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The Role of Cognitive Control

EARLY SELECTION VERSUS LATE CORRECTION

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Marge Schott, owner of the Cincinnati Reds, was in the news in the spring and summer of 1996 because of her inflammatory remarks about minorities. Subsequently, she was removed from control of the Cincinnati Reds and prohibited from attending their games through 1998. During the controversy, she was interviewed for *Sports Illustrated* magazine (Reilly, 1996). We find an exchange recorded in the article written about that interview to be of particular interest. Marge Schott said: "There's what's-his-name, honey." The interviewer responded: "Who?" Schott replied: "The guy I'm paying $3 million a year to sit on his butt" (p. 84). The interviewer then noted that the player in question was a famous pitcher who, because of injury, had not played for any of the 1996 season or for part of the 1995 season. The player was paid $6.15 million a year, not the $3 million a year claimed by Schott.

If she had been asked about this conversation, it seems certain that Marge Schott would have told a different story than did the interviewer. The interviewer used her $3 million mistake, her failure to remember the player's name, and her insensitivity to the in-

jured player to build a case that she was incompetent and out of touch. In contrast, from Schott's perspective, the comment probably simply expressed her frustration over paying an employee a high salary when that employee was not obligated to work.

We offer a third perspective—the perspective of cognitive psychologists whose primary interest is in memory. We find it very interesting that Marge Schott was unable to remember the name of a person to whom she was paying such a high salary. Indeed, she seemed unable to remember anybody's name and so referred to everybody as "honey." Her emotional response also reflected an insensitivity to current norms in baseball salaries. Rather than being uniquely greedy, the pitcher could be seen as an outstanding participant in a system that rewards its members by giving them a fair share of the profits earned, with the absolute levels of salary being extraordinarily high in part because of the effects of inflation. The norm against which Schott compared the salary of the player was in all likelihood a very old one, formed at a much earlier time, when the situation for athletes was different. She was consistent in her

use of an antiquated norm: The ticket price for the Reds in 1996 was the lowest in the National League, and its stadium was the only place in the league where one could still buy a hot dog for $1. Later in this chapter, we speculate that there is a relation between Marge Schott's apparent memory deficit and her errors in monitoring. We compare her use of an antiquated norm to a reliance on habit—an automatic basis for responding—and we contrast habit with a consciously controlled basis for responding that can better take the current situation into account.

We are all sometimes guilty of acting on an emotional response or some other automatic process such as habit, rather than relying on reason. Epstein (1994; Epstein & Pacini, Chapter 23, this volume) contrasts an affect-laden experiential system of processing with an effortful, abstract, rational system. To illustrate the two systems, he describes a study in which people said their first thoughts in response to imaginary situations, such as having an accident while backing out of a parking space in which a friend had requested they park. Often people's first thought in this case was to blame the friend, and their first emotion was anger. Their second thought was more rational, accepting responsibility and even feeling guilty for blaming the friend. Chaiken's (1980) work on heuristic and systematic processing of persuasive messages also highlights the prevalence of alternatives to deliberative reasoning. People may be persuaded on the basis of minimal cues such as source credibility or the sheer length of a persuasive message, rather than expending the effort to evaluate the message systematically (see also Chen & Chaiken, Chapter 4, this volume).

AUTOMATIC BASES FOR RESPONDING

We are often reliant on the automatic. Uleman and his colleagues (Newman & Uleman, 1989; Winter & Uleman, 1984; see also Uleman, Chapter 7, this volume) found that people automatically abstract information about traits even when their task is to memorize. John Bargh (1997 and Chapter 18, this volume) vastly extends the realm of priming studies, such that nearly all behavior, affect, and motives appear automatic. Although

the selection of higher-level goals has traditionally been viewed as the epitome of conscious control, Bargh argues that even those goals are determined by accessibility effects due to priming and habit. For example, Chartrand and Bargh (cited in Bargh, 1997) primed participants in a supposedly unrelated first phase of an experiment with words related to the goal of forming an impression of someone (words such as "opinion," "personality," "evaluate") or with words related to the goal of memorizing ("absorb," "retain," "remember"). Priming with the former stimuli induced a goal of impression formation when participants later viewed lists of a target's behaviors, as shown by the patterns of greater free recall of behaviors and greater organization according to traits, compared to the patterns of people who were primed with the memory goal terms. Other experiments (Bargh, Gollwitzer, & Barndollar, cited in Bargh, 1997) primed achievement versus affiliation motives and observed corresponding behaviors in a situation where these goals conflicted. Bargh suggests that modern psychology has overemphasized the causal role of conscious choice as a legacy of serial-stage models of cognition. We return to the issue of independent processes versus stage models later in the chapter.

Automaticity in Frontal Lobe Patients

Patients with frontal lobe damage represent the case of a near-total lack of higher-level conscious control. Lhermitte (1983) describes a phenomenon in frontal lobe patients he calls "utilization behavior." If one places an object before a frontal lobe patient, the patient will often pick up and use the object (e.g., make cutting movements with a knife, write with a pen, or light a cigarette lighter). The behavior capture displayed in examples of utilization behavior also occurs at the level of situations and roles. Lhermitte took a man and a woman who were both frontal lobe patients to a reception at a professional conference where neither of the patients had any role. The woman quite inappropriately took on the role of server at the conference. The man, just as inappropriately, took on the role of visiting dignitary. These examples of behavior capture provide a vivid demonstration of the power of context in combination with prior knowledge

and experiences to produce automatic influences on behavior. People with fully functioning frontal lobes would be unlikely to assume either of these roles, but instead would clearly acknowledge their roles as outsiders. Perhaps accessibility effects are best thought of as automatic influences that can be opposed by consciously controlled intentions.

Emotional responses are critically important in shaping behavior, and they may also be examples of automatic influences on responding. However, in this case, frontal lobe patients illustrate what can happen when a normally automatic process of emotional responding does not occur. Damasio (1994) has noted that frontal lobe patients often make terrible decisions in real life, even though they perform perfectly normally on laboratory tests of reasoning and decision making. To try to pick up the judgment problems seen in natural situations, Damasio and Bechara (cited in Damasio, 1994) have devised a "gambling" paradigm, in which participants are given play money and seated in front of four decks of cards labeled A, B, C, and D. The object of the game is to increase the money by selecting cards one at a time from the four decks. Most cards have a payoff, but some cards demand that a player pay back money. Nothing else about the game is explained, so the player must learn about the decks by playing. Turning cards in decks A and B generally pays double that of turning cards in decks C and D, but the payback cards are for much higher sums for decks A and B. So, although decks A and B generally pay higher sums, they are accompanied by high risk; and playing them over the long haul will lead to large losses.

Most normal participants sample all four decks at first and are lured into playing decks A and B. However, after about 30 cards they have experienced enough large losses on decks A and B to stop playing them and settle in on decks C and D. In contrast, ventromedial frontal lobe patients are lured into playing decks A and B, but never learn from the high penalties. They stay with decks A and B, even though they go bankrupt halfway through the game and have to borrow money from the experimenter. It is not an intellectual problem for the frontal lobe patients. At the end of the experiment, they can say that decks A and B are dangerous and risky. However, this intellectual understanding of danger seems unaccompanied by an emotional anticipation as they consider drawing from the decks. In fact, unlike normal participants, who develop a stronger and stronger galvanic skin response (GSR) when they consider drawing from decks A and B, frontal lobe patients show no GSR as they consider those decks. They do show normal GSRs to winning and losing, but lack what Damasio calls a "somatic marker" that would allow them to anticipate the danger in decks A and B.

This dissociation between emotional response and reason is important, because it complements previous findings of dissociations where people show emotional responses in the absence of conscious access to the source of the emotional response. Damasio uses the dissociation findings to argue that reasoning in domains with real consequences is normally inextricably linked to and supported by emotion. We note that the emotional response is typically acquired automatically and serves an important role in shaping behavior.

Dissociations

Dissociations have been critically important for recent theories of memory. Amnesics are the paradigm case: Although they may show little or no ability to consciously recall or recognize events that occur after the onset of their amnesia, they nonetheless reveal the effects of specific past experiences indirectly in their performance on various tasks. These indirect effects of memory include increases in the likelihood of completing word fragments or stems with recently read words. Similar dissociations have been confirmed in people with normally functioning memory, as various independent variables produce dissociative effects on direct memory tests of recall and recognition versus indirect memory tests such as fragment completion (for reviews, see Kelley & Lindsay, 1996; Roediger & McDermott, 1993). As we will discuss later, the ability to consciously recollect events affords much more control over later behavior than do unconscious influences of the past.

Social psychologists have long realized the potential value of indirect tests as a means of measuring attitudes. For example, Gilbert and Hixon (1991) had an Asian American assistant versus a European American assistant

hold up cards displaying word fragments, which participants were to complete. Participants' choice of completion words revealed their stereotype of Asians. The word fragment "ri_e" was more likely to be completed with "rice" and the fragment "poli_e" was more likely to be completed with "polite" when an Asian woman was holding up the cards. (Interestingly, the stereotype activation didn't occur when participants were cognitively overloaded by an additional task, which suggests that when the participants were preoccupied, the woman was simply seen as a card holder.) Banaji and Greenwald (1994, 1995) argue for the value of indirect tests as a measure of attitudes. Analogous to projective tests, indirect tests are said to circumvent social desirability to reveal "true" attitudes in a way that direct tests of attitudes cannot.

Among the indirect tests of attitudes discussed by Banaji and Greenwald was our "false-fame" effect. We describe the false-fame effect in this chapter, using it to illustrate the general class of "opposition procedures" that we have employed to show separate effects of automatic and consciously controlled processes. Important advantages can be gained by placing processes in opposition rather than in concert, as is often done for indirect tests. Use of opposition procedures is sufficient to reveal the existence of separate bases for responding. However, we go beyond demonstrating existence to describe procedures that can be used to measure the separate contributions of automatic and consciously controlled processes. By doing so, we provide a different perspective for understanding a type of effect that has been very important to social psychologists—accessibility effects of the sort revealed by Gilbert and Hixon's (1991) experiment.

We argue that effects of category accessibility (e.g., Bruner, 1957) are the same as the memory preserved by amnesics and the automatic form of responding that marks the behavior capture of frontal lobe patients. The automatic basis for responding does not reveal attitudes that are any more "true" than the attitudes revealed by consciously controlled responding as measured by direct tests. Rather, the two types of processes serve as independent bases for responding. The situation is analogous to separating the contributions of knowledge and guessing to performance on

a multiple-choice test. Accessibility effects map onto guessing, whereas consciously controlled processes map onto knowledge. As we will show, "guesses" can be very revealing. However, we argue that guesses have been overinterpreted: The contribution of consciously controlled processing has been relatively neglected by emphasizing situations that rely heavily on accessibility effects.

Much of our recent research has been aimed at age-related deficits in memory. Our goals have been to devise better methods for diagnosing such deficits, along with treatment programs to remedy or diminish age-related differences. The general population is aging, which will lead to a much greater prevalence of Alzheimer's disease (AD) and other diseases that produce tragic reductions in cognitive functioning. In addition, frontal lobe functioning declines with aging (Albert & Kaplin, 1980; Daigneault, Braun, & Whitaker, 1992; West, 1996). We hope that this chapter will help persuade social psychologists to join us in our interest in age-related differences. An important applied problem and test for theorizing can be captured by this question: Can we "rehabilitate" Marge Schott? If she is indeed suffering from some form of cognitive difficulty, she is going to be joined by many others in the near future. We end by speculating about implications of our research for repairing her "deficits."

ADVANTAGE OF OPPOSITION: FAME AND IRONIC EFFECTS OF REPETITION

Baddeley and Wilson (1994) have attempted to rehabilitate the memory performance of people with various forms of neurological damage by building on their intact automatic influences of memory. Our goal is somewhat different, in that we want to measure and train intentional uses of memory. As described later, our hope is that we can return control of memory to the memory-impaired individual, instead of placing the control of memory in the environment.

False Fame

A person can become famous overnight, or even sooner if the audience is not paying atten-

tion (Jacoby, Kelley, Brown, & Jasechko, 1989; Jacoby, Woloshyn, & Kelley, 1989). In one series of experiments, automatic influences of memory (familiarity) were placed in opposition to recollection, allowing us to infer recollection deficits through the errors that people commit. Participants read a list of names that they were told were nonfamous, and then took a fame judgment test consisting of old nonfamous names mixed with new famous and new nonfamous names. The prior presentation of nonfamous names increased their familiarity, which made it more likely that the names would be mistakenly judged as famous. However, if participants could remember the source of the name correctly, then any automatic influence of familiarity would be opposed, as they could be certain that the name was nonfamous. In other words, to the extent that participants were able to recollect, they could avoid undesirable effects of the past.

Fame judgment tests were performed immediately after participants read the list of nonfamous names or 24 hours later. Results revealed a "false-fame" effect after a 24-hour delay, in that old nonfamous names were *more* likely to be mistakenly called famous than were new nonfamous names. In contrast, when participants took the fame judgment test immediately after reading the names, the results were the opposite: old nonfamous names were *less* likely to be called famous than were new nonfamous names. This combination of results is akin to a sleeper effect (Hovland & Weiss, 1951). When the test was immediate, participants were able to escape misleading automatic influences of memory by recollecting source information. However, when recollection was reduced by extending the retention interval or by dividing attention at study or test, then the false-fame effect was observed.

Because of a deficit in ability to recollect, individuals with a memory impairment might show a false-fame effect even on an immediate test. Indeed, elderly adults do show a pronounced immediate false-fame effect (Dywan & Jacoby, 1990; Jennings & Jacoby, 1993), as do amnesics (Cermak, Verfaellie, Butler, & Jacoby, 1993; Squire & McKee, 1992) and patients who have sustained a closed head injury (Dywan, Segalowitz, Henderson, & Jacoby, 1993). We have made use of such misleading effects of automatic influences of

memory to diagnose deficits in recollection in elderly adults.

Ironic Effects of Repetition

A friend whose mother is suffering symptoms of AD tells the story of taking her mother to check out a nursing home. The rules and regulations were explained during an orientation lecture, including an explanation of how the dining room operated. The dining hall was described as similar to a restaurant, except that tipping was not required. In fact, the absence of tipping was mentioned frequently during the lecture as an illustration of the quality of care and the advantages of paying in advance. At the end of the meeting, the friend's mother was asked whether she had any questions. She replied that she only had one: "Should I tip?"

Similar to this unwanted effect of repetition, repeated asking of questions is one of the most striking and frustrating symptoms of AD. For the AD patient, each repetition of a question seems to "strengthen" it and paradoxically increases the probability of repeating the question, whereas for people with normally functioning memory, that automatic strengthening is opposed by their ability to recollect earlier asking the question (along with its answer). Repetition may well have two effects, serving both to automatically increase the strength of the question and to increase the probability of recollecting that one already asked it. Because of a deficit in recollection, the AD patient is left only with the increase in strength and so is condemned to repeatedly asking the same question. The result is similar to the false-fame effect in showing automatic influences of memory that are unopposed by recollection.

Jacoby (in press) used an opposition procedure to examine age-related differences in memory and to show that repetition does indeed have two effects. Young and elderly adults read a list of words, with each word being read either one, two, or three times. Next they listened to a list of words that they were told to remember for a later test. At test, participants were instructed to identify words that were heard earlier, and were warned that the test list would include words that were read earlier. They were further told that the earlier-read words were to be excluded, be-

cause none of those words were in the list of words that they had heard. Repeatedly reading a word would increase its familiarity and might also increase the likelihood that the word would be mistakenly judged as having been heard, because of a misattribution of the source of the familiarity. However, recollection of having read the word would oppose its familiarity, allowing the word to be excluded, just as in the false-fame experiments.

Because of a deficit in recollection, the performance of elderly participants revealed the strengthening effect of repetition. For elderly participants, repeatedly reading a word *increased* the probability of their mistakenly accepting the word as one that was earlier heard (Table 19.1). The strengthening effect of repetition, unopposed by recollection, may be what underlies AD patients' repetition of questions. Younger participants, in contrast, were better able to use recollection to oppose familiarity. For younger participants, repeatedly reading a word made it more likely that they would later recollect that the word was read, allowing them to be certain it was not heard. For them, repeated reading of a word *decreased* the probability of their mistakenly accepting the word as one that was heard earlier.

The use of recollection is generally slower and more effortful than is reliance on familiarity to make decisions. This difference between the two bases for memory judgments suggests that one could arrange conditions such that young participants would show "ironic" effects of repetition similar to those shown by elderly adults. For example, if young adults were forced to respond rapidly, repeatedly reading a word might have the ironic effect of making it more likely that the word would be mistakenly accepted as heard earlier, just as was found for the elderly participants. Indeed, this was shown to be the case: Forcing young adults to respond rapidly produced effects of repetition that were opposite to those observed when more time was allowed for responding, leading to the same pattern of results produced by the elderly participants. This might suggest that the problem for elderly participants was that they simply did not have enough time to engage in recollection. Because of general slowing (Salthouse, 1991), elderly participants might require more time than younger participants might. However, allowing elderly participants more time to respond was not sufficient to eliminate the ironic effect of repetition. Even when the elderly were allowed more time, repeated reading of a word still increased the probability of its being mistakenly accepted as heard earlier. The ironic repetition effect found for the elderly reflects an age-related deficit in recollection.

We refer to the false-fame effect and to the misleading effect of repetition as "ironic effects," to highlight their similarity to the ironic effects described by Wegner (1994). Wegner has shown that attempts to avoid mental states can have the ironic effect of increasing the probability of their occurrence.

TABLE 19.1. Probability of Identifying Words as Heard Earlier

Response deadline	Read presentations			New	Heard
	1×	2×	3×		
Young					
Long (1,250/750)	.35	.31	.21	.22	.63
Short (750)	.31	.40	.45	.18	.43
Elderly					
Long (1,250/750)	.43	.53	.59	.19	.52
Extra long (1,250/ASAP)	.35	.42	.44	.14	.52

Note. Both for the young and elderly participants, the long (1,250/750) response deadline refers to a 1,250-ms delay before response signal, after which there was a 750-ms response window. The young short (750) response deadline for the young participants refers to a response window of 750 ms (i.e., there was no delay or response signal). The extra long (1,250/ASAP) response deadline for the elderly participants refers to a 1,250-ms delay before response signal, after which they were to respond as soon as possible. Adapted from Jacoby (in press). Copyright 1998 by the American Psychological Association. Reprinted by permission.

For example, as Marge Schott would probably testify, trying to avoid saying things that are sexist or racist can actually increase the probability of making such statements (Wegner, Erber, & Bowman, cited in Wegner, 1994). Attempts to avoid politically incorrect statements increase their accessibility, just as earlier reading of a nonfamous name increases its familiarity, and repetition of a word increases its strength. In all these cases, the result is an automatic influence that can produce an ironic effect if left unopposed by cognitive control.

Reinstating study context can also produce an ironic effect of memory. As a commonplace example, most people have had the experience of telling a joke to the very person from whom they originally heard the joke. In the context of the person who earlier told the joke, the joke comes to mind and is told as one the person might enjoy, left unopposed by recollection of its original telling. The ironic effect seems surprising, because one might expect the presence of the person to serve as a powerful cue for recollection of the earlier telling of the joke. We have evidence to show that reinstating associative context has two effects, just as repetition does. Reinstating associative context decreases the probability of exclusion after divided attention during study, but has the opposite effect after full attention during study (Jacoby, 1996).

In an experiment similar to the one described above, words read in a first list were presented with a context word during study, and that context word was either presented again at test or not. When context was reinstated at test, young participants who had ample time to respond were *less* likely to mistake a read word for one that was heard in a second list than when the context was not reinstated. In contrast, the elderly and the young participants who were forced to respond rapidly were *more* likely to mistakenly accept a read word as a heard word when context was reinstated. Reinstating context thus both increased accessibility and increased the probability of recollection. Similarly, Trope (1986; Trope & Gaunt, Chapter 8, this volume) has shown that context effects on accessibility can alter the interpretation of an ambiguous stimulus, and furthermore that such effects on interpretation are separate from the effects of context on attribution processes. Ironic effects result when the effects of context on accessibility are left unopposed by recollection.

Early Selection versus Late Correction: Process Dissociations

Use of opposition procedures is sufficient to produce results that demonstrate the existence of automatic or unconscious influences of memory, and is useful for diagnosing deficits in recollection—a form of consciously controlled processing. However, our research has been designed to go beyond demonstrations of existence to develop techniques that allow us to measure the separate contributions of consciously controlled and automatic processes. To estimate how much performance is accomplished by unconscious memory requires that we specify the relation between conscious and unconscious memory processes.

In much of our research, participants have been asked to complete word stems or word fragments. The reason for our interest in completion tasks is that even individuals with very dense amnesia show an effect of memory by being more likely to use an earlier-read word as a completion for a stem or fragment (e.g., "bone" as a completion for the fragment "b_n_") than they would be if the word had not been read in the experimental setting. For example, amnesics show near-normal memory for earlier-read words when asked to complete fragments with the first word that comes to mind (an indirect test of memory), although their performance is much poorer than that of people with normally functioning memory when asked to use the fragments as cues for recall of the earlier-studied words (a direct test of memory) (e.g., Graf, Squire, & Mandler, 1984; Jacoby, 1982; Warrington & Weiskrantz, 1982). How do people with normally functioning memory use consciously controlled processing to accomplish cued recall in a way that is different from simply completing a stem with the first word that comes to mind?

One answer to that question is that consciously controlled processes can serve to edit or "correct" potential responses whose accessibility reflect unconscious memory. Jacoby and Hollingshead (1990) advocated an account of this sort by proposing a "generate-

recognize" model to describe recall cued by presentation of word stems. According to this model, earlier reading of a word makes the word later come more readily to mind as a completion for a stem—an automatic influence of memory on the generation of candidate responses for cued recall. Candidate responses are then subjected to a recognition memory test prior to their output. For a test of cued recall, only those words that are recognized as earlier studied are given as a response. Thus, a direct test of cued recall is said to differ from an indirect test of stem completion only in that the direct test involves a recognition memory check. The role of consciously controlled processes is to edit the products of unconscious processes, correcting inappropriate responses so as not to mistakenly output words that were not studied. This is a "late-correction" model of conscious control.

Our alternative is an "early-selection" model of conscious control, whereby conscious memory retrieval starts very early in processing, although it may take longer to complete than an automatic process. This analysis of the relation between automatic and controlled processes in memory tasks is very different from a "response plus correction" model. Conscious memory processes do not always simply follow automatic processes, but can occur in parallel and serve as an independent basis for responding. During attempts to remember, people may rely on conscious recollection of a prior event. In contrast, a response may simply pop into mind because of general knowledge or habit, or because of the sort of unconscious memory that an amnesic exhibits on an indirect memory test. According to the early-selection model, consciously controlled processes tightly constrain what comes to mind, resulting in recollection.

Much of our recent work has been aimed at showing that an early-selection model of conscious memory retrieval sometimes holds. To separately estimate the contributions of conscious recollection versus other bases for responding, we have arranged situations in which only conscious recollection can afford control over responding across experimental situations. Studies using the process-dissociation procedure (Jacoby, 1991; Jacoby, Toth, & Yonelinas, 1993) set up two condi-

tions in which people either tried to or tried not to respond when they could consciously recollect an event. The difference in performance between the two conditions provided an estimate of how much conscious recollection contributed to their performance.

According to the early-selection model, when participants were instructed to consciously remember and to give the first response that comes to mind when they cannot remember (the inclusion condition), their responses should reflect the contributions of both recollection and unconscious memory, $R + U$, minus the overlap of the two processes, UR, or $R + (1 - R)U$. In contrast, when participants were instructed *not* to respond with what they consciously remembered (the exclusion condition), the probability that they would nonetheless inadvertently respond with an item that was studied should be $(1 - R)U$. The performances in the two conditions and the equations that describe them should enable estimates of conscious recollection and unconscious memory to be calculated. In a variety of studies using the process-dissociation procedure, dividing attention or forcing people to respond within a short deadline reduced the estimate of conscious memory, but left the estimate of unconscious memory intact. Those dissociations provided support for the use of the independence assumption in the equations.

The contrast between early-selection and late-correction models is a very general one. Consider the different ways that an exclusion memory task might be accomplished. To return to the task introduced with the "Should I tip?" example, a word that was repeatedly read might seem familiar, and elderly participants' failure to exclude those earlier-read words might reflect a failure to use source memory (Johnson, Hashtroudi, & Lindsay, 1993) to edit or correct familiarity—a relatively automatic influence of memory. Alternatively, one could use the test word as a cue for direct retrieval or recollection.

The same alternatives apply to social monitoring. Why doesn't the average person say obscenities when talking to a nun? According to the late-correction approach, the obscenities may well come to mind while speaking to a nun, but are withheld because they are recognized as being socially inappropriate to say. The early-selection view, in con-

trast, holds that the person is likely to be sufficiently situated in the "speaking to a nun" context that obscenities never come to mind. That is, cognitive control can take the context into account and operate to determine what comes to mind, rather than only being called forth to serve as an editor for the contents of consciousness.

Although both relations between consciously controlled and automatic processes hold, but in different situations (Jacoby, 1998a), we focus here on an early-selection model, rather than a late-correction model. We do so because the early-selection model has been relatively neglected, due to the greater intuitive appeal and unwarranted general acceptance of a late-correction model.

ACCESSIBILITY BIAS: TOWARD SEPARATING AUTOMATIC AND CONTROLLED PROCESSES

The "New Look" movement in perception (e.g., Bruner, 1957; Greenwald, 1992) argued that perception is influenced by expectancies, values, attitudes, and needs. If perception involves an act of categorization, then it should be influenced by the accessibility of different categories. Social psychology has explored these influences by studying individual differences in the accessibility of particular traits, stereotypes, and attitude categories (Bargh & Pietromonaco, 1982; Fazio, 1986), as well as temporary changes in accessibility due to recent experience that primes a category (e.g., Devine, 1989; Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1980).

The current view in social psychology is that automatic processes provide an early-stage or preliminary analysis that is then "corrected" by more consciously controlled processing (but see Bargh, Chapter 18, this volume). For example, Devine's (1989; Devine & Monteith, Chapter 17, this volume) theory of stereotyping suggests that all members of a culture possess knowledge of various stereotypes—knowledge that is made automatically accessible by priming and so affects judgments of targets. However, people who are not prejudiced strive to counteract these automatic processes by consciously thinking egalitarian thoughts. Similarly, Gilbert and his colleagues (see Gilbert, 1989 for a review)

suggest that perceivers categorize and characterize another person's behavior automatically in terms of personality dispositions, and then, if the perceivers not cognitively overloaded, correct for situational factors.

Although we agree that consciously controlled processes do sometimes serve to correct automatic processes, we believe that cognitive control more often serves an early-selection role, as in the case of obscenities' not coming to mind around a nun. Next, we describe an experiment done to examine effects of a "stereotype" on perception, which illustrates the difference between early-selection and late-correction forms of cognitive control.

The contrast between the two views holds for perception as well as for social monitoring. Perceptual identification has been an important indirect memory test used to show memory dissociations. For example, Jacoby and Dallas (1981) found that reading a word in the experimental setting enhanced its perceptual identification when the word was later briefly flashed, and that this effect on perception did not depend on recognition memory for the word. A recent experiment (Jacoby, 1998b) extended this earlier research to show that prior experience can serve as a basis for guessing during a perceptual task.

Habits of varying strength were created in the first phase of the experiment by having people view words with a fragment of a related word (e.g., "knee–b_n_") on a computer monitor and attempt to predict how those fragments would be completed by the computer program. Immediately after their prediction, one of two possible words was shown that completed the fragment. For some pairs, a biasing habit was created by showing a particular completion 75% of the time during the training phase. For example, 15 out of 20 times when the stimulus "knee–b_n_" was shown, it was completed by the word "bone," and on the remaining 5 trials it was completed by "bend." For other, unbiased pairs, the two completions were presented equally often, and one completion was arbitrarily designated as typical.

The second phase of the experiment was a perceptual task. Words were flashed for a brief duration (28 or 43 milliseconds [ms]), followed by a visual mask. Next the context

word and fragment (e.g., "knee–b_n_") were presented; participants were told to complete the fragment with the word that was flashed, or, if they were unable to identify the flashed word, to complete the fragment with the first word that came to mind. The flashed word was either congruent ("bone") or incongruent ("bend") with the habit ("knee–bone") formed in the first phase of the experiment.

This habit can be thought of as akin to a stereotype. As a result of training in the first phase of the experiment, participants learned that "bone" is the sort of a thing that is likely to hang around with "knee." Reliance on that stereotype might serve as a source of errors, resulting in reports of "bone" when "bend" was actually the flashed word. Indeed, there was a high probability of such an error for the incongruent test words (Table 19.2). The probability of "false perception" was much higher in the 75/25 condition than in the unbiased (50/50) condition, and was also higher when the flash duration was short (28 ms). To this point, the results were quite in line with the constructionism spawned by the New Look view of perception. Expectations established during the first phase apparently influenced perception.

However, a different interpretation emerged when the probability of *correct* perception for congruent test items was examined. The probability of correct perception increased with flash duration. Moreover, the improvement in correct perception for the congruent items in the 75/25 condition over the 50/50 condition was accompanied by a nearly equivalent increase in the likelihood of false perception on the incongruent items,

which fit with a bias to produce the habitual response. The bias produced a symmetrical increase in correct responding for congruent items and a decrease in correct responding for incongruent items.

Habit and perception were assumed to make independent contributions to the cued-perception test, as reflected by the equations $P + (1 - P)H$ for correct perception in the congruent cases and $(1 - P)H$ for false perception in the incongruent cases. The independence assumption represented by the equations was confirmed, because different variables produced dissociative effects on the estimates of habit versus perception. The estimate of habit in the perception test mirrored the strength of the habit established in the training phase, but this manipulation of habit strength had no effect on estimates of perception. In contrast, a short flash duration lowered the estimates of perception, but did not affect the estimate of habit.

In sum, these results showed that, contrary to the New Look view, habit or a stereotype did not truly influence perception. That is, habit did not result in an early "bone" percept that had to be corrected to allow the incongruent test word "bend" to be seen. Rather, habit served as a bias, coming into play only when perception failed $(1 - P)$. Note that we have not said that prior experience "just" influenced bias, as was often said by critics of the New Look approach who relied on signal detection theory to analyze their results (e.g., Eriksen, 1960). Our analysis differs from that of signal detection theory in that our dual-process model assumes that perception and habit serve as independent bases

TABLE 19.2. Probabilities of Correct Perception (CP) on Congruent Pairs and of False Perception (FP) on Incongruent Pairs across Training Condition and Mean Estimates of Perception (P) and Habit (H)

	Probabilities		Estimates	
Training condition	Cong. (CP)	Incong. (FP)	P	H
75/25				
Long duration	.81	.43	.37	.67
Short duration	.68	.65	.03	.66
50/50				
Long duration	.69	.32	.37	.51
Short duration	.51	.51	.00	.51

Note. Short duration, 28 ms; long duration, 43 ms. From Jacoby (1998b).

for responding, whereas signal detection theory is a single-process model. In our model, habit is an important process in its own right, as important as perception; it is described as a "bias" only when one focuses on the accuracy of perception.

Habit versus Recollection

One source of automatic responses on a memory test is responding on the basis of habit rather than on the basis of recollection of a particular event. For example, you may habitually leave your keys on your bedroom dresser, but one night you leave them on a table in your entryway. The next morning as you try to remember where you left your keys, you may recollect that you left the keys in the entryway, or you may think of them in their habitual location on the dresser. Hay and Jacoby (1996) used a variant of the process-dissociation procedure to show that habits could serve as a source of bias in cued-recall performance. The habitual response was meant to be analogous to the habit of leaving one's keys in a particular location.

The method of Hay and Jacoby's (1996) experiments paralleled that of the experiment on habit and perception described above. Habitual responses to word fragment combinations such as "knee–b_n_" were established in a first phase. In the second phase of the experiment, participants studied short lists of word pairs and took a cued-recall test. Some of the items on the study list were either congruent with the habit ("knee–bone") or incongruent with the habit ("knee–bend"). The second phase was meant to be analogous to a test of memory for a specific event (e.g., "Where did I leave my keys last night?").

The pattern of results was the same as that described above for the perception experiment. Varying the probability of a particular response during Phase 1 (75/25 vs. 50/50) influenced habit but did not affect the probability of recollecting the response studied in the short list. Other factors, such as the amount of time allowed for study of pairs in the short list, influenced recollection but did not affect habit. Requiring people to respond rapidly, as compared to allowing more time for a response, reduced the probability of recollection but left the estimated contribution of habit unchanged. As described in conjunction

with the "Should I tip?" example, recollection is a slower process than habit, which is an automatic influence of memory. Whether participants were given a test of perception or one of recollection, habit served as a source of guesses, coming into play *only* when perception or recollection failed.

Kelley (1998) recently used a similar paradigm to show that preexisting habits—in this case, general knowledge—also make an independent contribution to memory performance. Participants studied a list of general-knowledge questions paired with what they thought were another student's answers, which were incorrect a certain proportion of the time. Later, they attempted to recall the studied answers when presented with the questions as cues. The estimate of memory in their cued-recall performance was sensitive to manipulations such as time delay, while the use of general knowledge was sensitive to the proportion of correct answers on the studied list. These studies of the interplay of habit and general knowledge with recollection are similar to social-psychological analyses of chronic accessibility effects.

In the studies outlined above, the habit of responding with "knee–bone" whether or not it had been studied can be characterized as an accessibility bias. Similarly, unconscious memory effects can also be characterized as an accessibility bias: Recent experience changes what comes to mind during a task, independently of the likelihood that the person will consciously recollect the experience (see also Jacoby, McElree, & Trainham, in press). However, accessibility bias did not influence perception or remembering, as would be expected from a late-correction model of the sort that has guided theorizing by social psychologists. Rather, accessibility bias served as an alternative source of responses, independent of conscious perception and memory. Similarly, general knowledge is another alternative basis for responding.

Speed–Accuracy Tradeoff

Process-dissociation procedures provide a way of estimating the contribution of underlying processes to a response. In many cases, underlying processes may differ in processing speed. For example, an automatic process may be completed sooner than a slower, con-

sciously controlled process. In cases where there are underlying differences in process speed, one can employ speed–accuracy trade-off (SAT) procedures to precisely track and contrast the time course of component processes underlying a single, overt response.

One such SAT procedure is the response signal procedure. It measures the time-course of responses by tracking changes in accuracy over processing time (e.g., Dosher, 1976, 1979; McElree, 1993, 1996; McElree & Dosher, 1989, 1993; Reed, 1973, 1976; Wickelgren, 1977). Measures of accuracy are derived by requiring participants to judge some key aspect of a test stimulus. Participants are trained to respond within a 100- to 300-ms window marked by the presentation of a response signal such as a tone. Across trials, the response signal is randomly presented at one of six to eight time delays spread throughout the full time course of processing (e.g., from 100 to 3,000 ms after the onset of the test stimulus). In this way, performance is measured across the full extent of processing—from times when performance is at or near chance levels to times when it has reached an asymptotic level. Studies using the response signal methodology reveal three distinct phases: a period of chance-level performance, followed by a period of increasing accuracy, followed by an asymptotic period beyond which further processing does not yield increases in accuracy. Speed of processing is measured by when the function departs from chance levels and how quickly accuracy grows over processing time. Accuracy is measured by the asymptotic level of performance.

When SAT procedures are combined with tasks that place consciously controlled and automatic processes in opposition, it is possible to measure how underlying processes combine over time to form a response. By way of illustration, consider a recent series of recognition experiments (McElree, Jacoby, & Dolan, 1996; McElree, Dolan, & Jacoby, in press). As noted earlier, recognition memory may be mediated by two independent processes: a fast assessment of global familiarity, and a slower recollective process that recovers a specific episodic event from memory. Building on studies described previously (Jacoby, in press), these experiments presented participants with a list of to-be-read items, followed by a list of spoken items. For the read list, half the items were presented once, and half were repeated three times. Following study, participants were presented with test items that were either heard, read (once or three times), or new. They were instructed to respond "yes" to an item only if it was from the heard list, and were explicitly told that if they recalled an item as having being read, they could be assured that it was not in the heard list. The critical tests concerned the once- and thrice-read items. The prediction was that repetition should influence both the familiarity and the recollective process, with thrice-repeated items producing higher familiarity values and also an increased probability of recollection. Note, however, that the experimental design placed these two processes in opposition: Increased familiarity should induce participants to make false alarms (i.e., to mistake a read item as heard), but better recollection of an item as being read should reduce the false-alarm rate. We used SAT procedures to isolate when these two processes influenced "exclusion" judgments.

The first panel (A) of Figure 19.1 shows the SAT functions in d' units when the hit rate for the heard items is scaled against the new, once-read, and thrice-read items (symbols show empirical data, and smooth curves are the best-fitting dual-process model; see McElree et al., in press). We interpret the differences in the speed with which accuracy grows over time as due to the differential impact of the repetition of read items on the two processes. We isolated the impact of the familiarity and recollective processes by a type of pseudo-d' scaling (Dosher, McElree, Hood, & Rosedale, 1989; McElree & Dosher, 1989; McElree & Griffith, 1995). The second panel (B) shows the false-alarm rates for the two types of read items scaled against the false-alarm rate for the new items. Scaled in this manner, higher pseudo-d' values denote poorer performance resulting from higher underlying false-alarm rates in the read conditions. (If the false-alarm rates for the read items equaled the false-alarm rate for the new items, pseudo-d' values would equal zero.)

The important aspect of the curves in the second panel is that both show a clear nonmonotonic shape: There is a peak value at about 800 ms that diminishes with more retrieval time. The early portions of the func-
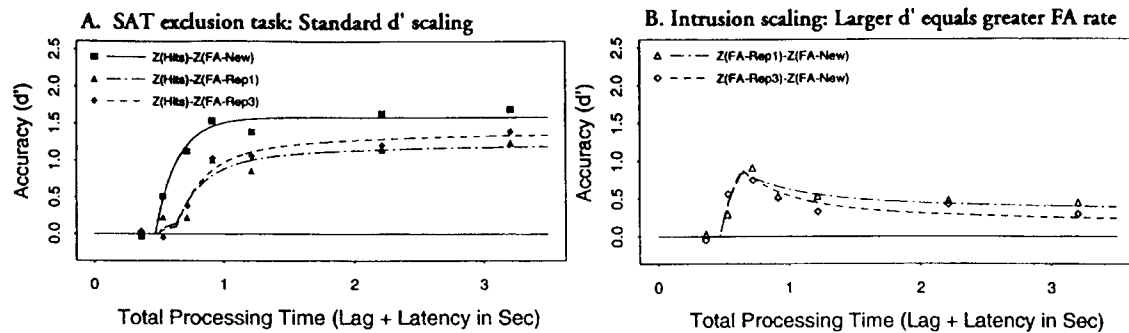
FIGURE 19.1. (A) The speed–accuracy tradeoff (SAT) functions in d' units. (B) The false-alarm (FA) rates. Adapted from McElree, Dolan, and Jacoby (in press). Copyright 1998 by the American Psychological Association. Adapted by permission.

tion (<800 ms) show the fast assessment of familiarity that resulted in high false-alarm rates. The latter portions of the functions show the impact of a recollective process that attenuated (although not perfectly) the misattribution based on high familiarity. We estimated the points in time when the familiarity and recollective processes were operating from the nonmonotonic shape of the pseudo-d' functions (using a two-process growth model as in Dosher et al., 1989; McElree & Dosher, 1989; McElree & Griffith, 1995). Familiarity was operative at 471 ms after the onset of a test probe, whereas the recollective process was operative later, at around 639 ms. Moreover, as hypothesized, both familiarity and recollection were stronger for thrice-repeated than for once-repeated items.

The facts that familiarity and recollection are independent, and that recollection is a slower process than familiarity, mean that recollection can be used to counteract or correct erroneous responses based on familiarity. However, our use of experimental paradigms that place familiarity and recollection in opposition so as to allow their separation should not be misinterpreted as our saying that the only role of conscious recollection is to correct or edit responses based on familiarity. Conscious recollection is not a late stage that relies on the prior stage of computing familiarity. In fact, in nature, it is probably just as likely that familiarity and recollection act in concert as in opposition.

This type of SAT procedure has been profitably used to isolate and examine component processes in several cognitive do-mains, including language comprehension (e.g., McElree, 1993; McElree & Griffith, 1995; 1998), semantic memory (e.g., Corbett & Wickelgren, 1978), and episodic memory (e.g., Dosher et al., 1989; McElree & Dosher, 1989). Although SAT studies have primarily addressed issues of the architecture of cognitive processing, we believe that similar procedures can be profitably used to examine issues that have been at the forefront of theorizing in social cognition—notably several of the research domains touched upon here, including stereotyping (Devine & Monteith, Chapter 17, this volume), impression formation (e.g., Bargh, 1989; Srull & Wyer, 1979), heuristic and systematic processing (Chen & Chaiken, Chapter 4, this volume), and ironic effects of mental control (Wegner, 1994). The SAT studies and the process-dissociation procedure allow investigators to separate the contributions of several processes to a task, instead of attempting to devise conditions where only a single process might be operating. Much of human behavior is a result of multiple processes rather than "process-pure." These techniques not only look at the processes operating together, but allow very precise assessment of their time course and relative contributions.

EVERYDAY AUTOMATICITY: CONSCIOUSNESS IS NOT A STAGE

Consciousness has returned as a popular topic of discussion for philosophers (e.g., Block, 1995; Dennett, 1991). Dennett argues against the "Cartesian theater" view of conscious-

ness, arguing that there is no one "place" where different processes come together to form a percept that is "viewed." We agree that consciousness is not a theater. Neither is it a stage. Consciousness does not always follow automatic processes at some later stage and enable consciously controlled processing, which can "correct" the errors of automaticity. Rather, consciously controlled processing can provide a basis for responding that is *independent* of that provided by automatic processes.

The often implicit assumption that conscious processes occur at late stages of processing has permeated the thinking of social and cognitive psychologists. As noted earlier, Bargh has argued that the prevalence of serial-stage theories in cognition, with conscious recognition and reasoning following unconscious analysis and preceding behavior, has created a meta-assumption that conscious processes always causally precede behavior. We illustrate the difference between a stage analysis and an analysis that contrasts independent bases for responding by considering Devine's (1989) important research on prejudice. In particular, we consider her research in the context of Jacoby's (1998b) experiments that separated the contributions of habit and perception.

Stages versus Independent Bases for Responding

Devine's research has been very influential in part because the results imply that people are all bigots, although some people do consciously correct their bigotry before it can be expressed in behavior. Devine presented words related to the stereotype of African Americans under conditions meant to allow only unconscious perception. Presenting those words did increase the accessibility of the African American stereotype, as shown by effects on the interpretation of a paragraph which provided an ambiguous description of a racially unspecified person's behavior. Behavior that could be interpreted as either assertive or hostile was interpreted as hostile when the stereotype of African Americans was made accessible, even for those participants who were not prejudiced (according to their responses on a scale that directly assessed their attitude).

Devine's finding is a striking one for those who think of consciousness as a stage. It implies that people automatically view the world in terms of their stereotypes and then act accordingly, unless they consciously correct for their bias. However, we can think of her findings in a somewhat different way by drawing parallels to the research on habit and perception. In that research, habits or stereotypes do not have their effects on an early stage that precedes a second look; rather, they form an alternative basis for responding. The study of perception and habit (Jacoby, 1998b) included cues for perceptual report of items that could not have been perceived because they were not flashed (a blank flash followed by "knee–b_n_"). Responses to those "ambiguous" guessing items showed probability matching to the strength of the habit established in the first phase, just as Devine's ambiguous description revealed increased accessibility of a stereotype. But in the study of perception and habit, perception was independent of bias, as shown by dissociative manipulations. Similarly, consciously controlled individuating processes in impression formation may be independent of stereotype accessibility effects, and not simply follow on the automatic accessibility.

In earlier studies of memory, researchers interested in unconscious memory processes wanted to study "pure cases" and so attempted to arrange situations where participants would not use conscious memory in an implicit memory test. That turned out to be very hard to do in a test of anyone but densely amnesic participants. The process-dissociation procedure moves away from the search for pure cases, and instead tries to gain estimates of conscious and unconscious processes within a single task. Behavior in the "ambiguous" situation, such as recall of the unstudied items in Hay and Jacoby (1996) (cues such as "knee–b_n_" when neither "knee–bone" nor "knee–bend" was on the study list), does not predict behavior in the situation in which consciously controlled processing is also in play unless one takes into account the independence of the two bases for responding. We think that the control afforded by taking an initial set or orientation that constrains what comes to mind will prove to be as powerful in cases of social perception as we have found them to be in the domains of memory and perception.

Does it really matter whether one thinks of consciousness as correcting or as providing an independent basis for responding? To show that it does, we end this chapter by describing different ways of trying to make Marge Schott more sensitive to her situation. When we analyze her behavior from the perspective of the two models, we are led to very different proposals for her "rehabilitation."

"Fixing" Marge Schott

The 1996 controversy surrounding the behavior of Marge Schott was not her first. As a result of an earlier controversy, she was required to participate in "sensitivity training." We know nothing about this sensitivity training, except that it apparently did not work, leaving us free to speculate about how one might design effective training.

Why didn't the sensitivity training work? Schott's difficulty may be similar to that of Damasio's frontal lobe patients who engaged in risky gambles. The patients clearly understood that the gambles were risky and understood the consequences of their behavior. They produced emotional responses after winning and losing. What they lacked was an emotional response when they reached toward the cards in the risky deck. We return to this possibility after considering another possible course of treatment.

The layperson, along with most psychologists, would say that Schott's problem is that she does not think before she speaks. This analysis might be translated to mean that when a thought comes to mind, she should thoroughly inspect it to be certain that it will not be offensive before she says it. According to this account, conscious control is a late stage that allows us to edit thoughts that are generated by an earlier, unconscious, automatic stage. Gilbert (1989) used the metaphor of consciousness as a tailor who alters clothes of all one size to fit the current situation—another late-stage sort of model. The advice to think first seems simple, but may be taxing and miserable to follow. The self-consciousness entailed can be unpleasant (Wicklund, 1986), and the amount of cognitive resources required would be formidable (Macrae, Milne, & Bodenhausen, 1994). Indeed, trying harder to avoid stereotypes can make prejudiced behavior *more* likely—the ironic effect of trying not to be offensive (e.g., Macrae, Boden-

hausen, Milne, & Jetten, 1994). In addition, training a person to "generate, then edit" can even strengthen a habitual pattern of generating stereotypical reactions, as the person repeatedly practices the generation phase.

An alternative approach parallels our attempts to train recollection. In this approach, the attempt is to get people to treat a context word and fragment as cues for recall of the earlier-presented word pair, rather than simply producing the first completion that comes to mind. The difference is in treating memory as an object rather than as a tool (Jacoby & Kelley, 1987). People do not necessarily remember something simply because they are confronted with a stimulus they have seen before. They need to be oriented toward the past or to have a "set" to remember. So—rather than generating the first thoughts that come to mind in a situation, followed by an imperfect and intermittent editing process—the goal is to constrain what comes to mind by maintaining a set for recollection. Similarly, one might train Schott to adopt a set that leads the right thoughts to come to mind in the first place. The analogous treatment for Damasio's frontal lobe patients would be to train them to "see" the deck as a risky gamble even as they reach for a card.

At an abstract level, the set or orienting attitude necessary for recollection might rely on the same sort of cognitive skills required for social monitoring. For both, the problem is to "contextualize" responding by constraining the response that comes to mind, so as to fit the requirements of the past or of a current situation. As an alternative to Gilbert's metaphor, the "clothes" (situations as represented) are different from the outset rather than being altered to fit.

We think that the consciously controlled process of recollection is also necessary for the constancy that represents the self (Singer & Salovey, 1993). Sacks (1995) described a patient who suffered from both amnesia and frontal lobe syndrome and seemed "desouled," changing identities at a bewildering rate. Without access to the memories that maintained his identity, he was captured by the demands of each new situation. Similarly, Orne and Bauer-Manley (1991) argue that multiple personality disorder is not a problem of having multiple selves, but a problem of memory. Every person has many "selves," in the sense that every person has inconsistent

beliefs and behaviors. However, if people recollect rather than repress or dissociate, they incorporate those inconsistencies into one sense of self. Similarly, recollection may be necessary to maintain a constant identity for others across changing situations.

We do not have a "magic bullet" to offer that will miraculously make Marge Schott more sensitive. What we do have to offer are some new procedures for separating automatic and consciously controlled processes, along with a strong prejudice against stage analyses. We hope that social psychologists will join us in thinking about consciousness in different ways. Many of the most exciting problems in psychology are the "property" of social psychologists. We think that an extremely important problem is to better specify the relation between memory and monitoring one's behavior. Much has recently been said about the error(s) of Descartes in describing consciousness (Damasio, 1994). Perhaps Descartes's true error was in saying "I think, therefore I am"; maybe he should have said, "I remember, therefore I am."

ACKNOWLEDGMENTS

NOTE

1. This view may be reflected in the recent renaming of Multiple Personality Disorder (MPD) as Dissociative Identity Disorder (DID) in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association, 1994).

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