### Title

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# THE FUNCTIONAL INDEPENDENCE OF TRAIT AND BEHAVIORAL SELF-KNOWLEDGE: METHODOLOGICAL CONSIDERATIONS AND NEW EMPIRICAL FINDINGS

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In a series of studies, Klein and Loftus and their colleagues found that people who made self-descriptiveness judgments about trait words were no faster than people who performed a control task to subsequently retrieve behavioral memories about the same traits (e.g., Klein, Loftus, & Burton, 1989; Klein & Loftus, 1990, 1993a, 1993c). Based, in part, on these findings, Klein and Loftus (1993a; Klein, Loftus, & Kihlstrom, 1996) proposed that functionally independent memory systems underlie trait self-descriptiveness judgments and behavioral retrieval. The present studies had two purposes. First, we evaluate recent concerns about whether the control task used by Klein and Loftus provides the proper baseline against which to assess the absence of priming between trait judgments and behavioral retrieval (e.g., Brown, 1993; Keenan, 1993). Second, we present converging evidence from a powerful new technique, Dunn and Kirsner's (1988) method of reversed association, in support of Klein and Loftus's proposal that trait judgments and behavioral retrieval are mediated by functionally independent memory systems.

In his classic work, *Principles of Psychology* (1890), William James proclaimed the self to be the elementary fact of mental life about which all other psychic phenomena revolve:

> Every thought tends to be part of a personal consciousness....It seems as if the elementary psychic fact were not thought or this thought or that thought, but my thought, every thought being owned....On these terms the personal

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> self rather than the thought might be treated as the immediate datum in psychology. (James, 1890, p. 226)

Thus, to understand mental life we also must understand how we represent ourselves in our minds, how the mental representation of self becomes linked with mental representations of experience, and how those links are preserved in memory. Unfortunately, more than a century after James identified the self as the fundamental unit of analysis for a science of mental life, psychology has little to offer in answer to these basic questions (for reviews, see Greenwald & Pratkanis, 1984; Higgins & Bargh, 1987; Kihlstrom & Klein, 1994; Linville & Carlston, 1994).

Recently, however, Klein and Loftus and their colleagues proposed and tested a model of the self that has begun to address some of these issues (e.g., Klein & Loftus, 1990, 1993a, 1993b, 1993c; Klein, Loftus, & Burton, 1989; Klein, Loftus, & Kihlstrom, 1996; Klein, Loftus, & Plog, 1992; Klein, Loftus, & Sherman, 1993; Klein, Sherman, & Loftus, 1996; Klein, Loftus, Trafton, & Fuhrman, 1992; Schell, Klein, & Babey, 1996). Their model, which is concerned with the relation between memories of personal experiences and trait conceptions of self, incorporated the following three features: (1) long-term knowledge of one's traits is abstracted from experiences with trait-relevant behaviors and represented in memory in summary form; (2) trait judgments about the self are made by accessing these summary representations without reference to the behavioral memories from which they were derived; and (3) the memory system supporting access to trait summary representations is functionally independent of the system supporting access to behavioral memories. That is, operations of one system do not require the operations of the other.

An extensive series of studies by Klein and Loftus and their colleagues has produced compelling evidence in support of this model (e.g., Klein & Loftus, 1990, 1993a, 1993c; Klein et al., 1989; Klein, Loftus, Trafton, & Fuhrman, 1992; Klein, Sherman, & Loftus, 1996; Schell et al., 1996). Their research adapted for the study of the self the priming procedure familiar in studies of language and memory (e.g., Collins & Quillian, 1970; Meyer & Schvaneveldt, 1971), in which performance of an initial task facilitates performance on a subsequently presented target task. Because priming occurs as a function of overlap between the requirements of the initial and target tasks (e.g., Collins & Quillian, 1970; Macht & O'Brien, 1980; Malt, 1989), one way to determine the degree to which the two tasks require, and thereby make available, similar information is to examine the degree to which performing the first task reduces the time required to perform the second task.

To examine the representation of knowledge about the self, Klein et al. (1989) developed a new priming procedure comparing three tasks: (1) a *describe* task asked participants to judge whether a trait adjective described themselves; (2) a *recall* task required them to retrieve a personal memory in which they displayed behavior relevant to the trait; and (3) a *define* task asked participants to generate a definition of the trait word. For each trait word, participants performed two of these tasks, an initial task and a target task, in succession. There were nine possible initial task-target task pairings, and the data of interest were participants' response latencies when performing the target task of each pair.

As expected, priming was observed in all cases where the initial and target task were identical. But, the most important result was that, compared to the effects of an initial define task, an initial describe task did not prime performance of a subsequent recall task. Klein and Loftus (1993a; Klein et al., 1989; Klein, Sherman, & Loftus, 1996) concluded from this finding that participants were able to make self-descriptiveness judgments without activating behavioral memories. If behavioral memories had been activated, then participants who made those judgments should have had an advantage over participants who performed the initial define task in the speed with which they subsequently retrieved those memories.

Subsequent experiments (e.g., Klein, Loftus, Trafton, & Fuhrman, 1992, Experiment 2; Klein & Loftus, 1990, 1993a) provided even clearer evidence that trait self-descriptiveness judgments typically are made without reference to behavioral evidence. For instance, it has been argued that behavioral memories are more important for some trait judgments than others. Specifically, some self-theorists have suggested that traits not central to one's self-concept are less likely to be represented in summary form, and thus more likely to require behavioral evidence for self-descriptiveness judgments, than are traits central to one's self-concept (e.g., Bower & Gilligan, 1979; Kihlstrom & Cantor, 1984; Kihlstrom et al., 1988; Klein & Loftus, 1990; Wyer & Srull, 1989). If such a difference exists, it would not be apparent in the data of Klein et al. (1989), because that study combined all traits without regard to level of self-descriptiveness.

To address this concern, Klein, Loftus, Trafton, and Fuhrman (1992, Experiment 2; see also, Klein & Loftus, 1990) repeated the Klein et al. (1989) priming procedure, and then had participants rate each trait for self-descriptiveness. These ratings were used to sort participants' response latencies into three levels of trait self-descriptiveness (high, medium, low). Regardless of the self-descriptiveness of the trait being

judged, no facilitation was observed. Because trait self-descriptiveness judgments did not prime behavioral retrieval, Klein and Loftus concluded that knowledge of one's traits and knowledge of one's behavior are represented independently, and perhaps mediated by separate cognitive systems (for reviews, see Kihlstrom & Klein, 1994, in press; Klein & Loftus, 1993a; Klein, Loftus, & Kihlstrom, 1996).

This conclusion recently has been called into question by Brown (1993) and Keenan (1993), both of whom note that Klein and Loftus's interpretation of their findings depends on the assumption that definition generation does not activate trait-relevant behavioral memories. Brown and Keenan both reject this claim, arguing instead that participants are likely to retrieve behavioral memories of self when generating definitions. For example, a person asked to define the word *kind* may think "kind is like when I take care of the neighbor's cat, so kind means helping out neighbors when they need it" (Keenan, 1993, p. 71).

The Brown-Keenan proposal implies that definition generation activates the same type of information (i.e., trait-relevant behavioral memories) assumed to be activated during performance of self-tasks. If this is correct, Klein and Loftus's failure to find differential facilitation would not necessarily imply an absence of priming; rather, it might imply that the define and describe initial tasks promote comparable priming of the recall target task.

## THE PRESENT STUDIES

We had several goals in performing the present studies. First, we wanted to address the concerns raised by Brown (1993) and Keenan (1993) about the define control task. In Study 1 we replace this task with a control task even less likely to activate trait-relevant behavioral memories (a *read* task), and we obtain the same pattern of response latencies reported by Klein, Loftus, Trafton, and Fuhrman (1992; see also Klein & Loftus, 1993a). In Study 2 we test our assumption that performing a read task does not make available behavioral memories involving the self, and we find that it does not.

Second, we wanted to test Klein and Loftus's proposal that describe and recall task performance reflect the operation of functionally independent memory systems (Klein & Loftus, 1993a; Klein et al., 1989; Klein, Loftus, & Kihlstrom, 1996; Klein, Loftus, Trafton, & Fuhrman, 1992; Tulving, 1993). Study 3 presents findings from a new technique, the method of reversed association (Dunn & Kirsner, 1988), which is particularly effective for assessing whether different memory systems support performance on describe and recall tasks. The results of this

study offer strong support for Klein and Loftus's functional independence hypothesis.

## STUDY 1: IS THE FAILURE TO FIND DIFFERENTIAL FACILITATION AN ARTIFACT OF THE DEFINE CONTROL TASK?

In Study 1 we attempted to replicate Klein, Loftus, Trafton, and Fuhrman's (1992) findings using a control task that further reduced the likelihood of behavioral activation. Specifically, participants performed a read control task, which required them to read silently each trait word as it appeared on a computer screen. A number of studies have shown that the mere act of reading a trait word does not activate personal knowledge of any kind, behavioral or otherwise, regarding that trait (e.g., Geller & Shaver, 1976; Higgins, Van Hook, & Dorfman, 1988; McDaniel, Lapsley, & Milstead, 1987; for a related finding, see Reeder, McCormick, & Esselman, 1987).

We predicted that if trait self-descriptiveness judgments activate trait-relevant behavioral memories, then the reduction in time to perform a recall target task should be greater when a describe task is performed first than when a read task is performed first. This is because the behavioral information required for the recall task will have been activated during performance of the describe task but not during the read task. By contrast, if self-descriptiveness judgments do not require behavioral information, then performing a describe task first should not lead to a greater reduction in the time required to perform a recall target task than would result from first performing a read task.

### METHOD

*Participants.* Nineteen undergraduates enrolled in an introductory psychology course at the University of California, Santa Barbara participated as part of their course requirements. They were tested individually in sessions lasting approximately one hour.

*Materials and Design.* The stimulus words were the 90 trait adjectives used by Klein, Loftus, Trafton, and Fuhrman (1992). The adjectives were rated within one standard deviation of the Kirby & Gardner (1972) norm means on the dimensions of familiarity, imagery, and behavioral specificity. Participants received 90 trials. A trial consisted of performing an initial task and a target task in succession for each trait adjective. For the describe task, participants judged the trait

adjective for self-descriptiveness. For the recall task, participants retrieved from memory a specific incident in which their behavior exemplified the presented trait. For the read task, participants silently read the presented trait word.[1] Three initial tasks (describe, recall, read) were factorially combined with two target tasks (describe, recall) to create six initial task-target task pairings. The assignment of stimulus words to initial task-target task pairs (15 words per pair) and the order in which task pairs were presented were randomized across participants.

*Procedure.* Participants were told that we were investigating their ability to perform different tasks on trait adjectives. We then explained the experimental tasks and gave instructions for performing them.

A microcomputer presented the stimulus words and recorded response latencies for the initial and target tasks. Each trial began with the appearance on a computer screen of a cue for the initial task. The cue was either DESCRIBES YOU (for the describe task), RECALL (for the recall task), or READ (for the read task). After one second, a trait adjective appeared below the cue. Both the cue and trait adjective remained on the screen until the subject indicated that he or she had completed the initial task by pressing a key. The initial task cue was then removed, leaving the stimulus trait on the screen. After a one second pause, the cue word for the target task (either DESCRIBES YOU or RECALL) appeared on the screen above the stimulus trait, and a timer was activated. The cue and the trait adjective remained on the screen until the subject indicated that he or she had completed the target task. The timer then stopped and the target task response latency was recorded. There was a two second delay before the beginning of the next trial.

In our instructions, we informed participants that the ordering of the tasks would be random. We also informed them that on trials where the initial task was the same as the target task they need not generate a new response; rather, they could call to mind their original response a second time. Finally, we told participants that it was important to perform the tasks accurately and that they should indicate immediately when they had completed each task. Participants received six practice trials, one for each possible initial task-target task pair.

After participants had completed the experimental trials, we again presented them with each trait adjective appearing in the initial task

1. We did not request that subjects report their responses during the experimental trials; rather, we instructed them to generate responses to the task questions in their heads. Klein and Loftus (1993a, 1993b) provide a detailed discussion of our reasons for adopting this procedure and present research demonstrating the efficacy of the technique.

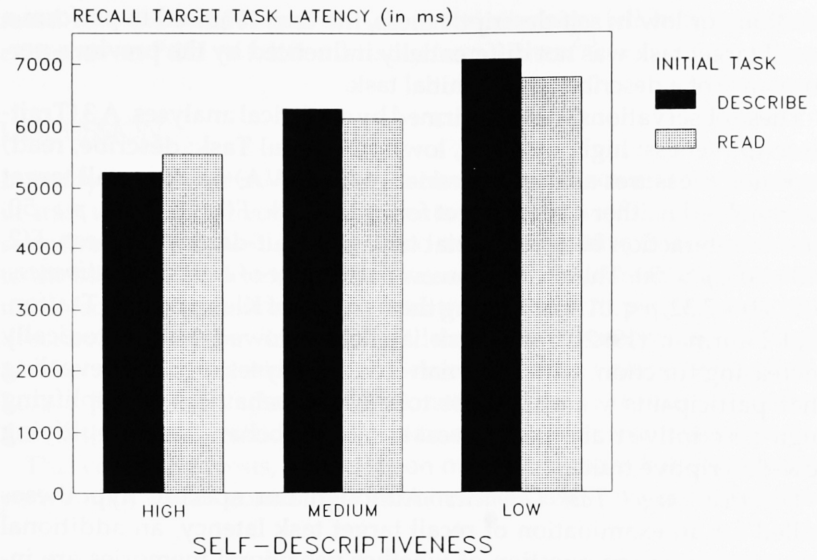


FIGURE 1. Mean recall target-task response latency as a function of initial task and trait-descriptiveness: Study 1

and asked them to rate it on a 9-point scale ranging from extremely unlike me (1) to irrelevant (5) to extremely like me (9). These ratings allowed us to sort each participant's response latencies for the 90 stimulus traits into three levels of self-descriptiveness. For each initial task-target task pair, a participant's five highest rated traits were placed in the high-descriptive category, the five traits receiving the next highest rating were placed in the medium-descriptive category, and the remaining five traits were placed in the low-descriptive category. In the case of ties in which the trait could be assigned to adjacent categories, random assignment was used.

## RESULTS

In the analyses reported in this article, the mean and median response latencies yielded identical patterns of results. To facilitate comparisons with latency data reported in previous studies of trait judgments about self (e.g., Klein & Loftus, 1993a; Klein et al., 1989; Kuiper, 1981; Kuiper & Rogers, 1979; Lord, 1993; Rogers, Kuiper, & Kirker, 1977), we present the results of analyses on the means.

*Recall Target Task Latencies.* The joint effects of initial task and trait-descriptiveness on recall target task mean response latencies are presented in Figure 1. As can be seen, regardless of whether the trait was rated high,

medium, or low in self-descriptiveness, the time required to perform a recall target task was not differentially influenced by the previous performance of a describe or read initial task.

These observations were confirmed by statistical analyses. A 3 (Trait-descriptiveness: high, medium, low) × 2 (Initial Task: describe, read) repeated measures analysis of variance (ANOVA) on the recall target task yielded neither a main effect for initial task, $F(1, 18) = .03$, $p > .50$, nor an interaction between initial task and trait-descriptiveness, $F(2, 36) = .03$, $p > .50$. There was, however, an effect of *trait-descriptiveness*, $F(2, 38) = 7.32$, $p < .01$. Replicating the findings of Klein, Loftus, Trafton, and Fuhrman (1992), recall task latencies showed a monotonically increasing function, with Newman-Keuls analyses ($p < .05$) revealing that participants were quickest to retrieve behaviors exemplifying high-descriptive traits and slowest to retrieve behaviors exemplifying low-descriptive traits.

*Describe Target Task Latencies.* Although our specific hypotheses called for an examination of recall target task latency, an additional perspective on the question of whether behavioral memories are involved in trait judgments about the self can be obtained by looking at the describe target-task latencies. We reasoned that if trait self-descriptiveness judgments require accessing relevant behavioral memories, the reduction in time to perform a describe target task should be greater when the initial task is recall task than when the initial task is read. This is because the behavioral information required for the describe task will have been accessed during the recall task but not during the read task. By contrast, if trait judgments do not require behavioral information, then performing a recall task first should not lead to a greater reduction in time than would result from first performing a read task.

A 3 (Trait-descriptiveness: high, medium, and low) × 2 (Initial Task: recall and read) repeated-measures Analysis of Variance (ANOVA) on the mean response latencies for the describe task revealed no main effect for initial task, $F(1, 18) = 1.74$, $p > .20$, nor did the initial task × trait-descriptiveness interaction reach significance, $F(2, 36) = 1.79$, $p > .15$. The only reliable effect was for trait-descriptiveness, $F(2, 38) = 16.32$, $p < .001$. Newman-Keuls tests ($p < .05$) confirmed the pattern of latencies obtained in previous studies examining the effects of trait-descriptiveness on describe task performance (e.g., Klein & Loftus, 1993a; Klein, Loftus, Trafton, & Fuhrman, 1992; Kuiper, 1981): Describe task latencies showed an inverted *U* pattern, with participants taking longer to judge traits rated medium ($M = 2{,}589$ ms) than traits rated high ($M = 1{,}973$ ms) in self-descriptiveness. The latencies for traits

rated low ($M$ = 2,305 ms) in self-descriptiveness fell between these extremes and did not differ reliably from either.[2,3]

## DISCUSSION

In Study 1 we found no evidence that behavioral memories are involved in trait self-descriptiveness judgments. Regardless of level of trait-descriptiveness, a describe task was no more facilitating than a read task to the subsequent performance of a recall task, and a recall task was no more facilitating than a read task to the subsequent performance of a describe task.[4] These findings are identical to those obtained by Klein and Loftus using a define control task (e.g., Klein & Loftus, 1993a; Klein, Loftus, Trafton, & Fuhrman, 1992), and thus support their contention that definition generation serves as an appropriate control task.

This conclusion rests, of course, on our assumption that participants performing a read control task do not access trait-relevant behavioral

2. A potential confound in the design of Study 1 merits consideration. Because latencies to perform the recall and describe tasks were collected before trait self-descriptiveness ratings, it is possible that these latencies, rather than access to self-knowledge, may have determined the subsequent ratings. For instance, participants may simply have based their trait ratings on their memory for the speed with which they previously had made a describe judgment. Data presented in Klein, Loftus, Trafton, and Fuhrman (1992), however, argues strongly against this possibility. These investigators showed that the same latency functions were obtained when participants made their trait ratings two weeks before performing the priming procedure.

3. Although we did not make any specific predictions involving conditions in which the initial and target task were the same, the logic underlying our priming procedure requires facilitation to be greatest under these circumstances. This is because facilitation is held to be an increasing function of the overlap in information required for two successive tasks. Consistent with this logic, Newman-Keuls ($p < .05$) revealed that response latency for the recall target task was fastest when the initial task also was recall; and response latency for the describe target task was fastest when the initial task also was describe.

4. It is important to note that this failure to find a significant effect of initial task performance on target task latency is not subject to some of the usual criticisms concerning null findings (e.g., Greenwald, 1975). There is a wealth of evidence attesting to the sensitivity of Klein and Loftus's priming procedure in detecting behavioral activation following a trait-descriptiveness judgment (e.g., Babey & Klein, 1996; Klein, Cosmides, Tooby, & Grant, 1997; Klein & Loftus, 1990; 1993a, 1993c; Klein et al., 1993; Klein, Loftus, Trafton, & Fuhrman, 1992; Schell et al., 1996; Sherman & Klein, 1994; Sherman, 1996). All of these studies reported interactions in which facilitation was observed only in those conditions in which judgments were predicted to rely on behavioral retrieval. Failures to find facilitation occurred only where predicted. It thus is highly unlikely that our failure in the present study to find recall task facilitation following a describe judgment (or describe task facilitation following performance of a recall task) was due to a lack of sensitivity of the procedure used.

memories. However, although this is both intuitively plausible and empirically defensible (e.g., McDaniel et al., 1987), Study 1 offered no direct evidence in support of this assumption. Consequently, the goal of our next study was to test whether read task performance activates behavioral memories involving the self.

## STUDY 2: DOES READ TASK PERFORMANCE ACTIVATE TRAIT-RELEVANT BEHAVIORAL MEMORIES?

To examine the role of behavioral memories in read task performance, we drew on recent work by Klein and Loftus and colleagues demonstrating that the effect of behavioral retrieval on trait self-descriptiveness judgments varies with the amount of experience one has with the trait being judged (e.g., Klein & Loftus, 1993a, 1993c; Klein, Sherman, & Loftus, 1996; Klein, Loftus, Trafton, & Fuhrman, 1992; Schell et al., 1996; see also Anderson, 1989; Park, 1986). When experience is limited, trait judgments are facilitated by the retrieval of trait-relevant behavioral memories. However, as the amount of experience becomes sufficiently large, trait judgments no longer are facilitated by behavioral retrieval. Thus, with increasing experience, the role of behavioral memories in the trait judgment process decreases.

These findings suggest that we can test whether a read task activates behavioral memories by examining its effects on response latencies for trait judgments regarding contexts in which participants' experience was either relatively low or relatively high. If a read task makes available the same type of self-knowledge (behavioral memories) made available by a recall task, then it should function similarly to a recall task when performed before a describe target task. The two tasks should be similarly facilitating to self-descriptiveness judgments made in low-experience contexts and similarly nonfacilitating to judgments made in high-experience contexts. But if reading a word does not activate behavioral memories, then a read task should function differently than a recall task. While the two tasks should still be similarly nonfacilitating in a high-experience context, a recall task should be more facilitating than a read task to a self-descriptiveness judgment made in a low-experience context, as the behavioral memories it makes available will decrease the time required to make such judgments (e.g., Klein & Loftus, 1993a, 1993c; Klein, Sherman, & Loftus, 1996).

We tested this hypothesis by establishing two judgment contexts to which participants would refer in making self-descriptiveness judgments. Our participants all were first year undergraduates who had been on campus approximately two months. Thus, the low-experience con-

text referred to the time period since they had entered college and the high-experience context referred to their lives prior to entering college.

We predicted that if a read task makes available behavioral memories, then an initial recall task should be no more (or less) facilitating than an initial read task to the subsequent performance of a describe task, regardless of whether the judgment context is college or home.

By contrast, if a read task does not make available behavioral memories, then the effects of initial task on describe target-task latencies should vary with judgment context. When the context is college (low experience), the time to make a describe judgment should be less when a recall task is preformed first than when a read task is performed first. This is because behavioral information facilitates describe judgments made with reference to low-experience contexts (e.g., Klein & Loftus, 1993a, 1993c; Klein, Loftus, Trafton, & Fuhrman, 1992). Because such information is made available by a recall task but not by a read task, a recall task should be more facilitating than a read task to the subsequent performance of a describe task. When the judgment context is home (high experience), however, the time required to perform a describe judgment should be unaffected by whether the initial task is recall or read. This is because behavioral memories play little, if any, role in describe judgments made within high-experience contexts (e.g., Klein & Loftus, 1993a, 1993c; Klein, Sherman, & Loftus, 1996); with no need for behavioral memories, an initial recall task should be no more facilitating than an initial read task to performance of a describe home task.

## METHOD

*Participants.* Sixteen undergraduates from the University of California at Santa Barbara in their first college quarter were recruited from the psychology subject pool. They were tested individually in sessions lasting approximately 25 min.

*Materials and Design.* A subset of 28 trait adjectives were randomly selected from the list used in Study 1. Participants received 28 trials, 1 trial per adjective. A trial consisted of performing an initial task and a target task in succession for each adjective. Two initial tasks (recall, and read) were factorially combined with two target tasks (describe college and describe home) to create four initial task-target task pairings. For the recall task, participants recalled a specific incident in which their behavior exemplified the presented trait.[5] For the read task, participants

5. Previous research has shown that when recall task performance was not restricted to any particular context, the majority of behaviors recalled by first-year undergraduates occurred in the college setting (e.g., Schell et al., 1996).

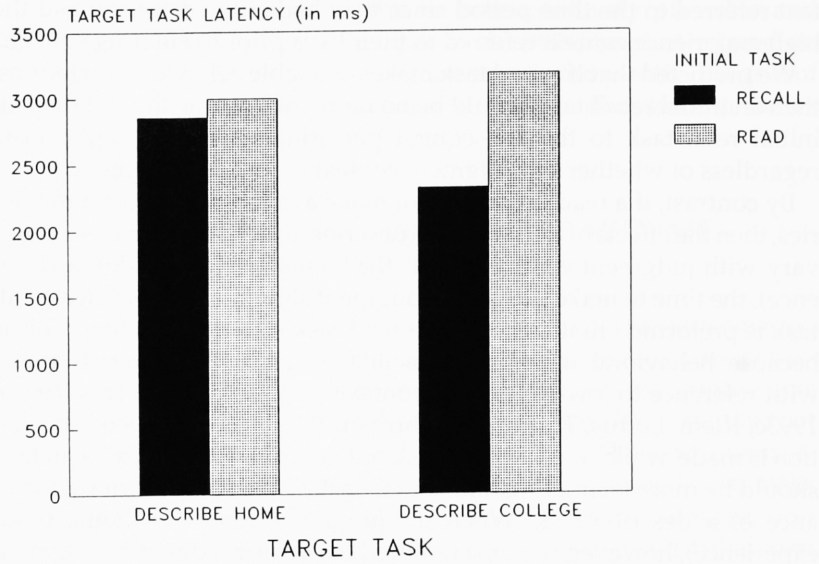


FIGURE 2. Mean describe target-task response latency as a function of initial task and judgment context (college or home): Study 2

silently read each trait adjective. For the describe college task, participants judged whether the presented trait described themselves since entering college. For the describe home task, participants judged whether the presented trait described the way they were before they came to college. The assignment of trait adjectives to initial task-target task pairs (seven trait adjectives per pair), and the order in which task pairs were presented were randomized across participants.

*Procedure.* The procedure was identical to that of Study 1, except that following completion of the experimental trials, participants were not asked to make trait ratings of the adjectives.

## RESULTS

Figure 2 shows the joint effects of initial task (recall and read) and target task judgment context (home and college) on the describe target task mean response latencies. A 2 × 2 repeated measures ANOVA on these latencies yielded a main effect of initial task, $F(1, 14) = 9.73$, $p < .01$, with participants responding more quickly following an initial recall task ($M$ = 2,624 ms) than following an initial read task ($M$ = 3,089 ms). This effect was qualified, however, by a reliable interaction between initial task and target task, $F(1, 14) = 5.56$, $p < .05$. Newman-Keuls tests ($p < .05$) revealed that the describe college task was performed more quickly when preceded by a recall task

than when preceded by a read task (mean difference in facilitation = 787 ms). By contrast, participants were not reliably faster at performing the describe home task when it was preceded by a recall task than when it was preceded by a read task (mean difference in facilitation = 142 ms).

### DISCUSSION

If trait-relevant behavioral memories are made available during the performance of both recall and read tasks, then the time required to perform a describe target task should have been the same regardless of whether the initial task was recall or read. Although the results from our high-experience condition conformed to this prediction, those from our low-experience condition did not: Participants were reliably faster to perform a describe college task when it had been preceded by an initial recall task ($M$ = 2,611 ms) than when it had been preceded by an initial read task ($M$ = 3,271 ms).

These results clearly are difficult to reconcile with the notion that read task performance activates behavioral memories involving the self. To do so, one would have to argue that a read task activates trait-relevant behavioral memories when it precedes a describe home task, but not when it precedes a describe college task. However, since participants are not told the context for the describe task until after they perform the read task, this explanation seems highly unlikely.

These results can easily be explained, however, if one assumes that trait-relevant behavioral memories are made available by a recall task, but not by a read task. Recall that Klein and Loftus (1993a, 1993c) showed that when experience pertaining to a particular trait is low, trait-relevant behavioral memories will facilitate trait self-descriptiveness judgments. However, as experience increases, the role of behavioral memories in the trait judgment process decreases.

These findings predict that for the low-experience context (self-at-college), participants should be faster to make self-descriptiveness judgments about themselves at college when they first retrieved a relevant behavior than when they first read the trait. By contrast, for the high-experience condition (self-at-home), judgments should take just as long following behavior retrieval as following trait reading. The pattern of latencies reported in Study 2 conforms exactly to these predictions.

## STUDY 3: DO DIFFERENT MEMORY SYSTEMS UNDERLIE PERFORMANCE OF DESCRIBE AND RECALL TASKS?

The findings from their self-priming studies prompted Klein and Loftus to propose that within the realm of long-term self-knowledge, function-

ally independent memory systems might mediate performance on describe and recall tasks (e.g., Klein & Loftus, 1993a; Klein, Loftus, & Kihlstrom, 1996; Klein, Loftus, Trafton, & Fuhrman, 1992; see also Tulving, 1993). They cautioned, however, that this proposal should be viewed tentatively because of interpretive problems inherent in trying to infer separate memory systems from functional dissociations between experimental tasks (for reviews, see Dunn & Kirsner, 1988; Neely, 1988; Roediger, Weldon, & Challis, 1989). As Dunn and Kirsner (1988) have shown, any form of a functional dissociation, even one involving a crossover interaction between tasks and levels of a variable, can, in principle, be accounted for by a single system model.

Accordingly, Study 3 was designed to provide a stronger test of the Klein and Loftus functional independence hypothesis. Our approach draws on a new technique, Dunn and Kirsner's (1988) method of reversed association, which has proven effective for determining whether independent memory systems are involved in the performance of different experimental tasks. A reversed association refers to a nonmonotonic relation between two tasks across experimental conditions common to both tasks.

Specifically, a reversed association occurs when the relation between Tasks *X* and *Y* is positive for one pair of conditions of Variable *A*, but negative for another pair. Such a pattern logically precludes the possibility that a single system mediates performance of both tasks, because levels of performance on two tasks that depend on the same underlying system will be monotonically related (e.g., Dunn & Kirsner, 1988; Kelley & Lindsay, 1996; Neely, 1988). The presence of a reversed association thus offers the strongest possible basis for inferring the existence of independent memory systems (e.g., Dunn & Kirsner, 1988; Neely, 1988).

To observe a reversed association between two tasks, performance on one task is plotted against performance on the other for at least three experimental conditions common to both tasks. In the present study, we plotted performance of a describe task as a function of performance of a recall task across three levels of trait self-descriptiveness (high, medium, low). When plotted in this manner, any deviation from monotonicity (i.e., reversed association) offers compelling evidence that different memory processes or systems underlie performance of the two tasks (e.g., Dunn & Kirsner, 1988).

## METHODS

*Participants.* Twelve undergraduates attending the University of California at Santa Barbara were recruited for participation in the study. Participants were tested individually in sessions lasting approximately 25 min.

*Materials and Design.* The material and design were identical to Study

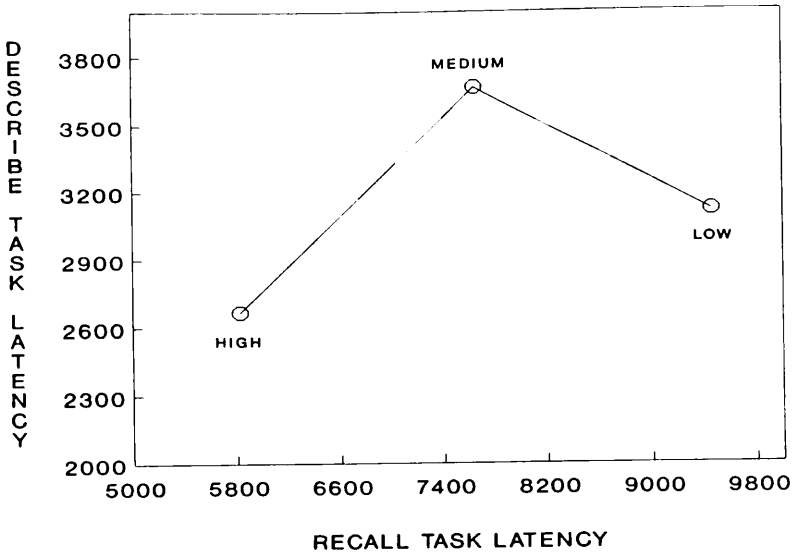


FIGURE 3. Describe task performance (in ms) plotted against recall task performance (in ms) for three levels of trait self-descriptiveness (high, medium, and low): Study 3

1 with two changes. First, each participant saw a randomly selected subset of 60 of the trait adjectives used in Study 1. Second, a trial consisted of performing only an initial task (describe or recall) for each trait adjective. These changes resulted a 3 × 2 factorial design with trait-descriptiveness (high, medium, low) and initial task (describe and recall) both varied within participants.

*Procedure.* The procedure was identical to that used in Study 1 with the following modification. Each trial began with the appearance on a computer screen of a cue for the initial task. The cue was either DESCRIBES YOU (for the describe task) or RECALL (for the recall task). After one second, a trait adjective appeared below the cue and a timer was started. The cue and trait adjective remained on the screen until the subject indicated by pressing a key that he or she had completed the initial task. The timer then stopped, the initial-task latency was recorded, and a row of asterisks appeared across the screen to mark the end of that trial. There was a 2 second delay prior to beginning the next trial.

## RESULTS AND DISCUSSION

Figure 3 presents the plot of performance on the describe task against performance on the recall task across three levels of trait-descriptiveness

(high, medium, and low). As can be seen, the relationship between these two tasks clearly is nonmonotonic: The line connecting the high, medium, and low trait-descriptiveness conditions is neither always increasing nor decreasing. The presence of this reversed association logically demands the conclusion that different memory systems are involved in the performance of describe and recall tasks.

It is important to note, however, that the logic of reversed association is mute with respect to the identity of those systems. Klein and Loftus (e.g., Klein, Cosmides, Tooby, & Grant, 1997; Klein & Loftus, 1993a; Klein, Loftus, & Kihlstrom, 1996; Klein, Sherman, et al., 1996; see also Tulving, 1993) have argued that episodic and semantic memory underlie performance on recall and describe tasks, respectively; however, other candidates cannot yet be ruled out (e.g., Schneider, Roediger, & Khan, 1993). Regardless of the identity of those systems, however, the important point with respect to the present data is that the discovery of a reversed association allows us to formally reject any single-system account of the Klein and Loftus latency data.

## GENERAL DISCUSSION

Identifying control conditions appropriate for establishing a baseline against which to evaluate theoretically meaningful manipulations is a critical aspect of the process of accumulating scientific knowledge. Put simply, the control conditions used determine what can be concluded from an experiment. One might assume, therefore, that challenging the assumptions underlying an investigator's choice of control condition would be the norm among social psychological researchers. Surprisingly, it is not. We therefore welcomed the concerns raised by Brown (1993) and Keenan (1993) for the opportunity they afforded to (a) reevaluate whether the define control task provides the proper baseline against which to assess the absence of priming between describe and recall tasks, and (b) provide converging evidence in support of Klein and Loftus's proposal that summary and behavioral trait self-knowledge are functionally independent.

### IS DEFINITION GENERATION AN APPROPRIATE CONTROL TASK?

One line of evidence Klein and Loftus presented in support of their conclusion that trait self-descriptiveness judgments are made without activating trait-relevant behavioral memories was the finding that an initial describe task was no more facilitating than an initial define task to the subsequent performance of a recall target task (e.g., Klein & Loftus,

1990; Klein et al., 1989). However, both Brown (1993) and Keenan (1993) have cautioned that Klein and Loftus's interpretation of these findings rests on the assumption that definition generation does not activate memories of one's trait-relevant behaviors. Brown and Keenan reject this assumption, arguing that what is needed is "to show that the same results can be obtained with another control task, especially one that would not so easily lend itself to the criticism that autobiographical information could have been involved" (Keenan, 1993, p. 71).

To address this potential methodological flaw, we developed a new control task that, on both intuitive and empirical grounds, is unlikely to activate trait-relevant behavioral memories. Specifically, in Study 1 we asked participants to read silently each presented trait word. Substituting the read task for the define control task, we obtained the same pattern of response latencies reported by Klein and Loftus and colleagues (e.g., Klein & Loftus, 1993a; Klein, Loftus, Trafton, & Fuhrman, 1992; Klein et al., 1997). In Study 2 we provided direct evidence that read task performance does not make available behavioral memories. On the basis of these findings we conclude that the define task employed in previous research is adequate as a control.

## THE FUNCTIONAL INDEPENDENCE HYPOTHESIS: CONVERGING OPERATIONS

It is important to note that Klein and Loftus's functional independence hypothesis was not based exclusively on findings from their priming paradigm. As Klein and Loftus observed: "The findings from any one paradigm are open to multiple interpretations and vulnerable to the charge that they reflect more the idiosyncracies of the methodology than the behavior of the variables of interest" (Klein & Loftus, 1993a, p. 15). Accordingly, they complemented their priming studies with results from studies using other methodologies to support their claims about the independence of summary and behavioral trait knowledge about the self.

For example, Klein, Loftus, and Plog (1992) made use of the phenomenon of transfer-appropriate processing (e.g., Roediger & Blaxton, 1987; Roediger, Weldon, & Challis, 1989) in a study of recognition memory for traits, to show that different processes are involved in accessing summary and behavioral trait self-knowledge. And Klein et al. (1989, Experiment 4) applied the principle of encoding variability (e.g., Bower, 1972; Martin, 1971) in a study of recall for traits, and found that the type of information made available when making trait judgments was different from that made available when retrieving trait-relevant behaviors.

Additional evidence for the functional independence of summary and behavioral trait self-knowledge came from studies of patients with

disorders of memory (e.g., Tulving, 1993; Klein, Loftus, & Kihlstrom, 1996; Schacter, Wang, Tulving, & Freedman, 1982). For example, Klein, Loftus, and Kihlstrom (1996) presented the case of patient W. J., who, as a result of a severe head injury, suffered a temporary loss of the ability to recall personal experiences. W. J. was asked both during her amnesia and following its resolution to make trait judgments about herself. Because her responses when she could access behavioral evidence were consistent with her responses when she could not, Klein, Loftus, and Kihlstrom (1996) concluded that the loss of trait-relevant behavioral memories did not greatly affect the availability of her summary trait self-knowledge (see also Tulving, 1993).

A neuropsychological dissociation, the finding that one function is impaired (e.g., behavioral recall) while another is spared (e.g., trait judgments), is commonly interpreted by cognitive neuropsychologists as evidence for the operation of independent memory systems (e.g., Knowlton, Mangels, & Squire, 1996; Shallice, 1979; Tulving, 1983: Weiskrantz, 1989). However, although the presence of a neuropsychological dissociation makes a single system account highly unlikely, it cannot by itself exclude it categorically (Dunn & Kirsner, 1988; Olton, 1989; Weiskrantz, 1990, 1997). By contrast, a reversed association between two tasks does permit formal rejection of a single system account (e.g., Dunn & Kirsner, 1988; Neely, 1988). Therefore, the existence of a reversed association between trait judgments and behavioral retrieval would provide the strongest possible grounds for arguing for the independence of summary and behavioral trait knowledge. In Study 3 we sought and obtained evidence of a reversed association between describe and recall task performance.

In summary, Klein and Loftus's proposal that knowledge of one's traits is represented and accessed separately from memory of one's trait-relevant behaviors is based on a convergence of findings from a number of sources. Although it is not difficult to generate alternate explanations for findings from a single experimental procedure, it becomes increasingly difficult to do so when experiments using different dependent measures (response latency, recall, recognition), different control tasks (define, read), and different participant populations (memory unimpaired, memory impaired) yield the same findings.

## REFERENCES

Anderson, N. H. (1989). Functional memory and on-line attribution. In J. N. Bassili (Ed.), *On-line cognition in person perception* (pp. 175–220). Hillsdale, NJ: Erlbaum.

Babey, S. H., & Klein, S. B. (1996, July). *Judgments about a group's stereotypic characteristics*

*activate stereotype-inconsistent memories.* Paper presented at the 8th Annual Convention of the American Psychological Society, San Francisco.

Bower, G. H. (1972). Stimulus-sampling theory of encoding variability. In A. W. Melton & E. Martin (Eds.), *Coding processes in human memory* (pp. 85–123). Washington, DC: Winston.

Bower, G. H., & Gilligan, S. G. (1979). Remembering information related to one's self. *Journal of Research in Personality, 13,* 420–432.

Brown, N. R. (1993). Response times, retrieval strategies, and the investigation of autobiographical memory. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 5, pp. 61–68). Hillsdale, NJ: Erlbaum.

Collins, A. M., & Quillian, M. R. (1970). Facilitating retrieval from semantic memory: The effect of repeating part of an inference. *Acta Psychologica, 33,* 304–314.

Dunn, J. C., & Kirsner, K. (1988). Discovering functionally independent mental processes: The principle of reversed association. *Psychological Review, 95,* 91–101.

Geller, V., & Shaver, P. (1976). Cognitive consequences of self-awareness. *Journal of Experimental Social Psychology, 12,* 99–108.

Greenwald, A. G. (1975). Consequences of prejudice against the null hypothesis. *Psychological Bulletin, 82,* 1–20.

Greenwald, A. G., & Pratkanis, A. R. (1984). The self. In R. W. Wyer, & T. K. Srull (Eds.), *Handbook of social cognition* (Vol. 3, pp. 129–178). Hillsdale, NJ: Erlbaum.

Higgins, E. T., & Bargh, J. A. (1987). Social cognition and social perception. *Annual Review of Psychology, 38,* 369–425.

Higgins, E. T., Van Hook, E., & Dorfman, D. (1988). Do self-attributes form a cognitive structure? *Social Cognition, 6,* 177–206.

James (1890). *The principles of psychology* (Vol. 1). New York: Holt.

Keenan, J. M. (1993). An exemplar model can explain Klein and Loftus' results. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 5, pp. 69–77). Hillsdale, NJ: Erlbaum.

Kelley, C. M., & Lindsay, D. S. (1996). Conscious and unconscious forms of memory. In E. L. Bjork & R. A. Bjork (Eds.), *Memory* (pp. 31–63). New York: Academic.

Kihlstrom, J. F., & Cantor, N. (1984). Mental representations of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 17, pp. 1–47). New York: Academic.

Kihlstrom, J. F., Cantor, N., Albright, J. S., Chew, B. R., Klein, S. B., & Niedenthal, P. M. (1988). Information processing and the study of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 21, pp. 145–177). New York: Academic.

Kihlstrom, J. F., & Klein, S. B. (in press). Self-knowledge and self-awareness. In J. G. Snodgrass & R. L. Thompson (Eds.), *The self across psychology: Self-awareness, self-recognition, and the self concept.* Annals of the New York Academy of Sciences.

Kihlstrom, J. F., & Klein, S. B. (1994). The self as a knowledge structure. In R. W. Wyer, & T. K. Srull (Eds.), *Handbook of social cognition* (Vol. 1, pp. 153–208). Hillsdale, NJ: Erlbaum.

Kirby, D. M., & Gardner, R. C. (1972). Ethnic stereotypes: Norms on 208 words typically used in their assessment. *Canadian Journal of Psychology, 26,* 140–154.

Klein, S. B., Cosmides, L., Tooby, J., & Grant, S. S. (1997). *The activation of trait-inconsistent behavioral memories during trait-descriptiveness judgments: A "summary-plus-exception" model of trait self-knowledge.* Manuscript in preparation.

Klein, S. B., & Loftus, J. (1990). The role of abstract and exemplar-based knowledge in

self-judgments: Implications for a cognitive model of the self. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 3, pp. 131–139). Hillsdale, NJ: Erlbaum.

Klein, S. B., & Loftus, J. (1993a). The mental representation of trait and autobiographical knowledge about the self. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 5, pp. 1–49). Hillsdale, NJ: Erlbaum.

Klein, S. B., & Loftus, J. (1993b). Some lingering self-doubts: Reply to commentaries. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 5, pp. 171–180). Hillsdale, NJ: Erlbaum.

Klein, S. B., & Loftus, J. (1993c). Behavioral experience and trait judgments about the self. *Personality and Social Psychology Bulletin, 19,* 740–745.

Klein, S. B., Loftus, J., & Burton, H. A. (1989). Two self-reference effects: The importance of distinguishing between self-descriptiveness judgments and autobiographical retrieval in self-referent encoding. *Journal of Personality and Social Psychology, 56,* 853–865.

Klein, S. B., Loftus, J., & Kihlstrom, J. F. (1996). Self-knowledge of an amnesic patient: Toward a neuropsychology of personality and social psychology. *Journal of Experimental Psychology: General, 125,* 250–260.

Klein, S. B., Loftus, J., & Plog, A. E. (1992). Trait judgments about the self: Evidence from the encoding specificity paradigm. *Personality and Social Psychology Bulletin, 18,* 730–735.

Klein, S. B., Loftus, J., & Sherman, J. W. (1993). The role of summary and specific behavioral memories in trait judgments about the self. *Personality and Social Psychology Bulletin, 19,* 305–311.

Klein, S. B., Loftus, J., Trafton, J. G., & Fuhrman, R. W. (1992). Use of exemplars and abstractions in trait judgments: A model of trait knowledge about the self and others. *Journal of Personality and Social Psychology,* 63, 739–753.

Klein, S. B., Sherman, J. W., & Loftus, J. (1996). The role of episodic and semantic memory in the development of trait self-knowledge. *Social Cognition, 4,* 277–291.

Knowlton, B. J., Mangels, J. A., & Squire, L. R. (1996). A neostriatal habit learning system in humans. *Science, 273,* 1399–1402.

Kuiper, N. A. (1981). Convergent evidence for the self as a prototype: The "inverted-'U' RT effect" for self and other judgments. *Personality and Social Psychology Bulletin, 7,* 438–443.

Kuiper, N. A., & Rogers, T. B. (1979). Encoding of personal information: Self-other differences. *Journal of Personality and Social Psychology, 37,* 499–514.

Linville, P. W., & Carlston, D. E. (1994). Social cognition of the self. In P. G. Devine, D. L. Hamilton, & T. M. Ostrom, (Eds.), *Social cognition: Impact on social psychology* (pp. 143–193). San Diego, CA: Academic Press.

Lord, C. G. (1993). The "social self" component of trait knowledge about the self. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 5, pp. 91–100). Hillsdale, NJ: Erlbaum.

Macht, M. L., & O'Brien, E. J. (1980). Familiarity-based responding in item recognition: Evidence for the role of spreading activation. *Journal of Experimental Psychology: Human Learning & Memory, 6,* 301–318.

Malt, B. C. (1989) An on-line investigation of prototype and exemplar strategies in classification. *Journal of Experimental Psychology: Learning, Memory and Cognition, 15,* 539–555.

Martin, E. (1971). Verbal learning theory and independent retrieval phenomena. *Psychological Review, 78, 314–332.*

McDaniel, M. A., Lapsley, D. K., & Milstead, M. (1987). Testing the generality and

automaticity of self-reference encoding with release from proactive interference. *Journal of Experimental Social Psychology, 23,* 269–284.

Meyer, D. E., & Schvaneveldt, R. W. (1971). Facilitation in recognizing pairs of words: Evidence of a dependence between retrieval operations. *Journal of Experimental Psychology, 90,* 227–234.

Neely, J. H. (1988). Experimental dissociations and the episodic/semantic memory distinction. In H. L. Roediger & F. I. M. Craik (Eds.), *Varieties of memory and consciousness: Essays in honor of Endel Tulving* (pp. 229–270). Hillsdale, NJ: Erlbaum.

Olton, D. S. (1989). Inferring psychological dissociations from experimental dissociations: The temporal context of episodic memory. In H. L. Roediger & F. I. M. Craik (Eds.), *Varieties of memory and consciousness: Essays in honor of Endel Tulving* (pp. 161–177). Hillsdale, NJ: Erlbaum.

Park, B. (1986). A method for studying the development of impressions of real people. *Journal of Personality and Social Psychology, 51,* 907–917.

Reeder, G. D., McCormick, C. B., & Esselman, E. D. (1987). Self-referent processing and recall of prose. *Journal of Educational Psychology, 79,* 243–248.

Roediger, H. L., & Blaxton, T. A. (1987). Retrieval modes produce dissociations in memory for surface information. In D. S. Gorfein & R. R. Hoffman (Eds.), *Memory and learning: The Ebbinghaus Centennial Conference* (pp. 349–379). Hillsdale, NJ: Erlbaum.

Roediger, H. L., Weldon, M. S., & Challis, B. H. (1989). Explaining dissociations between implicit and explicit measures of retention: A processing account. In H. L. Roediger & F. I. M. Craik (Eds.), *Varieties of memory and consciousness: Essays in honor of Endel Tulving* (pp. 3–41). Hillsdale, NJ: Erlbaum.

Rogers, T. B., Kuiper, N. A., & Kirker, W. S. (1977). Self-reference and the encoding of personal information. *Journal of Personality and Social Psychology, 35,* 677–688.

Schacter, D. L., Wang, P. L., Tulving, E., & Freedman, M. (1982). Functional retrograde amnesia: A quantitative case study. *Neuropsychologia, 20,* 523–532.

Schell, T. L., Klein, S. B., & Babey, S. H. (1996). Testing a hierarchical model of self-knowledge. *Psychological Science, 7,* 170–173.

Schneider, D. J., Roediger, H. L., & Khan, M. (1993). Diverse ways of accessing self-knowledge: Comment on Klein and Loftus. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 5, pp. 123–136). Hillsdale, NJ: Erlbaum.

Shallice, T. (1979). Neuropsychological research and the fractionation of memory systems. In L. G. Nilsson (Ed.), *Perspectives on memory research* (pp. 257–277). 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., & Klein, S. B. (1994). Development and representation of personality impressions. *Journal of Personality and Social Psychology, 67,* 972–983.

Tulving, E. (1983). *Elements of episodic memory.* New York: Oxford University Press.

Tulving, E. (1993). Self-knowledge of an amnesic individual is represented abstractly. In T. K. Srull & R. S. Wyer (Eds.), *Advances in social cognition* (Vol. 5, pp. 147–156). Hillsdale, NJ: Erlbaum.

Weiskrantz, L. (1989). Remembering dissociations. In H. L. Roediger & F. I. M. Craik (Eds.), *Varieties of memory and consciousness: Essays in honor of Endel Tulving* (pp. 101–120). Hillsdale, NJ: Erlbaum.

Weiskrantz, L. (1990). Problems of learning and memory: One or multiple memory systems? *Philosophical Transactions of the Royal Society of London B, 329,* 99–108.

Weiskrantz, L. (1997). *Consciousness lost and found.* New York: Oxford University Press.

Wyer, R. S., & Srull, T. K. (1989). *Memory and cognition in its social context.* Hillsdale, NJ: Erlbaum.