blocks of 9 items that were presented in one of four random orders. Each block contained 1 word taken from a stereotype-consistent behavior and 1 word taken from a stereotype-inconsistent behavior. These items were always separated by at least 2 filler words both within and across blocks. Along with the experimental instructions and the room-computer change, the large number of filler items diminished the possibility that

⁶ These findings refer specifically to implicit measures of perceptual encoding that do not require the use of explicit recollection processes. The use of such implicit measures was necessary in the present research because explicit measures of expectancy-relevant perceptual encoding are necessarily contaminated by conceptual processes related to intentional, expectancy-based reconstruction processes (e.g., Jacoby, 1996; Toth, Reingold, & Jacoby, 1994; von Hippel et al., 1993, 1995).

participants would somehow connect the first and second parts of the experiment. The proportion of words from consistent and inconsistent behaviors correctly identified served as the dependent measure.

Results

A 2 (capacity: high vs. low) \times 2 (target type: skinhead vs. priest) \times 2 (stimulus type: consistent vs. inconsistent) ANOVA, with repeated measures on the last variable, was conducted on arcsine transformations (Cohen, 1987, pp. 180–182) of the proportion of consistent and inconsistent target words that were correctly identified. This analysis yielded a significant main effect for stimulus type demonstrating that a greater proportion of words taken from inconsistent behaviors were identified ($M = .561$) than were words taken from consistent behaviors ($M = .507$), $F(1, 53) = 5.88, p < .05$. This pattern of results was evident in both the high (inconsistent $M = .572$, consistent $M = .510$) and low (inconsistent $M = .550$; consistent $M = .505$) capacity conditions. The interaction between processing capacity and stimulus type did not approach significance, $F < 1$ (see Figure 4). There was also a significant Target \times Stimulus Type interaction demonstrating that the words taken from the kind behaviors were more identifiable than the words taken from the unkind behaviors, $F(1, 53) = 22.99, p < .05$. This reflected chance differences in the stimulus items selected from the kind and unkind behaviors.⁷

Discussion

The results of Experiment 4 provide support for our key perceptual encoding hypotheses. Stimulus words taken from stereotype-inconsistent behaviors were identified with significantly

greater accuracy than words taken from stereotype-consistent behaviors. This demonstrates that perceivers more thoroughly encoded the perceptual details of inconsistent than consistent behaviors. This advantage was equally strong in the high and low capacity conditions. These findings add to the growing body of research suggesting that perceptual encoding processes are relatively unaffected by variations in processing capacity (e.g., Mulligan, 1998; Mulligan & Hartman, 1996). These findings also extend understanding of stereotype efficiency. Not only is greater attention paid to inconsistent than consistent information when capacity is low, but the perceptual details of that inconsistent information are encoded more completely. To our knowledge, this is the first demonstration of an encoding advantage for unexpected information under conditions of limited capacity. Current models of stereotype efficiency, which emphasize encoding advantages for stereotypical information under low capacity conditions, cannot account for these data.

Experiment 5

Despite the results of Experiments 1–4, we do not wish to suggest that all aspects of encoding favor inconsistent information when processing capacity is low. Although inconsistent behaviors may be attended to more carefully and receive greater perceptual encoding than consistent behaviors under such conditions, the conceptual meaning of inconsistent behaviors will be less likely to be extracted because they are difficult to explain (e.g., Bodenhausen, 1988; Bodenhausen & Lichtenstein, 1987; Bodenhausen et al., 1997; Fiske & Neuberg, 1990; Macrae et al., 1993; Macrae, Milne, & Bodenhausen, 1994; Macrae, Stangor, & Milne, 1994; Stangor & Duan, 1991). In contrast, because stereotype-consistent behaviors can be explained in reference to preexisting stereotypes, they are conceptually fluent. Thus, the meaning of such behaviors may be extracted rather easily, even when processing resources are limited.

Along these lines, a number of researchers have demonstrated that stereotype-inconsistent information is recalled as well as or better than stereotype-consistent information under high capacity conditions but is recalled less well than stereotype-consistent information under conditions of reduced capacity (e.g., Bodenhausen & Lichtenstein, 1987; Macrae et al., 1993; Stangor & Duan, 1991; Stangor & McMillan, 1992). Because free recall is a measure of memory that relies on conceptually driven processes (e.g., Richardson-Klavehn & Bjork, 1988; Roediger, 1990; von Hippel et al., 1993), these data suggest that conceptual encoding is greater for consistent than inconsistent information under low capacity conditions.⁸ However, there are

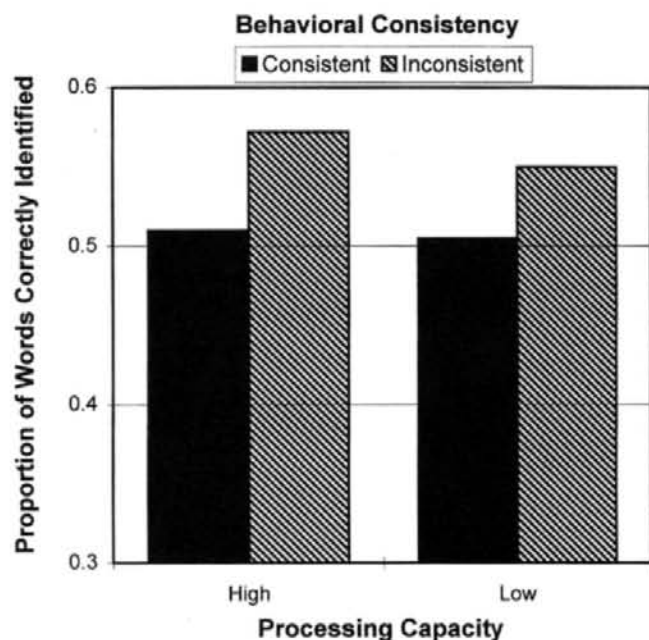


Figure 4. Experiment 4: Identification of words taken from stereotype-consistent and stereotype-inconsistent behaviors as a function of processing capacity.

⁷ As a means of further investigating this item effect, a control group of participants, who did not engage in the impression formation task, performed the word identification task. These participants were able to identify the words taken from kind behaviors ($M = .536$) with significantly greater success than the words taken from unkind behaviors ($M = .427$), $F(1, 21) = 9.34, p < .05$. When this item effect was subtracted from the experimental participants' data, the interaction between target and stimulus type disappeared. However, the main effect of stimulus congruency remained significant.

⁸ Note that the results of Experiment 3 are ambiguous with respect to our conceptual-perceptual hypotheses because recognition performance reflects both conceptual and perceptual encoding (e.g., Johnston, Dark, & Jacoby, 1985; Johnston, Hawley, & Elliott, 1991; Richardson-

some ambiguities in this interpretation. In particular, because free recall is an explicit measure of memory that requires participants to intentionally recollect the original stimuli, superior performance for consistent behaviors may reflect strategic retrieval strategies and decision processes rather than an advantage in conceptual encoding (e.g., Graesser, 1981; Sherman & Frost, in press; Stangor & McMillan, 1992; von Hippel et al., 1993, 1995). Implicit measures of conceptual memory that do not require conscious recollection would provide more direct evidence for differences in encoding processes (e.g., Jacoby, 1996; Toth, Reingold, & Jacoby, 1994; von Hippel et al., 1993, 1995). Thus, one goal of Experiment 5 was to more directly examine the encoding processes for stereotype-relevant information by using an implicit measure of conceptual encoding.

The primary goal in designing Experiment 5 (in conjunction with Experiment 4) was to demonstrate the predicted differences in conceptual and perceptual encoding of stereotype-consistent and stereotype-inconsistent information using a single dependent measure. Demonstrations of process dissociations are particularly compelling when they are observed with a single memory measure, because task differences are ruled out as an explanation for the dissociation (e.g., Jacoby, 1996; Richardson-Klavehn & Bjork, 1988; Toth et al., 1994). For example, if perceptual encoding is tested with a word identification task, whereas conceptual encoding is tested with a free recall task, performance differences between consistent and inconsistent items may reflect differences in perceptual-conceptual encoding or other differences between the tasks that are unrelated to the perceptual-conceptual distinction. As noted earlier, whereas free recall relies on the use of intentional memory, word identification relies almost entirely on automatic, unintentional uses of memory. Thus, dissociations between memory for stereotype-consistent and stereotype-inconsistent information demonstrated by these measures may reflect the fact that the two types of information rely on intentional and automatic uses of memory to a different extent, rather than reflecting differences in perceptual-conceptual encoding (for a full discussion of these matters, see Challis & Brodbeck, 1992; Richardson-Klavehn & Bjork, 1988; Toth et al., 1994). Thus, to produce the strongest test of our model, we measured conceptual encoding in Experiment 5 with the same word identification task used to measure perceptual encoding in Experiment 4.

Overview and Predictions

After forming impressions of the same stereotyped targets and behaviors as in Experiment 1-4 under conditions of high

or low processing capacity, participants performed the word identification task used in Experiment 4. However, the 20 target words from Experiment 4 were replaced with 20 new words for Experiment 5. These target words were 20 traits related to the conceptual meaning of the stereotype-consistent and stereotype-inconsistent descriptions of the impression target. Examples of these words include *neighborly*, *hostile*, *kind*, and *mean*. Participants' ability to identify these words is a measure of conceptual priming. To the extent that the meaning of the consistent and inconsistent behaviors has been extracted during the impression formation task, participants should be better able to identify the relevant traits because their meaning will have been activated (e.g., Bassili & Smith, 1986; Masson & MacLeod, 1992; Roediger, 1990; von Hippel et al., 1995). It is important to note that these target trait words had not been presented within the impression task stimulus behaviors and had not been seen in the course of the experiment. Thus, the ability to identify these words is unrelated to the perceptual encoding of the original stimulus sentences.

When encoding capacity is high, conceptual encoding of consistent and inconsistent behaviors should be equivalent. Thus, participants should be able to identify stereotype-consistent and stereotype-inconsistent traits equally well. In contrast, when resources are depleted during encoding, participants should be better able to extract the conceptual meaning of the consistent than the inconsistent behaviors. As a result, consistent traits should be identified more successfully than inconsistent traits in this condition.

Method

Participants. For their participation, 102 students at Northwestern University were given partial course credit in an introductory psychology course.⁹ Sessions included 1-4 participants. All participants were native English speakers.

Materials and procedure. Other than the aforementioned change in the 20 target items, the materials and procedure were identical to those of Experiment 4.¹⁰ The proportion of consistent and inconsistent traits correctly identified served as the dependent measure.

Results

A 2 (capacity: high vs. low) \times 2 (target type: skinhead vs. priest) \times 2 (number of filler items: 60 vs. 90) \times 2 (stimulus type: consistent vs. inconsistent) ANOVA, with repeated measures on the last variable, was conducted on arcsine transformations of the proportion of consistent and inconsistent trait words that were correctly identified.¹¹ This analysis yielded a signifi-

⁹ One low capacity participant's responses were removed from the data set because this participant failed to adequately perform the eight-digit memory task (see Footnote 1).

¹⁰ Participants took part in the study in two different school terms. For the first-term participants, there were 80 trials (60 filler words and 20 target traits). For the second-term participants, there were 110 trials (90 filler words and 20 target traits). Whether the test included 80 or 110 trials (i.e., was completed in the first or second term) did not affect any results of interest.

¹¹ This analysis also included covariates designed to factor out any identification effects due to valence that were independent of item stereotypicality. To construct these covariates, we took advantage of the fact that there were a number of stereotype-irrelevant negative and positive traits among the filler items (e.g., clumsy and organized). For each

Klavehn & Bjork, 1988). In fact, the strong perceptual component of recognition memory probably contributes to the dissociation between our recognition findings and the findings of previous experiments on processing capacity and memory that have relied on free recall (e.g., Bodenhausen & Lichtenstein, 1987; Macrae et al., 1993; Stangor & Duan, 1991; Stangor & McMillan, 1992). Whereas we showed a recognition advantage for inconsistent behaviors under conditions of limited capacity, those studies demonstrated a recall advantage for consistent material under the same conditions. This dissociation between recall and recognition is well established in the literature on expectancy-based memory (for reviews, see Sherman & Frost, in press; Stangor & McMillan, 1992).

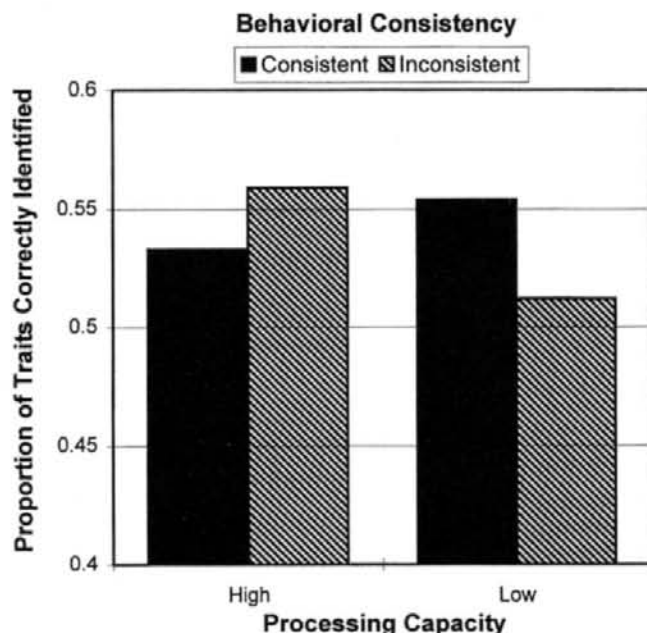


Figure 5. Experiment 5: Identification of traits implied by stereotype-consistent and stereotype-inconsistent behaviors as a function of processing capacity.

cant interaction between level of capacity and stimulus type, $F(1, 93) = 3.93, p = .05$. Whereas traits implied by the consistent ($M = .533$) and inconsistent ($M = .559$) impression behaviors were identified with equal success in the high capacity condition, $F(1, 93) = 2.23, ns$, traits implied by the consistent behaviors ($M = .554$) were significantly more likely to be identified than traits implied by the inconsistent behaviors ($M = .512$) in the low capacity condition, $F(1, 93) = 5.90, p < .05$ (see Figure 5).

There was also a significant Target \times Stimulus Type interaction demonstrating that, in general, the kind traits were identified with greater success than the unkind traits, $F(1, 93) = 35.35, p < .05$. Again, this reflected chance differences in the identifiability of the kind and unkind traits. However, this item effect

participant, we created two ratio scores that provided indexes of the extent to which positive and negative traits could be identified, independent of stereotypicality. For the negativity index, the equation was (negative stereotype-irrelevant + negative stereotype-relevant traits correctly identified)/all positive and negative traits correctly identified. This provided an index of the extent to which participants were able to identify negative as opposed to positive traits, regardless of their stereotypicality. For the positivity index, the equation was (positive stereotype-irrelevant + positive stereotype-relevant traits correctly identified)/all positive and negative traits correctly identified. This provided an index of the extent to which participants were able to identify positive as opposed to negative traits, regardless of their stereotypicality. By using these indexes as covariates, we were able to obtain clean measures of participants' ability to identify stereotype-consistent and stereotype-inconsistent items that were independent of valence effects. The influence of the covariates was significant, $F(1, 93) = 115.30, p < .05$.

did not moderate the interaction between level of capacity and item type. Finally, there was a significant interaction involving target, stimulus type, and number of filler items, $F(1, 93) = 11.54, p < .05$. This interaction demonstrated that the advantage for the kind over the unkind traits was apparent only when there were 90, as opposed to 60, filler items. When there were 60 items, the kind and unkind traits were identified with equal success.

Discussion

The results of Experiment 5 provide further support for our model of stereotype efficiency. In the high capacity condition, participants were able to identify traits implied by consistent and inconsistent behaviors with equal success. This demonstrates that conceptual encoding is equally strong for consistent and inconsistent behaviors when resources are plentiful. However, when capacity was depleted, participants were better able to identify traits implied by consistent than inconsistent behaviors. As a result of their conceptual fluency, stereotypical behaviors are easier to comprehend than counterstereotypical behaviors when capacity is low. These data provide a conceptual replication and extension of previous studies that have relied on free recall as a measure of conceptual encoding (e.g., Bodenhausen & Lichtenstein, 1987; Macrae et al., 1993; Stangor & Duan, 1991; Stangor & McMillan, 1992). By demonstrating the same pattern of results using an implicit measure, Experiment 5 provides the strongest evidence yet that stereotypical information is at a conceptual advantage under low capacity conditions.¹²

¹² Two alternative explanations of these findings do not suggest a conceptual encoding advantage for consistent over inconsistent behaviors. First, it could be argued that these results simply reflect the fact that stereotypes are activated to a greater degree in the low capacity than the high capacity condition (which our model suggests is true). As a result of this activation, stereotype-consistent traits could be identified more successfully than stereotype-inconsistent traits in this condition, regardless of behavioral encoding. However, if direct priming effects were responsible for our data, then we should have observed better identification of stereotype-consistent traits in the low than high capacity conditions. That is, performance on the consistent traits should have improved as capacity was depleted. It did not. Consistent traits were recognized equally well in the two conditions. These results are most consistent with our encoding explanation. We do not argue that conceptual extraction of consistent behaviors should be greater in the low capacity than high capacity condition, rather, conceptual priming should be greater for consistent than inconsistent behaviors in the low capacity condition. A second alternative hypothesis is that, in the low capacity condition, participants were still extracting conceptual meaning from inconsistent behaviors but were extracting a conceptual meaning different from the traits we tested. According to this argument, participants were making situational attributions for the inconsistent (but not consistent) behaviors, and that is why there was less conceptual priming for the inconsistent than the consistent traits. However, this explanation cannot account for the data in the high capacity condition. It is under conditions of full capacity, if ever, that perceivers would be most likely to make situational attributions for inconsistent behaviors (e.g., Gilbert, Pelham, & Krull, 1988). Yet, when participants had full processing capacity, there was no difference in conceptual priming for consistent and inconsistent behaviors (in fact, there was a slight advantage for inconsistency). Thus, this alternative also would not seem to be able to account for our data.

Along with Experiment 4, these findings show that different aspects of consistent and inconsistent information are encoded as a function of available processing resources. When capacity is not threatened, conceptual encoding is equally successful for the two types of items, whereas the perceptual details of inconsistent behaviors are encoded more thoroughly than those of consistent behaviors. In contrast, when capacity is depleted, even though perceivers encode more completely the perceptual details of inconsistent behaviors, the conceptual meanings of these behaviors are encoded less completely. That we were able to demonstrate this dissociation using the same memory task to measure perceptual and conceptual processing contributes to our confidence that the results are due to encoding differences as opposed to task demands. Thus, despite the attentional and perceptual encoding advantages for inconsistent information when capacity is low, conceptual encoding favors stereotypical information in these conditions.

These findings have significant implications for everyday social cognition. Assume that a member of a stereotyped group is observed engaging in an equal number of stereotypical and counterstereotypical behaviors. When capacity is limited, perceivers will thoroughly encode the basic gist but not the specific details of the stereotypical behaviors. In contrast, memory will be relatively strong for the perceptual details of the counterstereotypical behaviors, but their meaning will not be well understood. As a result of the differences in conceptual encoding, perceivers will believe that they have observed more behaviors that confirm than disconfirm the stereotype, leading to increased judgment stereotypicality (e.g., Bodenhausen, 1990; Bodenhausen & Lichtenstein, 1987; Gilbert & Hixon, 1991; Kim & Baron, 1988; Kruglanski & Freund, 1983; Pratto & Bargh, 1991; Stroessner & Mackie, 1993; Wilder & Shapiro, 1989). Moreover, because perceivers will have relatively poor memory for the details of the stereotypical behaviors, they may be easily led into believing that they had seen stereotype-consistent behaviors that, in fact, did not occur. In contrast, few such "false alarms" would be made toward counterstereotypical behaviors that did not actually occur. Thus, perceivers will be much more likely to falsely attribute stereotypical than counterstereotypical behaviors to a person, particularly under conditions of limited capacity (Sherman & Bessenoff, *in press*).

General Discussion

It has become quite clear that people find stereotypes especially useful when processing resources are scarce (e.g., Bodenhausen, 1990; Bodenhausen & Lichtenstein, 1987; Gilbert & Hixon, 1991; Kim & Baron, 1988; Kruglanski & Freund, 1983; Macrae et al., 1993; Pratto & Bargh, 1991; Stroessner & Mackie, 1993; Wilder & Shapiro, 1989). The predominant explanation for this phenomenon has centered around perceivers' desire to avoid careful thought, the idea that they are cognitive misers. However, in recent years, there is growing evidence that the social perceiver has not been given proper credit. People use stereotypes not only to make their lives easier but to live their lives more efficiently. Resources that are preserved through the application of stereotypic expectancies may be redirected toward other information-processing concerns (e.g., Macrae, Milne, & Bodenhausen, 1994; Macrae, Stangor, & Milne, 1994;

von Hippel et al., 1993, 1995). The goal of the present research was to further expand on this conception of stereotype efficiency.

One drawback with extant models of stereotype efficiency is that they propose a cognitive system that is overly conservative. According to these models, through either attentional or conceptual filters, stereotype-consistent but not stereotype-inconsistent information is successfully encoded and represented under conditions of limited capacity. Yet, it has become apparent that an efficient system not only must promote stability in its expectancies but must be responsive to contradictory data as well (e.g., Johnston & Hawley, 1994; McClelland et al., 1995; Nosofsky et al., 1994; Schank, 1982; Sherry & Schacter, 1987; Tulving et al., 1994). Indeed, humans seem to have specialized physiological mechanisms for detecting and encoding unexpected information (Cacioppo et al., 1994; Donchin & Coles, 1988; Johnston et al., 1990; McClelland et al., 1995; Tulving et al., 1994). In this study, we tested a model of stereotyping that promotes both stability and plasticity when resources are scarce.

According to our model, stereotype efficiency derives from the ability of stereotypes to facilitate, in different ways, the encoding of both stereotype-consistent and stereotype-inconsistent information when processing capacity is low. Stereotypes facilitate the encoding of consistent behaviors in these conditions by providing interpretive frameworks that render that information conceptually fluent. However, because the basic gist of this information may be extracted with relatively little effort, greater resources are available for processing stereotype-inconsistent information. Thus, resources that are conserved through the conceptual fluency of stereotype-consistent information may be redirected to assist in the encoding of stereotype-inconsistent information. Moreover, because the meaning of consistent behaviors is extracted so easily, the perceptual details of these behaviors are encoded less carefully than the perceptual details of inconsistent information (Ehrlich & Rayner, 1981; Jacoby, 1983; Johnston & Hawley, 1994; Johnston et al., 1990; von Hippel et al., 1993, 1995).

Thus, when resources are limited, stereotypes facilitate the encoding of both stereotype-consistent and stereotype-inconsistent information. Inconsistent information receives greater attention and more thorough perceptual encoding in these conditions. However, despite these advantages, conceptual encoding favors consistent information in these same conditions. Through these encoding flexibility processes, when resources are scarce, stereotypes are able to promote their own stability (through conceptual encoding) while maintaining vigilance (through attentional distribution and perceptual encoding) that reorientation may become necessary.

The results of five experiments provided strong support for this encoding flexibility model. Experiments 1–3 tested our hypotheses about the distribution of attentional resources under different encoding conditions. In Experiment 1, participants spent an equal amount of time reading consistent and inconsistent information when capacity was high but spent a greater amount of time reading inconsistent than consistent information when capacity was low. Experiment 2 used a dual-task paradigm to examine the amount of attention paid to consistent and inconsistent information as a function of cognitive capacity. When capacity was high, participants responded to a secondary task

equally quickly, regardless of whether consistent or inconsistent items were being encoded. In contrast, when capacity was low, participants took more time to respond to the secondary task when inconsistent items were being encoded than when consistent items were being encoded. Experiment 3 forced participants to attend selectively to either consistent or inconsistent information. The results showed that, when capacity was high, participants recognized consistent and inconsistent items from a pair equally well. However, when capacity was depleted, the inconsistent item in the pair was recognized with significantly greater accuracy than the consistent item. Together, these three experiments provide strong evidence that, when processing capacity is limited, greater resources are devoted to the encoding of inconsistent than consistent information. Strong filter models suggesting that attention will be directed toward consistent information and away from inconsistent information under low capacity conditions cannot account for these data.

Experiments 4 and 5 tested our hypotheses about the perceptual and conceptual encoding of stereotype-consistent and stereotype-inconsistent information. Each experiment used the same word identification task to measure different aspects of encoding. Experiment 4 showed that words taken from inconsistent behaviors were identified more successfully than words taken from consistent behaviors under conditions of both high and low processing capacity. This demonstrates that the perceptual details of inconsistent information are encoded more thoroughly than the perceptual details of consistent information. These findings extend current filter models of stereotype efficiency by demonstrating, for the first time, that certain aspects of encoding favor inconsistent over consistent information when processing capacity is low. Experiment 5 showed that, under high capacity conditions, traits related to the meaning of consistent and inconsistent behaviors were identified equally well. In contrast, when encoding capacity was limited, traits related to the meaning of consistent behaviors were identified with significantly greater success than traits related to the meaning of inconsistent behaviors. Thus, despite the attentional and perceptual encoding advantages for inconsistent information, conceptual encoding favors consistent information when resources are low.

Mechanisms of Stereotype Plasticity

One of the most important challenges for future research will be to identify the mechanisms through which the attentional and perceptual encoding advantages for inconsistent information under conditions of limited capacity ultimately contribute to stereotype plasticity. It would seem that these factors would have to contribute to stereotype change in some way. One possibility is that the increased effort directed at encoding inconsistent information increases the conceptual fluency of subsequently encountered inconsistent behaviors. As effort toward trying to comprehend inconsistent information is increased, eventually more and more of those behaviors will begin to make sense. At some point, perceivers will be able to extract their basic gist successfully, regardless of processing capacity.

Careful encoding of the perceptual details of inconsistent behaviors may also help perceivers to reconstruct the facts at a later time when they have more resources available to help understand the behaviors. In fact, a number of researchers have

argued that the purpose of episodic memory is to record the details of unexpected events for later inspection (e.g., McClelland et al., 1995; Nosofsky et al., 1994; Sherry & Schacter, 1987). In contrast, expected information is more likely to be recorded in semantic memory, where only the basic gist is extracted, stored, and retrieved. McClelland et al. (1995) and Nosofsky et al. (1994) have found support for these ideas in a number of simulation studies. We have also found evidence for these hypotheses in our own research. In two experiments, Sherman, Klein, Laskey, and Wyer (1998) showed that perceivers relied on episodic memory to differing degrees when they had learned stereotype-consistent and stereotype-inconsistent information about a target group. When the stimulus information confirmed participants' expectancies that in-groups would be positive and out-groups would be negative, judgments about the groups did not involve the activation of specific episodes. Instead, judgments were based on semantic summaries created during the encoding of the expected behaviors. In contrast, when the stimulus information suggested that the in-group was negative or that the out-group was positive, judgments of the groups were constructed by retrieving from memory specific behaviors. Perceivers did not form semantic summaries during the encoding of unexpected behaviors. These data demonstrate that, if perceivers are unable to extract the basic gist of unexpected behaviors, those episodes may be stored and retrieved for future use. Other work by Babey, Queller, and Klein (in press) further suggests that, as unexpected behaviors continue to accumulate, eventually a gist summary of those behaviors will be created. Thus, it would seem to be critical to encode the perceptual details of stereotype-inconsistent information when their conceptual meaning is difficult to extract. When these items are maintained in episodic memory, they are available for bolstering and additional interpretation should further inconsistencies arise. In this way, the perceptual encoding advantage for inconsistent information under conditions of low capacity may ultimately contribute to stereotype plasticity.

Stereotype Strength and Encoding Flexibility

According to our model, attention may shift from stereotype-consistent to stereotype-inconsistent information because stereotypes provide inferential frameworks that facilitate the encoding of stereotypical information and free up processing capacity. Moreover, because of the conceptual fluency of consistent behaviors, their perceptual details are not thoroughly encoded relative to inconsistent behaviors. Thus, factors that increase the inferential power provided by a stereotype should increase one's ability to shift attention from consistent to inconsistent information and should increase the relative perceptual encoding advantage for inconsistent information. One factor that may be expected to influence processing in this way is the strength with which a perceiver holds a particular stereotype. The more strongly a stereotype is held by a perceiver, the more useful that stereotype will be for interpreting consistent information. Thus, as stereotype strength increases, so too should perceivers' ability to shift resources from consistent to inconsistent information. This should be particularly true when resources are low and the stereotype is more likely to be applied as an interpretational

tool. Moreover, as stereotype strength increases, so too should the perceptual encoding advantage for inconsistent information.

It is in the initial stages of stereotype development, when stereotypes act more as hypotheses than as strong expectancies, that attentional allocation and perceptual encoding are more likely to be biased toward stereotype-confirming information (e.g., Klayman & Ha, 1987; Skov & Sherman, 1986). In such cases, the stereotype will be less useful for interpreting consistent information. In addition, the stereotype may not present a strong enough expectancy to produce clearly identifiable inconsistent data (e.g., Hamilton & Sherman, 1996; Sherman, 1996; Sherman & Klein, 1994; Srull, Lichtenstein, & Rothbart, 1985). Inconsistent information may draw attention only to the extent that it violates some expectancy (e.g., Schank, 1982). Indeed, information that allows one to establish a viable expectancy for future use may receive more careful processing than information that challenges an expectancy that is weak to begin with. Thus, when stereotypes are weak, consistent information may attract more attention and perceptual encoding than inconsistent information. However, as stereotypic expectancies congeal, consistent information becomes conceptually fluent, and disconfirming information becomes easier to identify and gains in importance. As a result, resources are more likely to shift from consistent to inconsistent information. These predictions may again be contrasted with those of attentional filter models, which suggest that the stronger the stereotype, the greater the extent to which inconsistent information will be filtered out when capacity is low.

Paradoxically, the preceding discussion suggests that, in the long run, strong stereotypes may actually be easier to change than weak ones. Although this may appear counterintuitive, there is precedent for such a prediction in the social psychological literature. For example, Kerpelman and Himmelfarb (1971) demonstrated that consistent associative reinforcement that certain social groups possessed particular trait attributes led to the formation of stronger attitudes about the groups than did intermittent reinforcement. However, the stronger group impressions were also unlearned more quickly than the weaker impressions in response to subsequent impression-discrepant information. This conclusion is consistent with the large body of research on the ease with which conditioned responses are extinguished after different schedules of reinforcement (Skinner, 1953). Although consistent reinforcement leads to stronger behavioral responses than intermittent reinforcement, responses following consistent reinforcement are more easily extinguished. A second example of such an effect comes from McGuire's (1964) inoculation research program. One of the conclusions from that research is that widely shared cultural truisms that are rarely questioned (and are thus strongly held) may be more vulnerable to attack and more easily changed than attitudes that have been challenged and have evoked counterargument. Thus, there is empirical support for the idea that stronger expectancies may be changed more easily than weaker expectancies. Whether such findings would be observed in the domain of stereotype change and what role encoding flexibility might play in such processes are intriguing questions for future research.

Implications for Dual-Process Models of Stereotyping

In a related matter, the model we have outlined and the accompanying data have significant implications for dual-process

models of stereotyping. Dual-process models have been developed to account for the conditions under which target judgments are dependent on top-down, stereotype-driven processes versus bottom-up integration of individual target behaviors (see Bodenhausen, Macrae, & Sherman, in press, for a review). Two prominent dual-process theories of stereotyping are those proposed by Brewer (1988) and Fiske and Neuberg (1990). In Brewer's analysis, perceivers may rely on either stereotypes or individuating information in forming their impressions, but not both at the same time. According to Fiske and Neuberg's model, stereotyping and individuating processes represent separate extremes of a continuum. As perceivers move toward one end of the continuum, processes associated with the other end of the continuum are diminished. Thus, in both Brewer's (1988) and Fiske and Neuberg's (1990) models, factors that promote stereotyping necessarily decrease the extent to which perceivers attend to and use individuating information, particularly inconsistent behaviors that may not be easily assimilated to the stereotype. However, our results suggest that this is not always the case. In our research, decreases in processing capacity were shown to increase both stereotyping processes (conceptual fluency processes) and certain individuating processes (attentional direction and perceptual encoding of inconsistent as compared with consistent information) at the same time. These results argue for a more flexible dual-process approach. In particular, they suggest that stereotype use and individuation should be conceived as two separate but related continua rather than as mutually exclusive processing modes. Moreover, movement along the two continua may proceed along different dimensions of encoding at the same time. Thus, stereotyping may be increased via one mode of encoding (e.g., conceptual), whereas individuation is increased via a different mode of encoding (e.g., perceptual) simultaneously.

Processing Goals and Attentional Allocation

A useful blueprint for developing this model of stereotyping may be found in the multiple motive heuristic-systematic model developed by Chaiken, Liberman, and Eagly (1989). According to Chaiken et al.'s model, heuristic (e.g., stereotyping) and systematic (e.g., individuating) processes are separate but related modes of information processing. Depending on the goals of the perceiver, increases in heuristic use may be associated with either more or less systematic processing that may be relatively biased or not. Current models of stereotype efficiency suggest that, when processing capacity is depleted, perceivers' processing goals do not matter. Motivations may only be realized if sufficient capacity is available. In contrast, we would argue that stereotypes are multifaceted tools that can be recruited to serve many different goals when resources are depleted. Thus, increases in stereotyping may lead to more or less individuation, depending on perceivers' processing motives.

The present research demonstrated that perceivers directed resources away from consistent information and toward inconsistent information when capacity was low. However, we do not wish to claim that this will always be the case. The goal of participants in our experiments was to form an impression of a target person about whom they expected to be asked at some later time. Thus, participants were at least somewhat concerned

with the accuracy of their impressions. This may have contributed to the perceived value of the inconsistent information and participants' willingness to shift resources toward that information. However, stereotypes are evoked on many occasions in which accuracy is not the primary goal of the perceiver. In contrast to many other kinds of expectancies, there is a strong motivational component to stereotype use. Indeed, Lippmann (1922) spoke not only of the efficiency function of stereotypes but also of their defense function. Perceivers may ascribe to stereotypes as a means of coping with inner tension (e.g., Bettelheim & Janowitz, 1950; Dollard, Doob, Miller, Mowrer, & Sears, 1939), gaining rewards and avoiding punishment (e.g., Horowitz & Horowitz, 1938), or reinforcing a preferred view of out-group inferiority (e.g., Tajfel & Turner, 1986). More basically, stereotypes may be comforting because they allow people to feel that they can predict and control their environment (e.g., Kruglanski, 1989; Kruglanski & Freund, 1983; Lippmann, 1922). In many other contexts, then, one can imagine that perceivers might prefer to focus limited resources on information that confirms their stereotypes, despite the fact that this information may already be conceptually fluent (Chaiken et al., 1989; Kruglanski, 1989).

In support of this notion, Frey's (1986) review of the literature on postdecisional dissonance and selective exposure concluded that, in general, there is support for the idea that people seek out information that is consistent with a chosen course of action when inconsistent information would produce dissonance. This suggests that, to the extent that stereotype-disconfirming information arouses dissonance, attention may be preferentially directed toward consistent information. However, Frey also raised some notable exceptions to this process. In particular, when dissonant information is perceived to be useful in the long run, or when consonant information is highly familiar, people may instead choose to focus on dissonant information. Interestingly, Bardach and Park (1996) recently demonstrated relatively greater memory advantages for stereotype-inconsistent versus stereotype-consistent information among out-group members (vs. in-group members) and those with higher (vs. lower) levels of prejudice. These are precisely the kinds of people who might be expected to demonstrate motivational biases favoring consistent information. It is clear that more research is needed on the conditions that promote accuracy-based versus defense-based attentional allocation, particularly when these motives are in opposition to one another or processing capacity is constrained.

Conclusion

In closing, we would like to reemphasize that an efficient cognitive system ought to do more than simply make things easy for people at all costs. Rather, an efficient system ought to distribute limited resources in ways that maximize the informational value gained for the effort expended. There is a delicate balance between maintaining stability and allowing for plasticity in a cognitive system (e.g., Johnston & Hawley, 1994; McClelland et al., 1995; Sherry & Schacter, 1987). Systems that are either too conservative or too unstable would seem to be at a disadvantage. Our research suggests that stereotypes help to solve this problem by facilitating, in different ways, the encoding of both expected and unexpected information in the environ-

ment. The advantage for expected information is a conceptual one that facilitates the comprehension of this information. At the same time, there are attentional and perceptual advantages for the encoding of unexpected information. Not surprisingly, these advantages are most likely to be observed when capacity is limited and resources must be carefully distributed. It is in these situations that stereotypes are most useful for interpreting incoming stimuli. The fact that the thoroughly attended to and encoded inconsistent information does not carry the day when judgments are made does not impugn the efficiency of encoding flexibility. What is important is that the unexpected events have been noted and may be bolstered should further inconsistencies arise (Sherry & Schacter, 1987). In this way, the cognitive system preserves useful expectancies while maintaining vigilance for evidence that the expectancies are not so useful.

Although we have tested our model in the domain of stereotypes, we believe it applies to many other kinds of knowledge. We see this as a very general model of conceptual coherence that describes how people take advantage of preexisting knowledge to guide the encoding of new information. In terms of stereotype function, this means that there is a need to start thinking about stereotypes as much more versatile tools than crutches or filters.

References

- Allport, G. W. (1954). *The nature of prejudice*. Cambridge, MA: Addison-Wesley.
- Babey, S. H., Queller, S., & Klein, S. B. (in press). The role of expectancy violating behaviors in the representation of trait knowledge: A summary-plus-exemplar model of social memory. *Social Cognition*.
- Bardach, L., & Park, B. (1996). The effect of in-group/out-group status on memory for consistent and inconsistent behavior of an individual. *Personality and Social Psychology Bulletin*, 22, 169-178.
- Bargh, J. A., & Barndollar, K. (1996). Automaticity in action: The unconscious as repository of chronic goals and motives. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action* (pp. 457-481). New York: Guilford Press.
- Bassili, J. N., & Smith, M. C. (1986). On the spontaneity of trait attribution: Converging evidence for the role of cognitive strategy. *Journal of Personality and Social Psychology*, 50, 239-245.
- Bettelheim, B., & Janowitz, M. (1950). *Dynamics of prejudice*. New York: Harper.
- Bobrow, D. G., & Norman, D. A. (1975). Some principles of memory schemata. In D. G. Bobrow & A. Collins (Eds.), *Representation and understanding: Studies in cognitive science* (pp. 131-150). New York: Academic Press.
- Bodenhausen, G. V. (1988). Stereotypic biases in social decision making and memory: Testing process models of stereotype use. *Journal of Personality and Social Psychology*, 55, 726-737.
- Bodenhausen, G. V. (1990). Stereotypes as judgmental heuristics: Evidence of circadian variations in discrimination. *Psychological Science*, 1, 319-322.
- Bodenhausen, G. V., & Lichtenstein, M. (1987). Social stereotypes and information processing strategies: The impact of task complexity. *Journal of Personality and Social Psychology*, 52, 871-880.
- Bodenhausen, G. V., Macrae, C. N., & Garst, J. (1997). Stereotypes in thought and deed: Social-cognitive origins of intergroup discrimination. In C. Sedikides, J. Schopler, & C. A. Insko (Eds.), *Intergroup cognition and intergroup behavior* (pp. 311-335). Mahwah, NJ: Erlbaum.
- Bodenhausen, G. V., Macrae, C. N., & Sherman, J. W. (in press). On

- the dialectics of discrimination: Dual processes in social stereotyping. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology*. New York: Guilford Press.
- Brewer, M. B. (1988). A dual process model of impression formation. In T. K. Srull & R. S. Wyer, Jr. (Eds.), *Advances in social cognition* (Vol. 1, pp. 1–36). Hillsdale, NJ: Erlbaum.
- Britton, B. K., Westbrook, R. D., & Holdredge, T. S. (1978). Reading and cognitive capacity usage: Effects of text difficulty. *Journal of Experimental Psychology: Human Learning and Memory*, 4, 582–591.
- Cacioppo, J. T., Crites, S. L., Jr., Gardner, W. L., & Berntson, G. G. (1994). Bioelectrical echoes from evaluative categorizations: I. A late positive brain potential that varies as a function of trait negativity and extremity. *Journal of Personality and Social Psychology*, 67, 115–125.
- Chaiken, S., Liberman, A., & Eagly, A. H. (1989). Heuristic and systematic processing within and beyond the persuasion context. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 212–252). New York: Guilford Press.
- Challis, B., & Brodbeck, D. R. (1992). Level of processing affects priming in word fragment completion. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 18, 595–607.
- Cohen, J. (1987). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.
- Dollard, J., Doob, L. W., Miller, M. E., Mowrer, O. H., & Sears, R. R. (1939). *Frustration and aggression*. New Haven, CT: Yale University Press.
- Donchin, E., & Coles, M. G. H. (1988). Is the P300 component a manifestation of context updating? *Behavioral and Brain Sciences*, 11, 355–372.
- Ehrlich, S. F., & Rayner, K. (1981). Contextual effects on word perception and eye movements during reading. *Journal of Verbal Learning and Verbal Behavior*, 20, 641–655.
- Fiske, S. T. (1980). Attention and weight in person perception: The impact of negative and extreme behavior. *Journal of Personality and Social Psychology*, 38, 889–906.
- Fiske, S. T., & Neuberg, S. L. (1990). A continuum of impression formation, from category-based to individuating processes: Influences of information and motivation on attention and interpretation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 23, pp. 1–74). New York: Academic Press.
- Frey, D. (1986). Recent research on selective exposure to information. *Advances in Experimental Social Psychology*, 19, 41–80.
- Gilbert, D. T., & Hixon, J. G. (1991). The trouble of thinking: Activation and application of stereotypic beliefs. *Journal of Personality and Social Psychology*, 60, 509–517.
- Gilbert, D. T., Pelham, B. W., & Krull, D. S. (1988). On cognitive busyness: When person perceivers meet persons perceived. *Journal of Personality and Social Psychology*, 54, 733–739.
- Graesser, A. C. (1981). *Prose comprehension beyond the word*. New York: Springer-Verlag.
- Grier, J. B. (1971). Nonparametric indexes for sensitivity and bias: Computing formulas. *Psychological Bulletin*, 75, 424–429.
- Hamilton, D. L., & Sherman, J. W. (1994). Stereotypes. In R. S. Wyer, Jr., & T. K. Srull (Eds.), *Handbook of social cognition* (2nd ed., Vol. 2, pp. 1–68). Hillsdale, NJ: Erlbaum.
- Hamilton, D. L., & Sherman, S. J. (1996). Perceiving persons and groups. *Psychological Review*, 103, 336–355.
- Hashtroudi, S., Mutter, S. A., Cole, E. A., & Green, S. K. (1984). Schema-consistent and schema-inconsistent information: Processing demands. *Personality and Social Psychology Bulletin*, 10, 269–278.
- Hilton, J. L., Klein, J. G., & von Hippel, W. (1991). Attention allocation and impression formation. *Personality and Social Psychology Bulletin*, 17, 548–559.
- Horowitz, E. L., & Horowitz, R. E. (1938). Development of social attitudes in children. *Sociometry*, 1, 301–338.
- Jacoby, L. L. (1983). Remembering the data: Analyzing interactive processes in reading. *Journal of Verbal Learning and Verbal Behavior*, 22, 485–508.
- Jacoby, L. L. (1996). Dissociating automatic and consciously controlled effects of study/test compatibility. *Journal of Memory and Language*, 35, 32–52.
- Johnston, W. A., & Dark, V. J. (1986). Selective attention. *Annual Review of Psychology*, 37, 43–75.
- Johnston, W. A., Dark, V. J., & Jacoby, L. L. (1985). Perceptual fluency and recognition judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 11, 3–11.
- Johnston, W. A., & Hawley, K. J. (1994). Perceptual inhibition of expected inputs: The key that opens closed minds. *Psychonomic Bulletin and Review*, 1, 56–72.
- Johnston, W. A., Hawley, K. J., & Elliott, J. M. G. (1991). Contribution of perceptual fluency to recognition judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 17, 210–223.
- Johnston, W. A., Hawley, K. J., Plewe, S. H., Elliott, J. M. G., & DeWitt, M. J. (1990). Attention capture by novel stimuli. *Journal of Experimental Psychology: General*, 119, 397–411.
- Kerpelman, J. P., & Himmelfarb, S. (1971). Partial-reinforcement effects in attitude acquisition and counter-conditioning. *Journal of Personality and Social Psychology*, 19, 301–305.
- Kerr, B. (1973). Processing demands during mental operations. *Memory and Cognition*, 1, 401–412.
- Kim, H.-S., & Baron, R. S. (1988). Exercise and the illusory correlation: Does arousal heighten stereotypic processing? *Journal of Experimental Social Psychology*, 24, 366–380.
- Klayman, J., & Ha, Y. W. (1987). Confirmation, disconfirmation, and information in hypothesis-testing. *Psychological Review*, 94, 211–228.
- Kruglanski, A. W. (1989). *Lay epistemics and human knowledge*. New York: Plenum.
- Kruglanski, A. W., & Freund, T. (1983). The freezing and unfreezing of lay inferences: Effects on impression primacy, ethnic stereotyping, and numerical anchoring. *Journal of Experimental Social Psychology*, 19, 448–468.
- Lippmann, W. (1922). *Public opinion*. New York: Harcourt Brace Jovanovich.
- Macrae, C. N., Hewstone, M., & Griffiths, R. J. (1993). Processing load and memory for stereotype-based information. *European Journal of Social Psychology*, 23, 77–87.
- Macrae, C. N., Milne, A. B., & Bodenhausen, G. V. (1994). Stereotypes as energy-saving devices: A peek inside the cognitive toolbox. *Journal of Personality and Social Psychology*, 66, 37–47.
- Macrae, C. N., Stangor, C., & Milne, A. B. (1994). Activating social stereotypes: A functional analysis. *Journal of Experimental Social Psychology*, 30, 370–389.
- Masson, M. E. J., & MacLeod, C. M. (1992). Reenacting the route to interpretation: Enhanced perceptual identification without prior perception. *Journal of Experimental Psychology: General*, 121, 145–176.
- McClelland, J. L., McNaughton, B. L., & O'Reilly, R. C. (1995). Why there are complementary learning systems in the hippocampus and neocortex: Insights from the successes and failures of connectionist models of learning and memory. *Psychological Review*, 102, 419–457.
- McGuire, W. J. (1964). Inducing resistance to persuasion: Some contemporary approaches. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 1, pp. 191–229). San Diego, CA: Academic Press.
- Medin, D. L. (1988). Social categorization: Structures, processes, and

- purposes. In T. K. Srull & R. S. Wyer, Jr. (Eds.), *Advances in social cognition* (Vol. 1, pp. 119–126). Hillsdale, NJ: Erlbaum.
- Miller, D. T., & Turnbull, W. (1986). Expectancies and interpersonal processes. *Annual Review of Psychology*, *37*, 233–256.
- Minsky, M. (1975). A framework for representing knowledge. In P. H. Winston (Ed.), *The psychology of computer vision* (pp. 211–277). New York: McGraw-Hill.
- Morris, C. D., Bransford, J. D., & Franks, J. J. (1977). Levels of processing versus transfer appropriate processing. *Journal of Verbal Learning and Verbal Behavior*, *16*, 519–533.
- Mulligan, N. W. (1998). The role of attention during encoding in implicit and explicit memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *24*, 27–47.
- Mulligan, N. W., & Hartman, M. (1996). Divided attention and indirect memory tests. *Memory & Cognition*, *24*, 453–465.
- Neisser, U. (1976). *Cognition and reality*. San Francisco: Freeman.
- Nosofsky, R. M., Palmeri, T. J., & McKinley, S. C. (1994). Rule-plus-exception model of classification learning. *Psychological Review*, *101*, 53–79.
- Olson, J. M., Roese, N. J., & Zanna, M. P. (1996). Expectancies. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 211–238). New York: Guilford Press.
- Pratto, F., & Bargh, J. A. (1991). Stereotyping based on apparently individuating information: Trait and global components of sex stereotypes under attention overload. *Journal of Experimental Social Psychology*, *27*, 26–47.
- Richardson-Klavehn, A., & Bjork, R. A. (1988). Measures of memory. *Annual Review of Psychology*, *39*, 475–543.
- Roediger, H. L. III. (1990). Implicit memory. *American Psychologist*, *45*, 1043–1056.
- Rosenthal, R. (1991). *Meta-analytic procedures for social research*. Newbury Park, CA: Sage.
- Schank, R. C. (1982). *Dynamic memory*. Cambridge, England: Cambridge University Press.
- Schank, R. C., & Abelson, R. (1977). *Scripts, plans, goals, and understanding*. Hillsdale, NJ: Erlbaum.
- Sherman, J. W. (1996). Development and mental representation of stereotypes. *Journal of Personality and Social Psychology*, *70*, 1126–1141.
- Sherman, J. W., & Bessenoff, G. R. (in press). Stereotypes as source monitoring cues: On the interaction between episodic and semantic memory. *Psychological Science*.
- Sherman, J. W., & Frost, L. A. (in press). On the encoding of stereotype-relevant information under cognitive load. *Personality and Social Psychology Bulletin*.
- Sherman, J. W., & Klein, S. B. (1994). Development and representation of personality impressions. *Journal of Personality and Social Psychology*, *67*, 972–983.
- Sherman, J. W., Klein, S. B., Laskey, A., & Wyer, N. A. (1998). Intergroup bias in group judgment processes: The role of behavioral memories. *Journal of Experimental Social Psychology*, *34*, 51–65.
- Sherry, D. F., & Schacter, D. L. (1987). The evolution of multiple memory systems. *Psychological Review*, *94*, 439–454.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.
- Skov, R. B., & Sherman, S. J. (1986). Information-gathering processes: Diagnosticity, hypothesis-confirmatory strategies, and perceived hypothesis confirmation. *Journal of Experimental Social Psychology*, *22*, 93–121.
- Srull, T. K. (1984). Methodological techniques for the study of person memory and social cognition. In R. S. Wyer, Jr., & T. K. Srull (Eds.), *Handbook of social cognition* (Vol. 2, pp. 1–72). Hillsdale, NJ: Erlbaum.
- Srull, T. K., Lichtenstein, M., & Rothbart, M. (1985). Associative storage and retrieval processes in person memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *11*, 316–345.
- Stangor, C., & Duan, C. (1991). Effects of multiple task demands upon memory for information about social groups. *Journal of Experimental Social Psychology*, *27*, 357–378.
- Stangor, C., & McMillan, D. (1992). Memory for expectancy-congruent and expectancy-incongruent information: A review of the social and social developmental literatures. *Psychological Bulletin*, *111*, 42–61.
- Stern, L. D., Marrs, S., Millar, M. G., & Cole, E. (1984). Processing time and the recall of inconsistent and consistent behaviors of individuals and groups. *Journal of Personality and Social Psychology*, *47*, 253–262.
- Stroessner, S. J., & Mackie, D. M. (1993). Affect and perceived group variability: Implications for stereotyping and prejudice. In D. M. Mackie & D. L. Hamilton (Eds.), *Affect, cognition, and stereotyping: Interactive processes in group perception* (pp. 63–86). San Diego, CA: Academic Press.
- Swann, W. B., Jr. (1984). Quest for accuracy in person perception: A matter of pragmatics. *Psychological Review*, *91*, 457–477.
- Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel & W. Austin (Eds.), *The psychology of intergroup relations* (2nd ed., pp. 7–24). Chicago: Nelson-Hall.
- Taylor, S. E., & Crocker, J. (1981). Schematic bases of social information processing. In E. T. Higgins, C. P. Herman, & M. P. Zanna (Eds.), *Social cognition: The Ontario Symposium* (Vol. 1, pp. 89–134). Hillsdale, NJ: Erlbaum.
- Toth, J. P., Reingold, E. M., & Jacoby, L. L. (1994). Toward a redefinition of implicit memory: Process dissociations following elaborative processing and self-generation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *20*, 290–303.
- Tulving, E., Markowitsch, H. J., Kapur, S., Habib, R., & Houle, S. (1994). Novelty encoding networks in the human brain: Positron emission tomography data. *Neuroreport*, *5*, 2525–2528.
- Tulving, E., & Thomson, D. M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, *80*, 352–373.
- von Hippel, W., Jonides, J., Hilton, J. L., & Narayan, S. (1993). Inhibitory effect of schematic processing on perceptual encoding. *Journal of Personality and Social Psychology*, *64*, 921–935.
- von Hippel, W., Sekaquaptewa, D., & Vargas, P. (1995). On the role of encoding processes in stereotype maintenance. *Advances in Experimental Social Psychology*, *27*, 177–254.
- White, J. D., & Carlston, D. E. (1983). Consequences of schemata for attention, impressions, and recall in complex social interactions. *Journal of Personality and Social Psychology*, *45*, 538–549.
- Wilder, D. A., & Shapiro, P. (1989). Role of competition-induced anxiety in limiting the beneficial impact of positive behavior by an out-group member. *Journal of Personality and Social Psychology*, *56*, 60–69.

Received February 29, 1996

Revision received February 4, 1998

Accepted February 9, 1998 ■