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The Self-Reference Effect in Memory: A Meta-Analysis

Cynthia S. Symons
Houghton College

Blair T. Johnson
University of Connecticut, blair.t.johnson@uconn.edu

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The Self-Reference Effect in Memory: A Meta-Analysis

Cynthia S. Symons
Houghton College

Blair T. Johnson
Syracuse University

In this review, the authors examine the basis for the mnemonic superiority that results from relating material to the self. A meta-analysis confirms the expected self-reference effect (SRE) in memory, with self-referent encoding strategies yielding superior memory relative to both semantic and other-referent encoding strategies. Consistent with theory and research that suggest self-reference (SR) produces both organized and elaborate processing, the SRE was smaller (a) when SR is compared with other-reference (OR) rather than semantic encoding and (b) when the comparison tasks promote both organization and elaboration. Thus, the SRE appears to result primarily because the self is a well-developed and often-used construct that promotes elaboration and organization of encoded information. The authors discuss the implications of these and other findings for theories of the SRE and for future research.

Throughout the history of psychology, researchers have used the self as a central part of their explanations of various phenomena (see Banaji & Prentice, 1994; G. T. Greenwald & Pratkanis, 1984; and James, 1890). A large body of research suggests that the self-structure is unique, relative to other concepts (e.g., those about other people; see Kihlstrom et al., 1988; Markus, 1977; and Rogers, Kuiper, & Kirker, 1977), in its motivational and affective implications as well as in its structure and content. Social psychologists have long posited an important affective role for the self-concept (e.g., C. W. Sherif, Sherif, & Nebergall, 1965; M. Sherif & Cantril, 1947). More recently, appraisal theories of emotion have emphasized the phenomenological importance of the self in the interpretation of events and the resulting effect on emotions (Fiske & Taylor, 1991). From a motivational standpoint, examples of the self's pervasive influence abound. For example, the tendency to attribute another person's behavior to dispositional factors but one's own behavior to situational factors presumably occurs because the self dominates one's phenomenal perspective (Ross & Nisbett, 1991; Storms, 1973). Similarly, both self-serving biases and defense mechanisms have been attributed to self-protective or self-enhancing motives (cf. Fiske & Taylor, 1991; Maddi, 1989). The motivational influence of the self in persuasion is evident when people resist persuasive appeals because of self-presentational concerns (Johnson & Eagly, 1989). Indeed, self-attention theory (Carver & Scheier, 1981) emphasizes that conformity of behavior to salient behavioral standards requires a focus on the self.

Given the breadth of interest in self-related phenomena and theories thereof (e.g., Cantor & Kihlstrom, 1987; Markus & Wurf, 1987), it is not surprising that researchers have more recently examined whether self-related processes invoke different memory stores (Klein & Loftus, 1993) and the extent to which the self-structure can be distinguished from structures about others (e.g., Aron, Aron, Tudor, & Nelson, 1991). In addition, research on self-schematicity (Markus, 1977; Markus & Wurf, 1987) demonstrates that the content of self-schematic domains can have a wide variety of motivational, affective, and mnemonic consequences.

The focus of this article is on these purportedly unique mnemonic aspects of the self. Several researchers have argued that the self-structure in memory is unique relative to other concepts by virtue of its superior elaborative and organizational properties as well as its frequent use in information processing (e.g., Kihlstrom et al., 1988; Maki & Carlson, 1993; Markus, 1977; Rogers et al., 1977; Singer & Kolligan, 1987). If the self indeed has superior elaborative and organizational properties, then information actively related to the self should be better remembered than information that is processed in other ways (e.g., the relating of information to someone else or the processing of words for meaning). Researchers who initially obtained this pattern labeled the phenomenon the self-reference effect (SRE; Rogers et al., 1977). Although many subsequent studies found superior recall following self-reference (SR; e.g., Bellezza, 1984; Kuiper & Rogers, 1979; Maki & McCaul, 1985), other research suggest that the SRE was not so robust. Specifically, other kinds of non-SR processing appeared to promote memory as well as or better than SR (e.g., Bellezza & Hoyt, 1992; Keenan & Baillet, 1980; Klein & Kihlstrom, 1986; Lord, 1980). These conflicting study findings led Higgins and Bargh (1987) to conclude that "self-reference is neither necessary nor suffi-

Cynthia S. Symons, Department of Psychology, Houghton College; Blair T. Johnson, Department of Psychology, Syracuse University.

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Correspondence concerning this article should be addressed to Cynthia S. Symons, Department of Psychology, Houghton College, Houghton, New York 14744. Electronic mail may be sent via Internet to csymons@houghton.edu.

cient for memory of input to be facilitated in comparison to a semantic orientation task" (p. 392). Moreover, after 2 decades, researchers seem divided between those who are willing to attribute the SRE to special mnemonic properties of the self (e.g., Maki & McCaul, 1985; Rogers et al., 1977) and those who are not (e.g., Brown, Keenan, & Potts, 1986; Klein & Kihlstrom, 1986).

These inconsistencies were the impetus for our meta-analytic investigation. The first important question we address is whether SR tends to facilitate memory more effectively than other encoding tasks. That is, how consistently robust is the SRE? By addressing this question, we provide an empirical test of conclusions by narrative reviewers (e.g., Higgins & Bargh, 1987) that variation in the results of SRE studies imply that it is not SR per se that facilitates memory. Our second and more important question concerns the conditions under which the SRE is most likely to occur. That is, assuming that SRE reviewers were correct to conclude that studies' findings were inconsistent, we feel that it is most important to detail methodological features of SRE studies that can be used to account for these inconsistencies. Obviously, such explanations represent the most theoretically interesting aspect of this investigation.

In this article, we adopt the perspective that the SRE results primarily because the self is a well-developed and often-used construct in memory that promotes both elaboration and organization of encoded information—a perspective first advanced by Klein and Loftus (1988). The respective roles of elaboration and organization in the SRE have been discussed by several researchers (e.g., A. G. Greenwald & Banaji, 1989; Klein & Kihlstrom, 1986; Klein & Loftus, 1988). In general, these researchers emphasized the role of ordinary memory processes, which leads to the conclusion that there is nothing special or unique about SR that renders it more effective as a mnemonic device than other encoding tasks. According to Klein and Loftus, although SR may be ordinary in the sense that it can be explained by these properties, it is distinguished from many other comparison tasks (e.g., synonym judgments) in the sense that SR promotes both elaboration and organization simultaneously, resulting in a mnemonic advantage. However, only Klein and Loftus's study provides empirical support for the joint elaboration–organization model. Their findings imply that, across all the studies in the literature, SR tends to result in superior memory compared with tasks that promote either organization or elaboration separately (e.g., a synonym judgment task) but not combined.

We further submit that, to the extent that SR is spontaneous or habitual (e.g., Markus, 1977), the major benefit of SR lies not in its ability to invoke organizational or elaborative processing per se but rather its likelihood to spontaneously create matching between encoding and retrieval conditions (see Wells, Hoffman, & Enzle, 1984). This effect distinguishes the SR task from other tasks and may be the primary reason why it promotes memory more than other kinds of processing in the typical incidental learning situation.

This study provides a meta-analytic integration of the SRE literature that allows an examination of the consistency and generality of the SRE and the conditions under which it is likely to occur. Furthermore, it provides a meta-analytic test of the joint roles of elaboration and organization. Specifically, we present evidence that the SRE occurs as a result of two features of the experimental task in a typical SRE study: (a) the nature of the comparison task (person-reference vs. semantic processing) and (b) the likelihood that the semantic or other-reference (OR) comparison task promotes both organization and elaboration. First, we show that comparisons that involve person reference (e.g., SR vs. OR) have smaller SREs relative to SR- versus semantic-encoding comparisons. Even more interesting, we show that comparisons of SR versus OR appear to be sensitive to certain task parameters (e.g., expectation of a test) that do not affect comparisons of SR with semantic processing. In addition, we show that the mnemonic advantage following SR tends to diminish when SR is compared with encoding tasks that invoke memory structures, which resemble the self in terms of the amount of development and use (e.g., OR tasks in which the target is very well known). Second, we show that, when the task compared with SR is judged to promote both elaboration and organization of stimulus words, the SRE is smaller than when the comparison task promotes only organization (relational processing) or only elaboration (item-specific processing; Klein & Loftus, 1988).

Historical Overview of SRE Research

In a seminal pair of studies, Rogers et al. (1977) extended the depth of processing (DOP) paradigm (Craik & Tulving, 1975) to the realm of the self. The basic strategy of the DOP paradigm is to compare the responses produced by encoding tasks that are presumed to differ in depth, or extensiveness, of processing (Eysenck & Eysenck, 1979). Essentially, DOP theory assumes that recall is a function of trace elaboration at the time of encoding. Differences in responses to different tasks, therefore, reflect underlying differences in the processes used to encode stimulus materials, such as word lists. DOP researchers had already demonstrated that semantic-encoding tasks ("Does the word mean the same as xxx?") resulted in superior recall compared with phonemic ("Does the word rhyme with xxx?") or structural encoding ("Does the word have capital letters?") tasks (e.g., Craik & Tulving, 1975). Rogers et al. used these standard DOP encoding tasks and added a new one, an SR task (i.e., "Does the word describe you?"). Showing that memory was even better for the SR condition than the semantic condition, Rogers et al. concluded that the self acts as a "superordinate schema" (p. 686) to facilitate encoding and retrieval of the information.

Researchers in subsequent studies generally confirmed that SR produces superior memory relative to semantic encoding. These researchers obtained an SRE with different (a) SR-encoding tasks (e.g., self-descriptiveness, autobiographical retrieval, imagery; Bower & Gilligan, 1979; Brown et al., 1986); (b) to-be-remembered materials (e.g., traits, nouns, prose; Bellezza, 1984; Klein & Loftus, 1988; Maki & McCaul, 1985; Reeder, McCormick, & Esselman, 1987); and (c) populations (e.g., children and adults, Pullyblank, Bisanz, Scott, & Champion, 1985; participants with and without depression, Derry & Kuiper, 1981). The SRE appeared to be a robust phenomenon and quickly surfaced in introductory social and cognitive psychology textbooks.

However, along with those who found SREs, researchers also obtained findings in which SR failed to facilitate memory better than other types of processing. Researchers soon observed that comparisons of SR tasks with semantic tasks were confounded: That SR denotes a social entity, whereas the semantic task does not, suggests that enhanced memory may be a mere artifact of this task feature (Bower & Gilligan, 1979). In an effort to solve this problem, researchers compared memory following SR to that following OR (e.g., "Does this word describe your mother?"). Studies usually showed that the SRE was reduced, if not eliminated entirely, when the target referenced in the comparison task was a highly familiar other (e.g., Bower & Gilligan, 1979; Kuiper, 1982; Kuiper & Rogers, 1979). Further studies suggest other boundary conditions on the SRE. For example, the SRE is shown to be reduced or reversed when imagery tasks are used (Lord, 1980), the semantic comparison task is a desirability rating (Ferguson, Rule, & Carlson, 1983), or the semantic comparison task promotes organization (but the SR task does not; Klein & Kihlstrom, 1986). Despite these null findings and reversals, our narrative inspection of the literature suggests that the SRE appears more often than not.

Self as a Cognitive Construct That Promotes Elaboration

The most popular explanation of the SRE is that SR promotes elaborative processing of to-be-remembered information (Keenan, 1993; Rogers et al., 1977). Based on DOP theory, *depth* is equated with the extent or amount of processing that a stimulus receives, whereas *elaboration* involves item-specific processing (see Eysenck & Eysenck, 1979). When a participant processes a word using elaboration, he or she attends to the specific meaning of the word and the semantic associations between the word and extra list material in semantic memory (Anderson & Reder, 1979; Einstein & Hunt, 1980; Klein & Loftus, 1988). According to Klein and Loftus, the effect of this kind of processing is to provide multiple routes for retrieval and create an environment in which "inference-based reconstruction . . . [is supported] . . . in the event of retrieval failure" (p. 6). Exemplifying this elaboration perspective, Anderson and Reder (1979) theorized that

> it is not depth of processing per se that is important, but one's prior practice at making elaborations about various types of information and practice at interpreting the previously stored elaborations. The "better" processing is that which generates more elaborations of the input that can be interpreted at retrieval . . .. The instructions that can produce rich elaboration and the materials that can be richly elaborated must be defined with respect to the processor. The most critical determinant of retention is the number of elaborations. (p. 390)

Anderson and Reder further argued that certain kinds of elaborations may be easier for some people because they are practiced habitually. This ease of processing that develops as a consequence of repeated elaborations suggests a connection to the memorial advantage of SR processing. Many researchers have concluded that processing information in a self-relevant way may be a "normal" processing mode (e.g., Catrambone, Beike, & Niedenthal, 1996; Catrambone & Markus, 1987; Fong & Markus, 1982; Wells et al., 1984). They argued that the self is exceptionally well learned and often used (Kihlstrom, 1993; Maki & Carlson, 1993) and that, indeed, people generally possess more expertise about themselves than about any other structure in memory (Markus, 1977). Thus, the evidence suggests that SR constitutes a processing task that receives a great deal of practice. An important consequence of the facility with which one elaborates on information using SR is that such processing can become exceptionally efficient.

Meta-analytic predictions for SR–semantic and SR–OR comparisons. Given the foregoing logic, we expected the results of our investigation to show that SR should produce superior memory when compared with tasks that promote less elaboration. Proponents of the elaboration hypothesis argued that, under most circumstances, SR results in greater elaboration of the stimulus word than that achieved by a semantic comparison task (e.g., Rogers et al., 1977). Thus, based on the elaboration hypothesis, the SRE should be smaller (or disappear altogether) when studies use semantic-encoding tasks that engender greater elaboration and larger when the semantic-encoding tasks engender less elaboration than the SR.

On the one hand, it is difficult to think of tasks that would promote more elaboration than SR when the stimulus words are trait adjectives because trait dimensions are the most common attributes along which people judge themselves (Maki & McCaul, 1985; see Markus & Kitayama, 1991). Thus, we might predict that when traits are used as stimulus items, SR should always result in memory superior to that of a semantic task. On the other hand, such mnemonic superiority should increase to the extent that a person is practiced at making such elaborations. Certainly self-relevant judgments about traits are often practiced, however, certain semantic judgments are also often used. In particular, people commonly identify certain trait adjectives as more socially desirable than other adjectives, a process that is part of socialization (Ferguson et al., 1983). We thus expect our meta-analysis to show that the act of judging a word for its desirability produces memory equivalent to that of SR (Ferguson et al., 1983; cf. McCaul & Maki, 1984). Similarly, SR should theoretically facilitate processing of traits better than nouns because it is more common for people to judge themselves along trait dimensions than to judge, for example, which careers they have considered in the past (Maki & McCaul, 1985; cf. Klein & Kihlstrom, 1986). Thus, on the basis of the elaboration hypothesis and findings that are consistent with it, we expect our meta-analysis to show that the SRE is larger for studies in the literature that used traits rather than nouns.

Similar arguments hold with regard to SR versus OR tasks: To reference highly intimate others (e.g., one's mother) should result in more elaborations than to reference a less intimate other, presumably because elaboration of information relevant to intimate targets is a highly practiced task undertaken many times before. This high degree of elaboration theoretically promotes superior memory because it increases the likelihood of additional retrieval routes at the point of recall. Thus, to process information about a highly intimate other ought to promote superior memory relative to that produced by reference to someone less intimate. Elaboration of stimulus words during reference to a highly intimate other (e.g., one's mother) is a frequently occurring task. It is conceivable that information about intimate others may be nearly as well known and well elaborated as self information (Aron et al., 1991). Thus, to the degree that the target other is intimate, the SRE should less likely be obtained (e.g., Bower & Gilligan, 1979; Brown et al., 1986; Kuiper, 1982). Yet, because studies in this subliterature have not always used highly intimate target others (e.g., the experimenter for the laboratory session), we still expect our meta-analysis to reveal a mnemonic advantage for SR conditions over OR conditions. When the rated target is highly intimate, however, OR should result in memory of stimulus words nearly equivalent to that of SR.

We should note that many researchers did not distinguish between familiarity and intimacy in their operationalizations of OR tasks. For example, in the literature, it is common to see, for example, Johnny Carson and one's mother described as highly "familiar" stimulus others. However, although both their mothers and Johnny Carson may be rated by research participants as very familiar target others, participants are, of course, much more likely to have an intimate knowledge of their mothers. Although this may seem like a minor and admittedly obvious point, we present it because it has contributed to the perception of inconsistency in findings in the SRE literature. Consistent with the elaboration hypothesis, researchers have examined the degree to which representations of intimate others may overlap that of the self (e.g., Aron et al., 1991). One's memory structure about one's mother should obviously be much more elaborate, differentiated, and well known than a memory structure about Johnny Carson. Thus, representations about one's mother are theoretically more likely to promote recall equivalent to that evoked by SR. Later, we show that the distinction between familiarity and intimacy, as they are used in the literature, is important: Only intimacy predicts variation in effect sizes in the SRE literature.

Encoding specificity. An important principle of memory is that elaboration at encoding cannot solely account for retrieval. A large body of literature asserts the importance of retrieval conditions as well as encoding conditions. Based on the encoding specificity principle (Fisher & Craik, 1977; Tulving, 1979; Tulving & Thompson, 1973), the best retention is obtained when retrieval conditions reinstate conditions that were present at encoding. Wells et al. (1984) examined the effects of encoding-specific conditions on the SRE and showed evidence that participants spontaneously reinstated SR conditions at retrieval. Notably, even when encoding and retrieval conditions were matched (i.e., OR encoding was followed by an OR cue at retrieval), recognition memory was higher for the SR condition. This finding is consistent with DOP research (Fisher & Craik, 1977) that shows differences in recall across processing conditions despite matched encoding and retrieval conditions. These findings suggest that, even with matched conditions, encoding conditions have an effect. In the same way, SR encoding may promote better recall than comparison processing conditions because it promotes SR retrieval (Wells et al., 1984) and more elaboration of stimulus words.

In summary, the elaboration hypothesis predicts that, across the literature, SR should be superior to both semantic and OR processing. Moreover, if we extend the logic of the elaboration hypothesis, (a) in general, the SRE should be larger for studies that compared SR tasks with tasks that promote less elaboration; (b) within the class of studies that used SR and OR tasks, the SRE should be larger for low-intimacy targets than for high-intimacy targets; and (c) within the SR–semantic class of comparisons, SREs should be larger when studies used traits rather than nouns.

Self as a Construct That Promotes Organization

Ironically, a huge literature on the mnemonic effects of organization predated the DOP perspective that elaboration is memory's driving force (see Bousfield & Bousfield, 1966; and Mandler, 1967), but it has only more recently been brought to bear on the SRE (Klein & Kihlstrom, 1986). *Organization* is the process of grouping items together. It (a) is essentially relational processing in which words are grouped based on some set of semantic criteria (Klein & Kihlstrom, 1986); (b) results in attention to similarities between list words (Hunt & McDaniel, 1993) as well as associations between the words and their category label (Battig & Bellezza, 1979; Klein & Kihlstrom, 1986); and (c) may take different forms (e.g., subjective organization or organizational strategies that are unique to the particular stimulus list or encoding situation; see Battig & Bellezza, 1979). According to Klein and Kihlstrom, organization facilitates recall in two ways. First, it encourages encoding of relationships between list words that share the same category, resulting in the development of multiple retrieval paths. Second, the associations formed between the words and their category label allow the category label to act as a retrieval cue, thus facilitating recall.

Klein and his colleagues rallied evidence to show that organizational processing also plays a role in the SRE (Kihlstrom et al., 1988; Klein & Kihlstrom, 1986; Klein & Loftus, 1988; Klein, Loftus, & Schell, 1994). For example, Klein and Kihlstrom showed that organizational properties presumably inherent in a typical SR task could account for its mnemonic superiority relative to a semantic comparison task. They found that, when an SR task is compared with a semantic-encoding condition designed to promote organization, the SRE disappeared. They concluded that organization was confounded with SR in the typical SRE paradigm.

In-line with this reasoning, if an organizational principle underlies the mnemonic superiority of SR encoding, to the degree that a comparison task promotes organization (e.g., a categorization task), then the difference in subsequent recall following the two tasks should decrease. However, organization can take several forms (Battig & Bellezza, 1979). For example, it can occur because participants become aware of a category due to its size (Hunt & Seta, 1984), can be subjective, or could be deliberately induced by the experimenter (e.g., through a category-sorting task). Although it has been demonstrated that a self-descriptiveness judgment task can elicit organizational processing (e.g., Klein & Kihlstrom, 1986), no researcher has specifically examined the degree to which specific kinds of organizing strategies or styles of organizational processing naturally arise out of an SR task or affect the SRE. On the basis of Klein and his colleagues' findings (e.g., Klein & Kihlstrom, 1986; Klein & Loftus, 1988), however, we can generally predict that, to the degree that SR processing elicits organization, recall should be greater than for a task that does not. Moreover, theoretically if both comparison tasks promote organization, to the degree that SR results in more organization than the comparison task, an SRE should be observed.

SR as Organized and Elaborative

Under certain circumstances, either organization or elaboration may produce good recall or prove superior to the other. Although some researchers have discussed the idea that either organizational (relational) or elaborative (item-specific) processing may explain the mnemonic superiority of SR, only Klein and Loftus (1988) have performed an empirical test of the hypothesis that both elaboration and organization are invoked during SR. By doing so, they raised certain issues that had not been addressed directly in the SRE literature. The basic question that has driven investigations of SR is whether there is something inherent in the SR task that makes it likely to produce more recall than a semantic or OR task. The important focus that Klein and Loftus emphasized was the joint effects of elaboration and organization and the mnemonic advantages that occur when both processes are simultaneously invoked by a particular task.

In a review in which they discussed the joint role of item-specific and relational processing across a wide range of cognitive phenomena, Hunt and McDaniel (1993) summarized the basic logic that appears in different domains of the memory literature, including Klein and Loftus's (1988) experiment. In their article, Hunt and McDaniel discussed the idea that, when words are already related, similarities between words are naturally encoded during comprehension and attention to differences between the words (item-specific processing) facilitates memory more than attention to similarities. However, when stimulus words are unrelated, differences between words are naturally encoded during comprehension and attention to similarities between the words (relational processing) facilitates memory more than attention to differences (Einstein & Hunt, 1980; Hunt & Einstein, 1981). On the basis of this logic, Klein and Loftus (1988) hypothesized that, if organization underlies SR, then an SR task should have effects similar to that of an organizational task. Thus, if the stimulus words are already related, then attention during comprehension is naturally drawn to relationships between words and both organizational processing and SR should be redundant. In this situation, elaborative processing should facilitate more memory than organization or SR. Klein and Loftus further hypothesized that, if elaboration underlies SR, then an SR task should have effects similar to an elaborative task. Thus, when words are unrelated, attention during comprehension is naturally drawn to differences between words. In this situation, both elaboration and SR should be redundant and organization should serve to enhance recall more than either SR or elaboration. Klein and Loftus's results show a pattern that supports a joint elaboration–organization explanation. Specifically, when list words were related, SR resulted in effects similar to elaboration: Both resulted in memory superior to organizational processing. However, when the list words were not related, SR also resulted in effects similar to an organizational task. In this case, both SR and organizational tasks enhanced recall more than the elaborative task. Klein and Loftus, therefore, advocated what they called a "dual-processing approach" and concluded that both organizational and elaborative processing are invoked in an SR task.

Given these ideas about the joint roles of relational and item-specific processing and consistent with Klein and Loftus's (1988) experiment, several predictions that distinguish SR from other kinds of processing arise. (a) SR tasks, which presumably promote both relational processing and item-specific processing, ought to promote better memory than any other task that promotes only one of these processes. (b) When list words are already related, an SR task should promote more memory than a task that promotes organization (because, when the list is related, organizational processing is redundant [Hunt & Einstein, 1981], and elaborative processing, theoretically inherent in an SR task, promotes optimal recall [Klein & Loftus, 1988]). (c) Conversely, when list words are already unrelated, an SR task should promote more memory than a task that promotes elaboration (because, when the list is unrelated, elaborative processing is redundant [Hunt & Einstein, 1981], and organizational processing, theoretically inherent in an SR task, promotes optimal recall [Klein & Loftus, 1988]).

Meta-Analysis

Design

Boundaries for the sample of studies. We attempted to maintain in our sample only those studies that used the standard DOP incidental learning paradigm, in which an encoding (orienting) question is posed and a stimulus word is presented for the participant's judgment. By eliminating atypical studies from the sample, we were able to confine our meta-analysis to studies or portions of studies that were relatively consistent on all methodological dimensions except those that are important for meta-analytic moderator testing (Johnson, 1989). Thus, we excluded studies that used unusual methodologies relative to the rest of our sample. For example, some studies involved the reading of passages of prose, which participants were instructed to read and relate to themselves as much as possible (e.g., Reeder et al., 1987). Other studies used atypical stimuli that were not similar to those used in most of our sample (e.g., faces; Mueller, Bailis, & Goldstein, 1979) or participants were not asked to recall stimuli in a manner that conformed to the vast majority of SRE studies.

Theoretical plan. Our general plan for the meta-analysis was first to test our expectation that the SRE is significant yet inconsistent across all studies in the literature. We then planned to test our expectation that the SRE would be larger in studies where researchers compared SR with semantic encoding rather than SR with OR. Because most of our other hypotheses are specific to one or the other of these two general classes of studies, we then planned to examine our hypotheses separately within these two classes. Indeed, some moderators that we examined could only be examined within one of the classes (e.g., type of semantic-encoding task).

On the basis of Klein and Loftus's (1988) conceptualization of the joint effects of relational and item-specific processing, we expect our meta-analysis to show that the SRE is smaller when the comparison task is judged to elicit both relational and item-specific processing rather than either one or the other of the two processes. Thus, for example, the SRE should decrease as intimacy of a rated target increases because the rating of a highly intimate other conceivably involves relational processing in which a highly organized domain in memory is referenced (see Sedikides, Olsen, & Reis, 1993) and item-specific processing that involves increasing degrees of elaboration as one's knowledge of the OR target increases.

Exploratory analyses. On an exploratory basis, we examined several other possible moderators of the SRE, which should prove of special interest to SRE researchers who have speculated about most of these dimensions. Indeed, in coding studies for their characteristics, we included any dimension of which we were aware that other SRE researchers had found to be plausible moderators of SRE magnitude. Because many of these moderators have been the subject of theoretical debate and the relevant studies have yielded quite inconsistent findings, it was difficult to make meta-analytic predictions about the moderators' roles in the SRE. Nonetheless, the exploratory moderators included (a) specific aspects of the experimental situation (e.g., whether a distractor task was used and what the length of the stimulus presentation was), (b) dependent variable (free recall vs. recognition), (c) design type (within vs. between subjects), and (d) memory load (i.e., amount of to-be-remembered material). We expect results for these dimensions to provide important clues regarding the basis of the SRE. Thus, for example, if the use of a distractor task has no impact on the SRE for semantic–SR comparisons but increases the SRE for SR–OR comparisons, then it may be that OR tasks benefit more from rehearsal strategies, as some reseachers have argued (Kuiper & Rogers, 1979).

Method

Criteria for study inclusion. Our meta-analysis focuses on two comparisons performed in the majority of SRE studies: (a) SR versus semantic encoding and (b) SR versus OR encoding. Studies had to meet two criteria:

1. Researchers had to manipulate encoding instructions by presenting participants with a task in which either (a) SR and semantic encoding or (b) SR and OR were compared. We generally included studies that presented traditional DOP paradigm encoding tasks; however, studies in which researchers did not use traditional tasks were included if we judged them to have manipulated the type of encoding in a relevant way, even though the task was not conventional (e.g., Mueller, Heesacker, & Ross, 1984). Both within- and between-subjects designs were included.

2. Acceptable dependent measures included free recall, recognition, or cued recall. Either adjusted or raw score means were acceptable; however, when both adjusted and raw score means were available, adjusted means were used. The mere use of an SR trait descriptiveness task in a reaction-time paradigm was not sufficient for inclusion (e.g., Markus, 1977); the task had to specifically test the effects of type of encoding on some measure of recall or recognition.

Study retrieval. A thorough search of the SRE literature was conducted to find as many studies as possible. We obtained studies through literature searches using *PsycLIT* (1974–1994) and by searching reference lists of relevant articles. In addition, we searched for unpublished dissertations and conference papers and made specific attempts to contact researchers of unpublished studies to avoid publication bias. Only studies that were available as of June 1994 were included in the sample.

Coding. We coded studies on several dimensions that were relevant for theoretical or exploratory purposes and on many more dimensions that were descriptive only. The *theoretically relevant* dimensions included (a) type of comparison (SR–semantic vs. SR–OR), (b) type of SR task (self-descriptive, autobiographical, imagery, associating self with nouns [e.g., body parts or boats], other), (c) type of semantic task (synonym decision, generate a definition, fits sentence, fits category, other), (d) relatedness of stimulus words (high, low, unable to rate), (e) type of stimuli presented (trait adjectives, nouns, other), (f) familiarity of the other-referent target (high, low, unable to rate), (g) intimacy of the other-referent target (high, low, unable to rate), and (h) type of processing promoted by the comparison task (relational, item-specific processing, or both). The *exploratory* dimensions included (a) type of dependent measure (free recall, cued recall, recognition), (b) design of study (within or between subjects), (c) nature of timing interval for retrieval measure (fixed, unlimited; recorded time if fixed), (d) type of OR task (descriptive, biographical, imagery, associated target other with nouns, other), (e) timing of stimulus presentation (fixed, variable based on response latency, variable based on experimenter judgment, other, unknown), (f) length of stimulus presentation, (g) duration of interval between task and retrieval, (h) presence of distractor task, (i) expectation of a memory task (i.e., use of an incidental vs. an intentional learning paradigm), and (j) memory load (coded as number of words in the stimulus list). The merely *descriptive* characteristics included (a) year of publication, (b) source of publication (journal, other publication, dissertation or master's thesis, unpublished), (c) source of participant population (undergraduate or other), (d) percentage of male participants in the sample, (e) method to test participants (individual or group), (f) geographic area in which the study was conducted, (g) mode of stimulus presentation (index cards, monitor, projector, read by experimenter, booklet, tachistoscope, other), and (i) expectation of a retrieval test by participants (i.e., incidental or intentional learning paradigm).

Computation of effect sizes. Effect sizes for the studies were recorded, along with their significance and direction. In so far as possible, separate effect sizes (gs) were computed for each relevant manipulation (i.e., SR vs. semantic encoding and SR vs. OR encoding) with the following formula:

$$g = \frac{M_{\text{self}} - M_{\text{semantic (other)}}}{SD_{\text{pooled}}},$$

where M_{self} is the mean recall for the SR-encoding condition, $M_{\text{semantic (other)}}$ is the mean recall for the semantic- (or OR-) encoding condition, and SD_{pooled} is the pooled standard deviation (see Johnson, 1989). We converted the gs to ds by correcting them for the bias that occurs, especially with small sample sizes (Hedges & Olkin, 1985). Some studies yielded multiple effect sizes because (a) more than one dependent measure was used (e.g., two different recall measures) or (b) several different levels of a variable were manipulated (e.g., several different target others; Keenan & Baillet, 1980). The effect sizes were analyzed using standard meta-analytic techniques (Hedges & Olkin, 1985; Johnson, 1989).

Results

Characteristics of studies. We began our analyses by summarizing the characteristics of studies reviewed in the meta-analysis. Table 1 shows the summary of study characteristics aggregated across all SRE studies and then across the two subsets of studies that represent the separate classes of (a) SR versus semantic manipulations and (b) SR versus OR manipulations. Table 2 presents the calculated effect size (d) for each study in our meta-analysis, along with its important study attributes.

As Table 1 shows, studies in our meta-analysis (a) were published relatively recently; (b) were primarily published reports; (c) tested 39 participants on average; (d) tested participants primarily from college populations; (e) usually tested adults; (f) were primarily conducted in North America; (g) tended to test participants individually (75%), with 24% using group methodologies; (h) tended to use within-subjects (75%) versus between-subjects designs (25%); (i) had an average memory load of about 54 words, with studies in the SR versus OR class tending to have longer stimulus lists than the SR versus semantic class; (j) used trait words as stimuli more than nouns; (k) primarily used stimulus lists that contained unrelated words; (l) used a small number of encoding tasks on average, with SR versus OR studies tending to use more tasks than did SR versus semantic studies; (m) tended to present stimuli at a fixed rate or measure participants' reaction times; (n) used a variety of modalities to present stimulus materials, with the majority using computers; (o) tended to use free recall as the dependent measure, with a small percentage using recognition and very few using cued recall; (p) tended to allow participants a fixed time period to respond during the retrieval task; (q) were slightly less likely to use distractor tasks (47%) than not (53%) between presentation and retrieval; and (r) tended to use an incidental learning paradigm (87%) in which participants did not expect a recall test rather than an intentional learning situation in which testing was expected.

Overall SRE. After summarizing study characteristics, we analyzed the entire set of SRE studies to test the hypothesis that SR results in greater memory than OR or semantic encoding. These analyses appear at the bottom of Table 1 and show that SR encoding does promote better recall on average than other types of encoding, as evidenced by a mean weighted effect size that differed significantly from the 0.00 value that indicates exactly no effect, $d = 0.50$, 95% confidence interval (CI) = 0.45–0.54. Also as expected, the assumption of homogeneity of effect sizes was rejected, $Q(128) = 451.40$, $p < .0001$. Consistent with the conclusion that study results were inconsistent, homogeneity could not be achieved until we discarded 34 (26%) outlying effect sizes. The resultant mean effect size was still significant, $d = 0.45$, 95% CI = 0.39–0.50. Thus, the hypothesis of an overall SRE across the literature was supported, although its magnitude varied considerably.

Cross-Literature Models for SRE Magnitude

Following the overall analysis, we fitted models using coded study characteristics to explain variation in effect sizes. With our first model, we examined whether the SRE varied as a function of studies' manipulation class (SR–semantic vs. SR–OR). As predicted, the SRE did vary as a function of manipulation class, with a significantly smaller SRE for the SR–OR versus the SR–semantic class (see Table 3). However, also as expected, each of these mean SREs was highly significant. Effect sizes within each class were also found to be heterogeneous; it was necessary to remove 11 studies (18%) from the SR–semantic class and 14 studies (20%) from the SR–OR class to achieve homogeneity. After removal of these studies, however, the resulting mean effect sizes were still significant (see Table 1). Thus, results show that, although study effect sizes are inconsistent, the SRE does tend to occur when one compares SR encoding with semantic encoding and OR, as predicted.

To test our hypothesis that the SRE would be smaller when the comparison task promotes both relational and item-specific processing, we performed a model test by collapsing across manipulation class. As the second model in Table 3 shows and as we predicted, when the comparison tasks used in studies in the literature promoted both relational and item-specific processing, the SRE was significantly smaller than when the comparison task promoted either relational or item-specific processing. Within the class of studies that used tasks that were judged to promote both relational and item-specific processing, the effect sizes were homogeneous; moreover, this class differed significantly from the separate classes for relational and item-specific processing. However, the relational and item-specific classes did not differ significantly from each other. In all three classes, significant SREs were observed.

Two continuous predictors—(a) time between encoding and memory tasks and (b) length of stimulus presentation—were significant predictors of the magnitude of SR effect sizes across the literature. Specifically, the SRE tended to increase as the time between the encoding and memory tasks increased and to decrease as the length of stimulus presentation grew longer. Note that the latter finding is based on the minority of studies that used fixed stimulus presentation times (i.e., $k = 51$). As Table 4 shows, both of these patterns generalized across the two manipulation classes. We next attempt to explain inconsistencies within the SR–semantic and SR–OR manipulation classes, respectively.

Moderators of SR–Semantic Effect Size Magnitude

Theoretical moderators. For the SR–semantic manipulation class, model tests for relatedness of stimuli reveal that studies using highly related stimulus items obtained a smaller mean SRE than those in the low-relatedness class (see Table 5). Indeed, the mean SRE in the high-relatedness class was not significant, and effect sizes in this class were consistent in contrast to the low-relatedness set in which a significant mean SRE occurred.

A model for type of stimulus materials used shows that, consistent with the elaboration hypothesis, the mean SRE for studies that used traits was significantly greater than that produced in studies that used nouns or other types of stimulus materials (see Table 5; as Table 6 shows and as discussed below, this pattern also appears for the SR–OR subliterature). However, the mean SRE for both the traits and the nouns classes was significant. Effect sizes for both classes of stimulus materials were inconsistent.

The next model was assessed to examine whether the semantic-encoding task used was related to SRE magnitude. Although there were eight classes of tasks in all, a few clear differences did emerge (see Table 5 for specific differences). Consistent with the organization hypothesis, the mean SRE for the fits-category class was marginally smaller than the mean SRE for the synonym judgment class ($p = .057$); however, it was not smaller than other classes of semantic tasks. Also, studies that used desirability ratings tended not to observe a significant mean SRE, in contrast to studies in the other classes. Studies that used tasks in which participants had to generate definitions and those that used synonym judgment tasks obtained significantly larger mean SREs than those that used desirability ratings. However, desirability judgments did not differ significantly from any of the other tasks, and the synonym judgment class differed significantly only from tasks involving desirability judgments.

Only three studies in the entire sample tested children as

Table 1
Summary of Study Characteristics for SRE Studies and Within Manipulation Class

Variables and class	All (k = 129)	SR–semantic (k = 60)	SR–OR (k = 69)
Publication characteristics			
Median publication year of studies	1985	1985	1985
Publication form of studies			
Journal articles or book chapters	126	58	68
Unpublished reports (including theses, etc.)	3	2	1
Participant and study method characteristics			
M number of participants	38.75	47.17	31.43
Participant population			
College undergraduate	106	54	52
Other	23	6	17
Age of participants			
Adult	126	57	69
Child	3	3	0
Geographic area of study			
United States	85	36	49
Canada	38	22	16
Europe	6	2	4
Method used to test participants			
Individual	97	46	51
Group	31	13	18
Other[a]	1	1	0
Experimental design			
Within subjects	97	32	65
Between subjects	32	28	4
M memory load (in words)	53.64	46.25	60.09
Stimulus type used in included studies			
Trait words	90	47	43
Nouns	37	11	26
Other	2	2	0
Relatedness of stimulus items			
High	13	9	4
Low	116	51	65
M number of encoding tasks presented	3.53	2.53	4.39
Timing of stimulus presentation			
Fixed time (e.g., every 7 s)	51	23	28
Variable, based on participant response	54	18	36
Variable, determined by experimenter	16	12	4
Other	7	6	1
Unable to rate	1	1	0
Mode of stimulus presentation			
Index cards	11	11	0
Monitor	67	23	44
Overhead projector	23	8	15
Read by experimenter	18	10	8
Tachistoscope	4	4	0
Booklet (read by participant)	5	4	1
Other	1	0	1
Type of dependent variable used in studies			
Free recall	105	54	51
Cued recall	2	2	0
Recognition	22	4	18
Time allowed for recall–recognition test			
Fixed	93	49	44
Unlimited	36	11	25
Distractor task			
Present	60	32	28
Absent	69	28	41
Participants' expectation of memory test			
Expect	17	2	15
Do not expect	112	58	54

Table 1 (*continued*)

Variables and class	All (k = 129)	SR–semantic (k = 60)	SR–OR (k = 69)
	Effect size summary		
M weighted effect size (d_+)	0.50	0.65	0.35
95% CI	0.45–0.54	0.58–0.71	0.29–0.42
Homogeneity of effect sizes (Q)[b]	451.40***	178.30***	230.40***
n outliers removed to achieve homogeneity	34 (26%)	11 (18%)	14 (20%)
M weighted d_+ excluding outliers	0.45	0.59	0.26
95% CI	0.39–0.50	0.52–0.66	0.19–0.33
M unweighted d	0.53	0.72	0.35
95% CI	0.42–0.62	0.58–0.86	0.22–0.45

Note. For the purposes of these analyses, each effect size represents a separate study. CI = confidence interval; OR = other reference; SR = self-reference; SRE = self-reference effect.
[a] Davis (1979) manipulated this variable. [b] Significant value indicates rejection of hypothesis of homogeneity.
*** $p < .001$.

participants, and all three of these studies also used SR versus semantic tasks. However, model tests reveal that studies with adults as participants obtained significantly larger mean SREs than studies with children as participants; in both classes, the mean SRE was significant. In addition, whereas effect sizes in the children class were homogeneous, effect sizes in the adult class were quite heterogeneous.

Exploratory analyses. Exploratory analyses reveal, first, that type of SR task related significantly to the magnitude of the SRE.[1] Specifically, self-descriptiveness, autobiographical, and other tasks do not differ in promoting recall. However, the mean effect size for the association with nouns class differs significantly from the other tasks (see Table 5).

As Table 5 shows next, a significant model test examining the SRE as a function of dependent variable used shows that the mean SRE for studies using recognition was not significant but that the mean SREs for studies using free and cued recall were significant. Study findings were quite inconsistent within the free recall class but consistent in the other two classes.

Two other model tests were significant. First, the model for mode of stimulus presentation shows that the use of projectors resulted in the largest SREs for this class, but mean effect sizes were not significantly different from studies that used index cards or booklets to present stimuli. Second, the model for participant population reveals that studies that tested undergraduates as participants obtained significantly larger SREs than studies that tested participants who were not undergraduates.

In contrast to the usual expectation that within-subjects designs are more powerful statistically than between-subjects designs, type of experimental design did not affect the magnitude of the SRE. Finally—as Table 4 details—as the memory load induced in the studies increased, so did the magnitude of the semantic–SR effect sizes (a pattern that did not appear in the SR–OR class).

Moderators of SR–OR Effect Size Magnitude

Theoretical moderators. As Table 6 shows, within the SR–OR class and, consistent with expectations, the mean SRE was larger (and significant) in studies using traits rather than nouns. Moreover, the mean SRE for studies using nouns was not significant. (This pattern contrasts with the SR–semantic manipulation class in which results reveal significant mean SREs in both the traits and nouns classes.) However, both classes' effect sizes were quite heterogeneous.

Also as expected, model tests reveal that familiarity of the rated target other did not predict the magnitude of the SRE, whereas intimacy did. Specifically, as Table 6 shows, studies in which participants rated highly intimate targets obtained a significantly smaller mean SRE than studies in which target others were low in intimacy.[2] However, although the SRE was smaller when highly intimate others were rated, SR still tended to result in better memory.

Model tests also show that studies using self-descriptiveness tasks produced a significantly larger mean SRE than did studies using imagery tasks, as hypothesized and compared with other tasks (see Table 6). In addition, use of SR-imagery tasks within the SR- versus OR-manipulation class did not result in a significant mean SRE, as evidenced by the CI for that class. Within all three classes of SR tasks, study effects were inconsistent.

Exploratory moderators. Exploratory model tests for OR task used reveal that studies in the descriptiveness class had a significantly larger mean SRE than did the imagery, nonspecific-other, and other classes. Moreover, the mean SRE for studies using imagery tasks was not significant, as its CI shows. Model tests of dependent variable used reveals a significantly larger SRE when recognition versus free recall was used. This pattern is exactly opposite from that obtained for studies in the SR versus semantic manipulation class, which obtained a larger mean SRE when recall was used rather than recognition (see Table 5).

(*text continues on page 384*)

[1] In this case, type of SR task was considered to be exploratory because we felt that we could not make a priori predictions about the patterns in the literature. This is in contrast to the same model test for the SR–OR manipulation class; the literature predicts that imagery task studies should obtain smaller SREs than other kinds of tasks.

[2] For both the familiarity and intimacy classes, studies in the unable to rate class tended to use nonspecific target others. It was difficult to classify these targets as either high or low in familiarity or intimacy.

Table 2
SRE Study Characteristics

Study and condition	Effect size (d)	95% CI for d: Lower	95% CI for d: Upper	Encoding task for self	Manipulation class	Encoding task for comparison	Other's status: Fam	Other's status: Int	Stimuli	ML	ToP	Timing: PT	Timing: TET	Timing: TAR	Expectation of test	Distractor	DV
Bargh & Tota (1988), no-load	0.64	0.08	1.19	Desc	O	NSO	NR	NR	T	66	Rel	7	0.0	3.0	Incid	Ab	Recall
	1.37	0.76	1.97	Desc	Sem	Syn	—	—	T	66	Item	7	0.0	3.0	Incid	Ab	Recall
Baron & Moore (1987), no-exercise	0.09	−0.31	0.50	Desc	O	Desc	L	L	T	48	Rel	2	1.0	3.0	Incid	Ab	Recall
	1.18	0.75	1.62	Desc	Sem	M	—	—	T	48	Item	2	1.0	3.0	Incid	Ab	Recall
Bower & Gilligan (1979, Experiment 1)	2.61	1.28	3.94	Auto	Sem	FC	—	—	O	54	Rel	7	10.0	10.0	Incid	Pr	Recall
	1.11	0.06	2.16	Auto	Sem	FC	—	—	O	54	Rel	7	10.0	8.0	Incid	Pr	CR
Bower & Gilligan (1979, Experiment 2), abstract vs. W. Cronkite	0.81	−0.11	1.72	Desc	O	Desc	H	L	T	54	Rel	7	10.0	10.0	Incid	Pr	Recall
	1.16	0.21	2.11	Desc	O	Desc	H	L	T	48	Rel	7	10.0	10.0	Incid	Pr	Recog
Bower & Gilligan (1979, Experiment 2), episodic vs. mother	0.40	−0.48	1.29	Auto	O	Bio	H	H	T	54	Both	7	10.0	10.0	Incid	Pr	Recall
	0.16	−0.72	1.04	Auto	O	Bio	H	H	T	48	Both	7	10.0	10.0	Incid	Pr	Recog
Bradley & Mathews (1983)	0.48	−0.33	1.29	Desc	O	Desc	H	H	T	12	Both	10	0.3	2.0	Exp	Pr	Recall
	0.43	−0.38	1.24	Desc	O	Desc	H	L	T	12	Rel	10	0.3	2.0	Exp	Pr	Recall
Bradley & Mathews (1988)	1.30	0.61	1.98	Desc	O	Desc	H	L	T	16	Rel	10	0.3	2.0	Exp	Pr	Recall
Breck & Smith (1983)	0.42	0.10	0.75	Desc	Sem	M	—	—	T	84	Item	UJ	UJ	2.0	Incid	Pr	Recall
Brown et al. (1986, Experiment 1)	0.37	−0.12	0.87	Imag	O	Imag	H	L	N	40	Item	UJ	0.0	UL	Exp	Ab	Recall
Brown et al. (1986, Experiment 2), multiple ratings	−0.19	−0.69	0.30	Imag	O	Imag	H	L	N	60	Item	16	0.0	5.0	Exp	Ab	Recall
Brown et al. (1986, Experiment 2), no multiple ratings	−0.19	−0.69	0.30	Imag	O	Imag	H	L	N	60	Item	16	0.0	5.0	Exp	Ab	Recall
Brown et al. (1986, Experiment 3)	0.20	−0.16	0.57	Imag	O	Imag	H	L	N	32	Item	16	0.0	UL	Incid	Ab	Recall
Brown et al. (1986, Experiment 4)	0.24	−0.18	0.66	Imag	O	Imag	H	L	N	32	Item	UL	0.0	UL	Incid	Ab	Recall
Brown et al. (1986, Experiment 5)	1.24	0.63	1.86	O	O	O	H	L	N	44	Item	UL	0.0	UL	Incid	Ab	Recall
	0.22	−0.35	0.79	Imag	O	Imag	H	L	N	44	Item	UL	0.0	UL	Incid	Ab	Recall
Brown et al. (1986, Experiment 6)	0.73	0.15	1.32	Imag	O	Imag	H	L	N	44	Item	UL	0.0	UL	Incid	Ab	Recall
	2.66	1.88	3.43	O	O	O	H	L	N	44	Item	UL	0.0	UL	Incid	Ab	Recall
Cacioppo et al. (1985)	0.64	0.08	1.20	Desc	Sem	Desir	—	—	T	96	Both	UL	1.0	5.0	Incid	Pr	Recall
Clifford & Hemsley (1987), recall, "normals" only	0.67	−0.15	1.49	Desc	Sem	O	—	—	T	24	Item	UJ	0.0	4.0	Incid	Ab	Recall
Davis (1979)	0.81	0.28	1.35	Desc	Sem	M	—	—	T	48	Item	UJ	0.0	3.0	Incid	Ab	Recall
Derry & Kuiper (1981)	0.21	−0.49	0.90	Desc	Sem	Syn	—	—	T	66	Item	UL	0.0	3.0	Incid	Ab	Recall
Ferguson et al. (1983), SR vs. well-liked other	0.15	−0.29	0.59	Desc	O	Desc	H	H	T	48	Both	14	5.0	9.6	Incid	Pr	Recog
Ferguson et al. (1983), SR vs. meaning	0.18	−0.26	0.62	Desc	Sem	M	—	—	T	48	Item	14	5.0	9.6	Incid	Pr	Recog
Ferguson et al. (1983), SR vs. familiar other	0.70	0.25	1.15	Desc	Sem	Fam	—	—	T	48	Item	14	5.0	5.0	Incid	Pr	Recall
Ferguson et al. (1983), SR vs. desirability	−0.27	−0.71	0.17	Desc	Sem	Desir	—	—	T	48	Both	14	5.0	9.6	Incid	Pr	Recall
	−0.06	−0.50	0.37	Desc	Sem	Desir	—	—	T	48	Both	14	5.0	5.0	Incid	Pr	Recall
Ferguson et al. (1983), SR vs. meaningful	0.76	0.31	1.22	Desc	Sem	M	—	—	T	48	Item	14	5.0	5.0	Incid	Pr	Recall
Ferguson et al. (1983), SR vs. neutral other	0.44	0.00	0.88	Desc	O	Desc	H	L	T	48	Rel	14	5.0	9.6	Incid	Pr	Recog
	0.66	0.21	1.11	Desc	O	Desc	H	L	T	48	Rel	14	5.0	5.0	Incid	Pr	Recall
Ferguson et al. (1983), SR vs. best friend	0.44	0.00	0.88	Desc	O	Desc	H	H	T	48	Both	14	5.0	5.0	Incid	Pr	Recall
Ferguson et al. (1983), SR vs. enemy	0.44	0.00	0.88	Desc	O	Desc	H	L	T	48	Both	14	5.0	5.0	Incid	Pr	Recall
	0.51	0.07	0.96	Desc	O	Desc	H	L	T	48	Item	14	5.0	9.6	Incid	Pr	Recog
Ferguson et al. (1983), SR vs. familiar other	0.27	−0.17	0.71	Desc	Sem	Fam	—	—	T	48	Both	14	5.0	9.6	Incid	Pr	Recog
Ganellen & Carver (1985)	0.87	0.42	1.32	Desc	O	Desc	H	L	T	56	Rel	15	3.0	5.0	Incid	Pr	Recall
Halpin et al. (1984)	0.20	−0.19	0.60	Desc	Sem	Desir	—	—	T	14	Both	UJ	0.0	1.0	Incid	Ab	Recall
Hull et al. (1988, Experiment 1)	0.65	0.24	1.06	Desc	Sem	M	—	—	T	64	Item	UJ	0.0	UL	Incid	Ab	Recall
Katz (1987)	0.98	0.69	1.27	Desc	Sem	Syn	—	—	T	84	Item	UJ	20.0	UL	Incid	Pr	Recall

Table 2 (*continued*)

Study and condition	Effect size (*d*)	95% CI for *d*: Lower	95% CI for *d*: Upper	Encoding task for self	Manipulation class	Encoding task for comparison	Other's status: Fam	Other's status: Int	Stimuli	ML	ToP	Timing: PT	Timing: TET	Timing: TAR	Expectation of test	Distractor	DV
Keenan et al. (1992, Experiment 1), factual	0.21	−0.28	0.71	O	O	O	H	L	N	40	Both	NR	NR	2.0	Incid	Ab	Recall
Keenan et al. (1992, Experiment 1), evaluative	0.00	−0.49	0.49	O	O	O	H	L	N	40	Both	NR	NR	2.0	Incid	Ab	Recall
Keenan et al. (1992, Experiment 2), evaluative	0.00	−0.49	0.49	O	O	O	H	L	N	40	Both	NR	NR	2.0	Incid	Ab	Recall
Keenan et al. (1992, Experiment 2), factual	0.00	−0.49	0.49	O	O	O	H	L	N	40	Both	NR	NR	2.0	Incid	Ab	Recall
Keenan & Baillet (1980, Experiment 1), SR vs. best friend	0.20	−0.20	0.60	Desc	O	Desc	H	H	T	48	Both	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 1), SR vs. J. Carter)	1.14	0.71	1.57	Desc	O	Desc	H	L	T	48	Rel	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 1), SR vs. teacher–boss	1.01	0.58	1.43	Desc	O	Desc	H	L	T	48	Rel	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 1), SR vs. parent	0.49	0.08	0.89	Desc	O	Desc	H	H	T	48	Both	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 1)	0.62	0.21	1.03	Desc	Sem	Syn	—	—	T	48	Item	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 1), SR vs. friend (not best)	0.41	0.01	0.82	Desc	O	Desc	H	H	T	48	Item	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 1), SR vs. favorite character	0.79	0.37	1.20	Desc	O	Desc	H	L	T	48	Rel	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 2), SR vs. parent, evaluative	0.35	−0.09	0.79	Desc	O	Desc	H	H	T	160	Item	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 2), SR vs. favorite character	1.23	0.75	1.71	Desc	O	Desc	H	L	T	160	Rel	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 2), evaluative SR vs. J. Carter	0.79	0.34	1.25	Desc	O	Desc	H	L	T	160	Rel	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 2), factual SR vs. J. Carter	−0.27	−0.71	0.17	O	O	O	H	L	N	160	Rel	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 2), factual SR vs. parent	−0.09	−0.53	0.35	O	O	O	H	H	N	160	Rel	UL	10.0	UL	Incid	Pr	Recog
Keenan & Baillet (1980, Experiment 2), factual SR vs. favorite character	−0.18	−0.62	0.26	O	O	O	H	L	N	160	Rel	UL	10.0	UL	Incid	Pr	Recog
Kendzierski (1980)	1.01	0.49	1.53	Desc	Sem	Syn	—	—	T	47	Item	UL	0.0	UL	Incid	Ab	Recall
	0.48	−0.02	0.98	Desc	Sem	FS	—	—	T	47	Item	UL	0.0	UL	Incid	Ab	Recall
Klein & Kihlstrom (1986, Experiment 1)	0.99	0.36	1.62	Desc	Sem	Syn	—	—	T	54	Item	UL	1.0	5.0	Incid	Ab	Recall
Klein & Kihlstrom (1986, Experiment 2), organized SR	−0.09	−0.79	0.60	Auto	Sem	FC	—	—	N	34	Rel	UL	1.0	5.0	Incid	Ab	Recall
Klein & Kihlstrom (1986, Experiment 2), unorganized SR	0.19	−0.50	0.88	N assn	Sem	FS	—	—	N	34	Item	UL	1.0	5.0	Incid	Ab	Recall
Klein & Kihlstrom (1986, Experiment 3), organized SR	−0.09	−0.79	0.60	Auto	Sem	FC	—	—	N	34	Rel	UL	1.0	5.0	Incid	Ab	Recall
Klein & Kihlstrom (1986, Experiment 3), unorganized SR	0.09	−0.60	0.79	N assn	Sem	FS	—	—	N	34	Item	UL	1.0	5.0	Incid	Ab	Recall
Klein & Kihlstrom (1986, Experiment 3), unorganized SR	0.37	−0.33	1.07	N assn	Sem	FS	—	—	N	34	Item	UL	1.0	5.0	Incid	Ab	CR
Klein & Kihlstrom (1986, Experiment 5), organized SR	−0.13	−0.84	0.59	N assn	Sem	FC	—	—	N	34	Rel	UL	1.0	5.0	Incid	Ab	Recall
Klein & Kihlstrom (1986, Experiment 5), unorganized SR	0.38	−0.34	1.11	O	Sem	O	—	—	N	34	Item	UL	1.0	5.0	Incid	Ab	Recall
Klein & Loftus (1988), SR vs. organization, recall	0.42	−0.11	0.95	Auto	Sem	FC	—	—	N	30	Rel	7	3.0	5.0	Incid	Pr	Recall

(*table continues*)

Table 2 (*continued*)

Study and condition	Effect size (*d*)	95% CI for *d*: Lower	95% CI for *d*: Upper	Encoding task for self	Manipulation class	Encoding task for comparison	Other's status: Fam	Other's status: Int	Stimuli	ML	ToP	Timing: PT	Timing: TET	Timing: TAR	Expectation of test	Distractor	DV
Klein & Loftus (1988), SR vs. elaborative recall	2.19	1.53	2.85	Auto	Sem	GD	—	—	N	30	Item	7	3.0	5.0	Incid	Pr	Recall
Klein & Loftus (1988), SR vs. organizational, recall	0.98	0.42	1.53	Auto	Sem	FC	—	—	N	30	Item	7	3.0	5.0	Incid	Pr	Recall
Klein & Loftus (1988), SR vs. elaborative recall	−0.09	−0.62	0.43	Auto	Sem	GD	—	—	N	30	Item	7	3.0	5.0	Incid	Pr	Recall
Klein et al. (1989, Experiment 1), recall	1.07	0.41	1.73	Auto	Sem	GD	—	—	T	30	Item	7	3.0	5.0	Incid	Pr	Recall
Klein et al. (1989, Experiment 1), modified auto vs. sem recall	0.34	−0.28	0.97	O	Sem	GD	—	—	T	30	Item	7	3.0	5.0	Incid	Pr	Recall
Klein et al. (1989, Experiment 1), desc SR, recall	1.45	0.75	2.15	Desc	Sem	GD	—	—	T	30	Item	7	3.0	5.0	Incid	Pr	Recall
Klein et al. (1989, Experiment 3), desc SR, recall	1.25	0.54	1.97	Desc	Sem	GD	—	—	T	30	Item	7	3.0	5.0	Incid	Pr	Recall
Klein et al. (1989, Experiment 3), auto SR, recall	1.10	0.40	1.80	Auto	Sem	GD	—	—	T	30	Item	7	3.0	5.0	Incid	Pr	Recall
Kuiper & Derry (1982, Experiment 1)	0.46	0.05	0.88	Desc	Sem	M	—	—	T	64	Item	UJ	0.0	4.0	Incid	Ab	Recall
Kuiper & Derry (1982, Experiment 2)	0.52	0.13	0.91	Desc	O	Desc	H	L	T	64	Rel	UJ	0.0	4.0	Incid	Ab	Recall
Kuiper & MacDonald (1982), SR vs. "others"	−0.05	−0.85	0.75	Desc	O	NSO	NR	NR	T	66	Rel	UL	0.0	3.0	Incid	Ab	Recall
Kuiper & MacDonald (1982), SR vs. familiar other	−0.01	−0.81	0.79	Desc	O	Desc	H	H	T	66	Both	UL	0.0	3.0	Incid	Ab	Recall
Kuiper & Rogers (1979, Experiment 1)	0.73	−0.09	1.56	Desc	Sem	M	—	—	T	48	Item	UJ	0.0	3.0	Incid	Ab	Recall
	0.60	−0.22	1.41	Desc	O	Desc	L	L	T	48	Rel	UJ	0.0	3.0	Incid	Ab	Recall
Kuiper & Rogers (1979, Experiment 2)	0.85	0.26	1.45	Desc	Sem	Syn	—	—	T	48	Item	UL	0.0	3.0	Incid	Ab	Recall
	0.35	−0.22	0.92	Desc	O	Desc	L	L	T	48	Rel	UL	0.0	3.0	Incid	Ab	Recall
Kuiper & Rogers (1979, Experiment 3)	0.27	−0.53	1.07	Desc	O	Desc	L	L	T	48	Item	UL	0.0	3.0	Incid	Ab	Recall
Kuiper & Rogers (1979, Experiment 4)	0.23	−0.57	1.03	Desc	Sem	M	—	—	T	48	Item	UJ	0.0	3.0	Exp	Ab	Recall
	−0.32	−1.10	0.48	Desc	O	Desc	H	L	T	48	Item	UJ	0.0	3.0	Exp	Ab	Recall
Kuiper & Rogers (1979, Experiment 5)	0.09	−0.62	0.81	Desc	O	Desc	H	L	T	48	Rel	UJ	0.0	3.0	Incid	Ab	Recall
	0.98	0.23	1.74	Desc	Sem	M	—	—	T	48	Item	UJ	0.0	3.0	Incid	Ab	Recall
Kuiper et al. (1985), recall, "normal" participants only	0.67	0.40	0.93	Desc	Sem	M	—	—	T	60	Item	UJ	0.0	3.0	Incid	Ab	Recall
Lord (1980, Experiment 1), SR vs. W. Cronkite	0.99	0.39	1.59	Desc	O	Desc	H	L	T	64	Item	8	0.0	5.0	Exp	Ab	Recall
Lord (1980, Experiment 1), SR vs. father	0.25	−0.32	0.82	Desc	O	Desc	H	H	T	64	Item	8	0.0	5.0	Exp	Ab	Recall
Lord (1980, Experiment 2), SR vs. father	−0.44	−1.00	0.13	Imag	O	Imag	H	H	N	60	Both	16	0.0	5.0	Exp	Ab	Recall
Lord (1980, Experiment 2), SR vs. W. Cronkite	−0.67	−1.30	−0.09	Imag	O	Imag	H	L	N	60	Item	16	0.0	5.0	Exp	Ab	Recall
Lord (1987), actual event imagery, SR vs. R. Reagan	0.02	−0.63	0.67	Imag	O	Imag	H	L	N	60	Item	30	0.0	5.0	Exp	Ab	Recall
Lord (1987), actual event imagery, SR vs. J. Carson	0.02	−0.63	0.67	Imag	O	Imag	H	L	N	60	Item	30	0.0	5.0	Exp	Ab	Recall
Lord (1987), imaginary events, SR vs. J. Carson	−0.63	−1.30	0.04	Imag	O	Imag	H	L	N	60	Item	30	0.0	5.0	Exp	Ab	Recall

Table 2 (*continued*)

Study and condition	Effect size (*d*)	95% CI for *d*: Lower	95% CI for *d*: Upper	Encoding task for self	Manipulation class	Encoding task for comparison	Other's status: Fam	Other's status: Int	Stimuli	ML	ToP	Timing: PT	Timing: TET	Timing: TAR	Expectation of test	Distractor	DV
Lord (1987), imaginary events,	−0.81	−1.50	−0.13	Imag	O	Imag	H	L	N	60	Item	30	0.0	5.0	Exp	Ab	Recall
SR vs. R. Reagan	0.88	0.29	1.47	O	O	NSO	H	L	T	48	Item	UL	0.0	4.0	Incid	Ab	Recall
Maki & McCaul (1985, Experiment 1), SR	0.67	−0.04	1.38	Desc	O	Desc	H	L	T	48	Rel	UL	0.0	4.0	Incid	Ab	Recall
vs. R. Reagan	−0.67	−1.50	0.12	O	O	NSO	H	L	N	48	Item	UL	0.0	4.0	Incid	Ab	Recall
Maki & McCaul (1985 Experiment 1), SR	−0.70	−1.50	0.10	O	O	NSO	H	H	N	48	Both	UL	0.0	4.0	Incid	Ab	Recall
vs. mother	0.47	−0.23	1.18	Desc	O	Desc	H	H	T	48	Item	UL	0.0	4.0	Incid	Ab	Recall
Maki & McCaul (1985, Experiment 2), SR	0.23	−0.34	0.80	O	O	NSO	H	H	T	48	Item	UL	0.0	4.0	Incid	Ab	Recall
vs. friend	−0.10	−0.66	0.47	O	O	NSO	H	H	N	48	Item	UL	0.0	4.0	Incid	Ab	Recall
Maki & McCaul (1985, Experiment 2), SR vs. R. Reagan	−0.07	−0.64	0.50	O	O	NSO	H	L	N	48	Item	UL	0.0	4.0	Incid	Ab	Recall
McCaul & Maki (1984)	0.91	0.21	1.62	Desc	Sem	Desir	—	—	T	48	Both	8	5.0	5.0	Incid	Pr	Recall
	1.07	0.35	1.78	Desc	Sem	Fam	—	—	T	48	Item	8	5.0	5.0	Incid	Pr	Recall
Mogg et al. (1987), normal only	1.09	0.15	2.03	Desc	O	Desc	H	L	T	80	Rel	10	0.3	4.0	Incid	Pr	Recall
Mueller et al. (1986), recall	0.45	0.01	0.90	Desc	O	NSO	NR	NR	T	80	Item	UL	0.0	UL	Incid	Ab	Recall
Mueller et al. (1991)	0.76	0.55	0.97	Desc	Sem	Syn	—	—	T	108	Rel	UL	UJ	UL	Incid	Pr	Recall
	0.30	0.09	0.50	Desc	O	NSO	NR	NR	T	108	Rel	UL	UJ	UL	Incid	Pr	Recall
Myers et al. (1989), collapsed over time	1.33	0.56	2.09	Desc	Sem	GD	—	—	T	36	Item	UJ	1.0	3.0	Exp	Pr	Recall
Pullyblank et al. (1985, Study 1), children	0.39	0.04	0.74	Desc	Sem	Syn	—	—	T	16	Item	UJ	1.0	UL	Incid	Pr	Recall
Pullyblank et al. (1985, Study 1), adults	0.58	−0.12	1.29	Desc	Sem	Syn	—	—	T	16	Item	UJ	1.0	UL	Incid	Pr	Recall
Pullyblank et al. (1985, Study 2), children	0.37	0.13	0.60	Desc	Sem	Syn	—	—	T	16	Item	UJ	1.0	UL	Incid	Pr	Recall
Pullyblank et al. (1985, Study 2), adults	0.47	0.07	0.88	Desc	Sem	Syn	—	—	T	16	Item	UJ	1.0	UL	Incid	Pr	Recall
Register & Kihlstrom (1987, Experiment 1, Trial 1)	1.61	1.11	2.12	Desc	Sem	Syn	—	—	T	64	Item	UJ	0.0	5.0	Incid	Ab	Recall
Rogers et al. (1977, Experiment 1)	0.98	0.46	1.50	Desc	Sem	Syn	—	—	T	48	Item	UL	0.0	3.0	Incid	Ab	Recall
Rogers et al. (1977, Experiment 2)	0.57	0.02	1.11	Desc	Sem	M	—	—	T	40	Item	UJ	0.0	3.0	Incid	Ab	Recall
Schmeck & Meier (1984)	0.85	0.39	1.31	O	Sem	Syn	—	—	T	55	Item	7	20.0	UL	Incid	Pr	Recall
Sutton et al. (1988)	0.73	0.25	1.20	Desc	Sem	Syn	—	—	T	60	Item	UL	2.0	3.0	Incid	Pr	Recall
Symons (1990)	1.26	0.85	1.66	Desc	Sem	GD	—	—	T	60	Item	7	3.0	5.0	Incid	Pr	Recall
Warren et al. (1985)	1.10	0.36	1.84	Desc	Sem	O	—	—	T	45	Both	UJ	UJ	8.0	Incid	Ab	Recall
	1.10	0.36	1.84	Auto	Sem	O	—	—	T	45	Both	UJ	UJ	8.0	Incid	Ab	Recall
Wells et al. (1984), recall	1.27	0.76	1.77	Desc	O	Desc	H	L	T	80	Rel	5	UJ	12.0	Incid	Ab	Recog

Note. Effect sizes are positive for memory differences in the direction of the SR group. Ab = absent; Auto = autobiographical; Bio = biographical; Both = both relational and item specific; CI = confidence interval; CR = cued recall; Desc = descriptiveness; Desir = desirable; DV = dependent variable; Exp = expected; Fam = familiarity; FC = fits category; FS = fits sentence; GD = generates definition; H = high; Imag = imagery; Incid = incidental; Int = intimacy; Item = item specific; L = low; M = meaningful; ML = memory load (in number of words); N = nouns; N assn = noun association; NR = not relevant; NSO = nonspecific other; O = other; Pr = present; PT = presentation time (in s); Recall = free recall; Recog = recognition; Rel = relational; Sem = semantic; SR = self-reference; SRE = self-reference effect; Syn = synonymity; T = traits; TAR = time allowed for recall (in min); TET = time between encoding and memory test (in min); ToP = type of processing; UJ = unable to judge; UL = unlimited time for recall.

Table 3
Cross-Literature Models for SRE Magnitude

Variable and class	Between-class effect (Q_B)	k	Mean weighted effect size (d_+)	95% CI for d_+ Lower	Upper	Within-class homogeneity (Q_{Wi})[a]
Manipulation class	42.70***					
SR vs. semantic		60	0.65	0.58	0.71	178.30***
SR vs. OR		69	0.35	0.29	0.42	230.40***
Type of processing induced by comparison task	21.29***					
Relational		37	0.51_a	0.43	0.59	115.68***
Item specific		67	0.56_a	0.50	0.62	282.92***
Both relational and item specific		25	0.29_b	0.19	0.39	31.50

Note. Mean effect sizes not sharing the same subscript significantly differed ($p < .05$, a priori). CI = confidence interval; OR = other reference; SR = self-reference; SRE = self-reference effect.
[a] Significance indicates rejection of the hypothesis of homogeneity.
*** $p < .001$.

Several models emerge that implicate task restrictions used in SRE studies that mediate the SRE. It is interesting that these restrictions were not found to affect the magnitude of SREs in the SR–semantic manipulation class. First, results show that the magnitude of the SRE was related to the use of distractor tasks. Specifically, within both the distractor-present and the distractor-absent classes, significant mean SREs resulted. However, the mean SRE for the distractor-present class was significantly larger than the mean SRE for the distractor-absent class. Further analyses reveal that distractor tasks had no influence on the magnitude of the SRE for studies that used high-intimacy targets (but did for low-intimacy targets). Second, results show that for studies in which participants did not expect a memory test, there was a significantly larger mean SRE than for studies in which participants did expect a test. Moreover, the mean SRE for studies in which participants expected a test was not significant. Further analyses reveal that an expectation of a test had no effect on the magnitude of the SRE for studies that used high-intimacy targets (but it did for low-intimacy targets).

Finally, two other exploratory models were significant for this manipulation class. The model test for mode of stimulus presentation shows that when researchers used a projector to present stimulus materials, they obtained a significantly smaller mean SRE than those who used monitors or presented stimuli orally. Moreover, studies in the projector class obtained a nonsignificant mean SRE. In each case, study findings were heterogeneous.

The model test for participant population reveals that studies that tested undergraduates as participants obtained a smaller mean SRE than studies that tested other populations. (Note that this pattern is opposite of that found for SR–semantic studies.) However, both mean SREs were significant; in both cases, study findings are inconsistent.

Discussion

The SRE has been of interest to researchers because of the assumption that it could tell them something about the self in memory and its relationship to other kinds of encoding processes. Most of the researchers cited in the literature have attempted to investigate this relationship through manipulation of various task parameters or with various populations. Judging by

Table 4
Continuous Models for Study Effect Sizes Across the Literature and Within Manipulation Class

Predictor	All (k = 129) b	β	SR–semantic (k = 60) b	β	SR–OR (k = 69) b	β
Memory load	−.0004	−.03	.0041*	.25	−.0009	−.07
Time between encoding and memory task	.0160***	.16	.0135*	.16	.0240**	.21
Length of stimulus presentation	−.0667***	−.64	−.1060***	−.60	−.0545***	−.66

Note. Models are least-square regressions with weights equivalent to the reciprocal of the variance of each effect size. k was smaller for some models. OR = other reference; SR = self-reference.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5
Effect Sizes as a Function of Task for SR–Semantic Manipulation

Variable and class	Between-class effect (Q_B)	k	Mean weighted effect size (d_+)	95% CI for d_+ Lower	95% CI for d_+ Upper	Within-class homogeneity (Q_{Wi})[a]
Relatedness of stimuli	17.33***					
High		9	0.20	−0.01	0.42	11.55
Low		51	0.69	0.62	0.75	149.41***
Stimulus type	12.79**					
Traits		47	0.67_a	0.60	0.73	119.72***
Nouns		11	0.40_b	0.21	0.59	42.79***
Other		2	1.68_c	0.86	2.51	3.00
Type of semantic task	44.54***					
Synonym judgment		16	0.72_{bcd}	0.63	0.82	39.16**
Generate definition		9	1.04_{cd}	0.84	1.24	37.74***
Fits sentence		4	0.32_{ab}	0.01	0.63	0.97
Fits category		7	0.45_{abc}	0.19	0.72	22.31**
Meaningful		12	0.62_{abc}	0.49	0.75	15.15
Familiar		3	0.57_{abc}	0.28	0.86	3.96
Desirable		5	0.16_a	−0.06	0.37	11.86*
Other		4	0.81_{abc}	0.58	1.19	2.61
Age of participants	13.41***					
Adult		57	0.69	0.62	0.76	164.30***
Child		3	0.34	0.17	0.52	0.58
Type of SR task	9.09*					
Self-descriptiveness		42	0.66_a	0.59	0.72	13.81***
Autobiographical		11	0.74_a	0.54	0.94	52.28***
Association with nouns		4	0.14_b	−0.22	0.49	1.00
Other		3	0.61_a	0.28	0.94	2.12
Dependent variable	16.79***					
Free recall		54	0.69_a	0.62	0.75	151.78***
Cued recall		2	0.60_{ab}	0.02	1.18	1.30
Recognition		4	0.21_b	0.00	0.43	8.42
Mode of stimulus presentation	34.92***					
Index cards		11	0.73_{abc}	0.56	0.90	43.81***
Monitor		23	0.57_{bc}	0.47	0.67	76.10***
Projector		8	1.05_a	0.86	1.24	12.92
Read by experimenter		10	0.55_{bc}	0.41	0.68	7.63
Tachistoscope		4	0.43_b	0.25	0.61	2.19
Booklet		4	0.98_{ac}	0.74	1.22	0.74
Participant population	11.16**					
Undergraduates		54	0.69	0.62	0.76	159.79***
Other		6	0.39	0.23	0.55	7.34
Experimental design	3.08					
Within subjects		32	0.68	0.61	0.76	60.66**
Between subjects		28	0.57	0.46	0.67	114.56***

Note. Mean effect sizes sharing the same subscript do not differ ($p > .05$, post hoc). CI = confidence interval; SR = Self-reference.
[a] Significance indicates rejection of the hypothesis of homogeneity.
* $p < .05$. ** $p < .01$. *** $p < .001$.

the relatively small number of new SRE studies in the last few years, we could easily conclude that the field has reached an impasse in terms of explaining why the SRE occurs. There is, of course, more recent work (e.g., Klein & Loftus, 1993; Klein, Loftus, & Burton, 1989) that focuses specifically on the potential causal cognitive mechanisms that underlie the SRE. This review represents an important empirical contribution to the SRE literature because, in addition to answering questions about the robustness of the SRE, it (a) clarifies the roles of most of the important moderators of the effect and suggests some more that ought to be investigated, (b) confirms most of the theoretical expectations that the SRE results because of elaborative and organized processing, and (c) suggests some important avenues that should be investigated that have not yet been explored in primary-level research.

We approach our discussion from the theoretical perspective that many of our findings may be explained by two aspects of processing tasks that may play important roles in determining the magnitude of the SRE: (a) the degree to which the task promotes organization and elaboration and (b) the nature of the referenced memory domain and the particular type of information being processed and how they may interact with these processes. We begin by reviewing our general findings of an overall SRE and the results of the models for the comparison class and nature of processing induced by the task. Then, we discuss pragmatic concerns for the design of SRE studies, re-

Table 6
Effect Sizes as a Function of Task for SR–OR Manipulation

Variable and class	Between-class effect (Q_B)	k	Mean weighted effect size (d_+)	95% CI for d_+ Lower	95% CI for d_+ Upper	Homogeneity within each class (Q_{Wi})[a]
Stimulus type	57.81***					
Trait		43	0.53	0.45	0.60	75.95**
Noun		26	0.03	−0.08	0.13	96.64***
Familiarity of rated other	0.69					
High		61	0.36_a	0.30	0.43	225.89***
Low		4	0.24_a	−0.04	0.53	1.38
Unable to rate		4	0.34_a	0.16	0.51	2.44
Intimacy of rated other	7.57*					
High		17	0.20_a	0.07	0.33	18.26
Low		48	0.41_{bc}	0.34	0.49	202.12***
Unable to rate		4	0.34_{ac}	0.16	0.51	2.44
Type of SR task[b]	54.46***					
Self-descriptiveness		39	0.53_a	0.45	0.61	72.78**
Imagery		13	-0.01_b	−0.16	0.13	27.96***
Other		15	0.12_b	−0.02	0.26	75.00***
Type of other task[b]	57.17***					
Descriptiveness		35	0.58_a	0.49	0.67	64.23**
Imagery		13	-0.01_b	−0.16	0.13	27.96**
Nonspecific other		14	0.19_b	0.07	0.32	22.87
Other		5	0.25_b	0.02	0.47	57.95***
Dependent variable	10.54**					
Free recall		51	0.28	0.21	0.36	149.35***
Recognition		18	0.50	0.39	0.61	70.51***
Distractor task	15.69**					
Present		28	0.48	0.39	0.56	75.66***
Absent		41	0.23	0.14	0.32	139.05***
Expectation of test	19.72***					
Expect		15	0.02	−0.14	0.18	46.90***
Do not expect		54	0.41	0.35	0.48	163.77***
Mode of stimulus presentation[c]	26.96***					
Monitor		44	0.42_a	0.34	0.50	129.58***
Projector		15	-0.02_b	−0.18	0.14	37.82***
Read (by experimenter)		8	0.64_a	0.44	0.84	18.08*
Participant population	10.07**					
Undergraduates		52	0.29	0.22	0.36	156.89***
Other		17	0.51	0.40	0.62	63.44***
Experimental design	1.25					
Within subjects		65	0.35	0.29	0.41	226.45***
Between subjects		4	0.61	0.16	1.06	2.70

Note. Mean effect sizes sharing the same subscript do not differ ($p > .05$, post hoc). CI = confidence interval; OR = other reference; SR = self-reference.
[a] Significance indicates rejection of the hypothesis of homogeneity. [b] One study, Bower and Gilligan (1979, Experiment 2), included two SR versus OR comparisons that were omitted from this model test because they involved the only autobiographical–biographical tasks in the SR–OR manipulation class. [c] Two studies (Brown et al., 1986, Experiment 3; Wells et al., 1984) were omitted from this model test because they did not fit any coding class.
* $p < .05$. ** $p < .01$. *** $p < .001$.

gardless of manipulation class. Finally, we draw conclusions based on significant model tests that are unique to each particular manipulation class.

SRE in Memory Is Robust

One important finding of our study is that the SRE does occur with highly significant regularity. Although study findings are inconsistent, SR was superior to semantic and OR encoding in facilitating memory in the studies reviewed. It may seem to some readers that this is a foregone conclusion of any review of the SRE, but there is some disagreement among researchers in this literature as to whether SR tends to promote memory better overall than other kinds of processes. For example, as we noted earlier, Higgins and Bargh's (1987) important narrative review concludes that "self-reference is neither necessary nor sufficient for memory of input to be facilitated" (p. 392). Our meta-analytic review suggests that, in fact, SR—although not necessary to promote good recall—is sufficient, by virtue of its ability to promote both item-specific and relational processing as well as its ability to promote compatible encoding and retrieval conditions.

Effects of Manipulation Class and the Nature of Processing

Manipulation class. The first moderator that affected the magnitude of the SRE across the literature was that a larger mean SRE was obtained in SR–semantic studies than in SR–OR studies. First, note that the SRE occurs on the average within both manipulation classes, although study findings were inconsistent. This finding begins to suggest possible differences between person-reference versus semantic processing as tasks, a topic that we discuss below.

Within the class of studies that used SR–OR manipulations, given the debates that have occurred in the literature, the finding that SR tends to promote better memory than OR may be surprising (cf. Bower & Gilligan, 1979; Brown et al., 1986; Lord, 1980, 1987; Maki & McCaul, 1985). Those debates arose because of inconsistent study findings; for example, reference to familiar others apparently causes the SRE to "disappear," leading researchers to argue that SR creates no memory advantage over reference to a familiar other. The results of our study show that, although the SRE was weaker in SR–OR studies, it was nevertheless present and statistically significant, as predicted.

The finding that the SRE was larger for SR–semantic manipulations is also intriguing if one begins to consider the nature of the underlying memory processes and structures. If, for example, it is assumed that both self and semantic representations (or processing, for that matter) are qualitatively similar, then one must also be able to explain why SR tends to facilitate memory better than semantic encoding overall. None of the models that we analyzed could completely explain the variation in the SR–semantic cases. Although we must be careful about conclusions with regard to the structures that underlie SR and semantic processing that are based on correlational evidence, one plausible conclusion is that SR is more effective in producing good recall than is a semantic task for a number of reasons. Specifically, the typical SR task (a) uses traits as stimulus items more than 80% of the time, (b) taps trait domains likely to have been elaborated on many times using SR, (c) is likely to promote an SR mode in retrieval because of this practiced elaboration of traits, and (d) taps trait domains that are, because of the two points just mentioned (b and c), likely to be highly organized along self-related (or at least person-referent) dimensions. Consistent with this reasoning, SR promotes better recall than semantic processing across the literature; but, perhaps more important, when we examined only SRE studies that used SR and semantic tasks that promote both relational and item-specific processing, the SRE was much smaller than it was for the set of all SR–semantic cases, $k = 7$, $d = 0.29$, 95% CI = 0.09–0.49. However, even in this subclass of studies, there was significant heterogeneity, $Q_{\mathrm{Wi}}(6) = 22.41$, $p < .01$; thus, although our codings of relational and item-specific processing predict some of the variation in SR–semantic studies, it does not account for all of the variation (cf. Klein & Loftus, 1988). As we discuss later, some models we examined within the SR–semantic class help to shed light on important moderators of the relationship, however, because in almost every case study findings were inconsistent, primary-level research is still needed to isolate the causal mechanisms responsible for the difference between SR and semantic encoding.

Model test for nature of processing induced. The second important model test shows that the degree to which compared encoding tasks are equivalent in promoting item-specific and relational processing affects the magnitude of the SRE. As stated earlier, for each study in the literature, the comparison tasks were judged to promote either relational processing, item-specific processing, or both (e.g., "Does the word mean the same as xxx?" probably promotes elaborative processing predominantly, whereas "Does the word describe your mother?" likely promotes both kinds of processes). Results show significantly smaller SREs on average for tasks that involved both kinds of processing. This would be expected if SR and the comparison task both promote the same kinds of processing. In addition, the effect sizes for this class were consistent, thus no further model testing is needed to explain that variation. Nonetheless, it is important to note that, even when the comparison task involved both kinds of processes, there was still a significant SRE for that class of studies. Presumably, SR not only invokes both processes but possibly more relational and item-specific processing. Of course, other alternatives are possible: For example, some additional process or condition may be invoked that results in superior memory, such as encoding specificity, or, because the majority of studies in this class used trait adjectives, it may be that SR poses an advantage because of the sheer frequency with which the average person relates traits to himself or herself (Wells et al., 1984).

Also interesting, and not wholly unexpected, is the finding that there was no difference in the magnitude of the SRE for studies in which the comparison task involved either relational or item-specific processing. In both cases, SR was superior in producing memory because theoretically SR invokes both. In both classes, however, there was significant variation in effect sizes. However, based on our data, the process of controlling for organization or elaboration does not entirely eliminate the SRE.

Roles of Organization and Elaboration

Understanding the role of organization can help us to explain the difference between semantic processing and SR if we take some of the following points into account. We have identified studies in which the comparison task has the potential to invoke relational (vs. item-specific) processing; however, just because a task promotes relational processing does not mean that memory will necessarily be facilitated. For example, the provision of cues to help recall a category may facilitate memory for the category but not necessarily items in the category (Tulving & Pearlstone, 1966). In addition to the possibility that organization will not facilitate memory in all circumstances, we note too that, except for a few instances in the SRE literature, organizational instructions to the participant are rarely used in the design of studies (for notable exceptions, see Klein & Kihlstrom, 1986; and Klein & Loftus, 1988). Nonetheless, Klein and his colleagues have produced evidence that some SR tasks naturally promote such organization and that such organization does facilitate memory. Other evidence suggests that people will use categorization in the absence of category labels (e.g., Lewis, 1971), and that category size is an important task parameter. For example, Hunt and Seta (1984) showed that large categories were more likely to promote relational processing. However, they also showed that, because relational processing is naturally promoted already, an encoding task that promotes item-specific processing is more beneficial for recall. Thus, relational processing is more likely to help recall of small categories than large ones.

These points may help to explain why SR promotes recall better than semantic encoding. On the one hand, SR has the potential (a) to provide self-relevant category labels, which may be helpful to facilitate subsequent recall because it may facilitate the reinstatement of encoding conditions at retrieval; (b) to help with the efficient processing of trait adjectives, despite the size of such a category, because of frequent processing of that domain; as well as (c) because it arguably promotes item-specific as well as relational processing, thus complementing the relational processing that is already present to create optimal recall conditions. On the other hand, without specific attention drawn to categories, the typical semantic-processing task is at a disadvantage on several counts because (a) for most people, processing trait adjectives (a large category) semantically is not a frequent or well-practiced task; consequently, (b) category labels may not be as readily available; moreover, (c) although the nature of most semantic tasks in the literature is to promote item-specific versus relational processing, to the extent that SR promotes both, it is the more versatile of the two tasks.

One notable exception to this conclusion concerns the desirability task. We believe that the pattern we found in our meta-analysis lends support to the idea that, although pleasantness–desirability ratings have been traditionally used in the cognitive literature as a task thought to promote elaboration (e.g., Hunt & Einstein, 1981), in the typical SRE paradigm task, it is likely to promote a certain degree of relational processing as well (Klein & Kihlstrom, 1986). It fits the criteria for relational processing in that (a) there is potential for recognition of a category label and (b) such processing draws attention to the fact that, in the stimulus list words, there are words that are related in the sense that they are either desirable or not. This assumption, of course, represents an empirical question that could be addressed in further investigations.

Along this same line of reasoning, person reference may generally promote more memory than a semantic task when list words are adjectives. It is logical to assume that some of the same mechanisms that govern an SR task may operate in any person-reference task. A person-reference task probably provides a potential for recognition of an obvious category label, a task that is frequently practiced, and the potential for the development of an organized domain in memory around that person because the task is frequently practiced. As an application of this logic, the difference between SR and other person reference is, of course, one of degrees. In other words, information about certain specific people (your mother, best friend, or worst enemy) is more frequently processed than information about other people (Johnny Carson or the experimenter at your study). People who are more often part of the information-processing environment are likely to be more accessible. Certainly, a participant who has engaged in an encoding task involving questions about himself or herself and about another person still has that information accessible in memory when asked to retrieve it. However, the more well known the person referenced is, the more organized and elaborated the information about the person in memory is and the more accessible the person category is. One important consequence of this idea is the potential for reinstatement of conditions at retrieval that are compatible with those that were present when the information was encoded. Thus, SR should pose an advantage in processing over other tasks, as our findings suggest.

Pragmatic Concerns for the Design of SRE Studies

Certain task variations used in SRE studies appear to affect the size of the SRE. These moderating variables suggest practical concerns that should be confronted by researchers when they design studies to investigate the SRE. It is interesting that, in some cases, moderators that have a significant effect on the magnitude of the SRE have apparently been ignored as factors in SRE study designs. The first of these moderators is memory load. Our results show that, as memory load increases, the magnitude of the SRE also increases but that this pattern exists only for SR–semantic comparisons. This model implies that, when there is a great deal to remember, SR is a relatively efficient processing strategy when compared with semantic encoding. One practical implication of this finding is that memory load may be an important consideration for researchers who wish to maximize (or minimize) the advantage of SR in their studies.

From a theoretical standpoint, this finding is a bit puzzling. Earlier, we discussed the effects of category size (Hunt & Seta, 1984): Large categories automatically promote relational processing, thus an item-specific processing task should facilitate memory more than a relational-processing task. Because most semantic tasks involve item-specific processing, why would the SRE increase as the memory load increases? To answer the question, we looked at the types of stimulus items that were processed. When traits are used as stimulus items, the SRE does increase as memory load increases, $k = 47$, $\beta = .26$, $p < .01$, demonstrating an advantage for person reference when processing trait items, a finding that is in-line theoretically with the patterns we predicted earlier. However, when the stimulus items are nouns, the pattern reverses itself, $k = 11$, $\beta = -.47$, $p < .01$. In this case, as memory load increases, the SRE gets smaller; this is a case where semantic processing is the normal processing mode for these kind of stimuli, thus posing an advantage because nouns are often elaborated and organized through semantic processing.

It is interesting that the choice of experimental design had no impact on the magnitude of the SRE. Our data show that the choice of a within- or between-subjects design made no difference for studies across the literature (or in either manipulation class). This is a curious finding because one would expect that controlling individual differences in processing would make a marked difference in the kinds of processes investigated in our meta-analysis. Thus, the SRE should have been larger in both manipulation classes when researchers used within- versus between-subjects designs. We speculate that interference may occur between encoding conditions in a within-subjects design. For example, Aron et al. (1991) have suggested that intimate others may actually overlap the self. Consequently, there is a confounding that arises that may render SR less advantageous than it is when a less intimate other is referenced. Similarly, participants may sometimes spontaneously consider whether a word in a semantic condition describes themselves. This kind of interference should occur less frequently in a between-subjects design, thus the SRE could be larger. The question is an empirical one, however, because virtually all studies in the literature that involved intimate other targets used within-subjects designs.

Finally, two moderators—participant population and mode of presentation—were found to exert opposite effects for the two manipulation classes. For the SR–OR class, larger SREs were found when undergraduate students were not the participants; in the SR–semantic class, when undergraduates were the participants, significantly larger SREs were obtained than for other populations. This is a difficult finding to explain, and one that has received little attention because it has not been considered important theoretically (except to the degree that, e.g., the population possessed some characteristic that affects SR, such as depression; Kuiper & Rogers, 1979). An examination of the 17 nonundergraduate studies shows that the samples were from a variety of other populations (e.g., participants with depression, healthy adults recruited from local communities, etc.). We present the results of this model as a design consideration that may be of importance to some researchers who choose to test other populations, whether out of convenience or necessity.

The second moderator, mode of presentation, is similarly intriguing in that it results in opposite patterns for the two manipulation classes. Specifically, in the SR–OR class, SREs were not obtained on average when a projector was used (monitors or orally presented stimuli resulted in significantly larger SREs). In contrast, projectors resulted in the largest SREs for the SR–semantic class. Different modes of presentation have largely been taken for granted in SRE study designs; presumably, the choice has been made based on convenience and history. The differences that we found may point to subtle differences in processing that may occur as a consequence of the choice of presentation mode. In particular, it should be noted that, in many cases in which projectors are used, the choice is often made because the experimenter wishes to test more than one participant at a time. It may be that, when an SR–OR manipulation is used, the presence of other people may provide cues for participants (even though fellow participants are not the referenced target) that may help to facilitate subsequent retrieval. Although admittedly speculative, it is an interesting question that merits consideration in future primary research.

Variation Within the Two Manipulation Classes

At this point, we turn to a number of task parameters in SRE studies that explain variation within the two manipulation classes (SR–OR and SR–semantic). Several of these model tests suggest pragmatic issues in the design of SRE studies that researchers may have overlooked that directly affect the magnitude of the SRE; others have theoretical significance and may suggest new avenues of exploration. We begin with the set of moderators, unique to a particular manipulation class, that suggest either important task parameters that significantly affect the magnitude of the SRE or important theoretical variables.

Models for the SR–OR class. Three model tests that pertain only to the SR–OR class were significant: (a) intimacy of the target other, (b) type of SR task, and (c) type of OR task. The results of the first model test show that, although studies that used highly intimate target others did obtain a significant mean SRE, this effect was significantly smaller than that obtained for studies that used low-intimacy target others. It should be noted that familiarity of the target other had no effect on the magnitude of observed SREs for studies in this class.[3] We specifically included ratings of both familiarity and intimacy in the meta-analysis because it was obvious that researchers did not discriminate between these variables. For example, Johnny Carson may be referred to as a highly familiar target in some studies, but he is not likely to be a highly intimate target to the average participant. Thus, it does not come as a complete surprise that familiarity does not result in a significant model test when both one's mother and Carson are classified as highly familiar targets. Our hypothesis that intimacy is a significant predictor of the magnitude of the SRE was supported. Results show a weak, but still significant, SRE for studies in the high-intimacy class, and study findings are homogeneous. Even though the referenced target is highly intimate, there is still a slight advantage of SR. Moreover, there is a significant difference between the class of studies that used highly intimate targets and low-intimacy targets, with significantly larger SREs in the low-intimacy class. Thus, reference to highly intimate others promotes memory almost as well as SR.

Thus, consistent with our hypotheses and contentions in the literature, results suggest that referencing a very well-known other, information about whom is presumably well organized and elaborated on in memory, has a facilitating effect on recall. Because the self is, presumably, even better known and information about the self has been even more frequently elaborated on and organized, SR facilitates memory even better. As Aron et al. (1991) have suggested, to the degree that a relationship is intimate, it is also likely to overlap with one's self-representations. Memory representations of one's mother are very likely to be fraught with SR associations, for example. It is possible that autobiographical retrieval may be more sensitive to this possibility than are trait descriptiveness tasks. However, only two studies in the literature used an episodic retrieval task in the SR–OR class (Bower & Gilligan, 1979), and both used high-intimacy targets, thus no comparison to test this possibility was possible. Future research should address this possibility.

Type of task was shown to be a significant moderator of SRE size in the SR–OR class. Results show that studies that used imagery tasks did not observe SREs on average, confirming Lord's (1980) hypothesis that the SRE will not occur with imagery instructions. Moreover, whereas studies that used imagery tended not to obtain SREs, all other types of tasks (SR or OR) in the SR–OR class did tend to produce SREs. Model tests for both type of SR task and type of OR task reveal that studies that used descriptiveness tasks found significantly larger SREs, on average, than any other type of task. Lord offered an explanation for this finding: He theorized that imagery involves the same kind of visual processing a person uses when he or she

[3] We performed continuous model tests as well for both familiarity and intimacy. The continuous models were based on ratings made by undergraduates who had judged the intimacy and familiarity of each referenced target used in the SRE literature. The findings for the continuous models parallel the categorical models we presented based on our codings. We thus omitted them to avoid redundancy.

actually views an object. When imagining others, he argued, one assumes one's usual visual orientation. In contrast, SR imagery forces participants to imagine themselves, causing them to assume an unusual visual orientation. Because imagining oneself is not a customary visual perspective, it does not help to facilitate memory. Imagining others, however, is customary; thus imagining others facilitates memory as well as SR imagery. Our results provide no evidence to contradict Lord's explanation. We would note, however, that Lord's formulation suggests that the imagining of others should promote recall superior to that of SR. This hypothesis was not supported by our data: Results of the meta-analysis do not show that the imagining of others facilitates memory better than does SR.

Models for the SR–semantic class. Three model tests unique to the SR–semantic class were significant: (a) age, (b) type of SR task, and (c) type of semantic task. Results from the model test for age show that the SRE was significantly larger for studies that tested adults than for those that tested children. This finding is consistent with the hypotheses of the researchers who investigated age differences (e.g., Halpin, Puff, Mason, & Marston, 1984; Pullyblank et al., 1985). It has been argued that a likely explanation for this difference is that it is related to the rate of development of the self-concept. Specifically, children may exhibit a smaller advantage of SR relative to semantic encoding because their self-concepts are in an earlier developmental stage than adults. Consequently, the self-concept either has not developed sufficiently to facilitate processing to the degree that the adult self-concept can or has not been sufficiently elaborated to provide a ready network of potential retrieval cues to facilitate recall.

We offer a different explanation: An examination of the tasks used in studies that compare SR in children with SR in adults suggests that, although task adaptations were made for younger participants, the tasks were still very similar to those presented to adults. Thus, our alternative explanation is that researchers may not have observed SREs because task demands were inappropriate to participants' developmental stage, not because children lack sufficiently developed self-concepts to produce SREs. Some data are available to support this contention. Barnas and Symons (1995) compared preschool children (4–5 years old) with older children (in kindergarten and first grade). The encoding task was modified such that pictorial stimuli were presented with each corresponding stimulus word at encoding. Children were then given a standard free-recall memory test. Results show that not only do very young children demonstrate an SRE but also there was no interaction between encoding task and age. Thus, we suggest that conclusions about the relationship between self-concept development and the SRE may be premature. More research is needed to address this issue.

The model for type of SR task shows that there was a significant difference between studies that used either self-descriptiveness tasks or autobiographical retrieval tasks and those that used tasks involving association of the self with nouns (e.g., professions: "Did you ever wish to be a ____?; doctor"). Studies that used tasks involving noun associations consistently did not observe SREs—a finding that may well be due to the use of nouns as stimuli, an issue that we discuss at some length below. More interesting is the finding that there is no difference between self-descriptiveness tasks and autobiographical retrieval tasks in terms of the magnitude of the SRE they produce. Klein and his colleagues (Klein & Loftus, 1993; Klein et al., 1989) have made convincing arguments that to engage in a self-descriptiveness judgment versus an autobiographical retrieval task may actually involve the tapping of separate memory representations. They showed, for example, that a person who engages in a self-descriptiveness task before engaging in an autobiographical retrieval task does not shorten response latencies on the second task, implying that information obtained during the self-descriptiveness judgment does not facilitate the autobiographical retrieval task. They showed the same pattern when autobiographical retrieval precedes the self-descriptiveness tasks. Klein et al. concluded that the two tasks tap different sources of information. Although their findings are compelling, we note that, on the basis of our meta-analysis, the differences that they observed do not seem to extend to dependent variables involving retrieval. That is, although self-descriptiveness judgments and autobiographical retrieval may involve accessing different areas of memory and some researchers have argued that the two tasks should generate different levels of recall (Bellezza, 1993), the magnitude of the SRE is equivalent in the two task classes. Thus, the two tasks appear to generate equivalent levels of recall. An extension of Klein and Loftus's model to other dependent variables may help to explain the bases of the SRE.

Although the model for type of semantic task used compares several types of encoding tasks, some patterns emerge that may suggest important theoretical issues. The first pattern is that studies that used desirability ratings did not observe SREs on average, consistent with Ferguson et al.'s (1983) hypothesis. These researchers argued that the evaluative component inherent in SR tasks was a confounding variable and that, if SR is compared with an evaluative-judgment semantic task (i.e., judgments of the stimulus word's desirability), the SRE would disappear.

Our results do confirm this pattern. However, an obvious alternative explanation, given the focus of our article, is that the desirability task promotes both relational and item-specific processing, as we discussed earlier. If future research supports this conclusion, then it will explain why studies that used desirability ratings obtained significantly smaller SREs than studies that used either synonym judgments or generate-definition tasks, which primarily promote elaborative processing (cf. Klein & Kihlstrom, 1986; Klein & Loftus, 1988). One other purely speculative explanation may be offered for researchers not finding a signficant mean SRE in studies in which desirability ratings were used. It may be that, when participants judge the desirability of a trait adjective, there is a degree of SR involved, thus the same sort of interference that may result when one is processing information about an intimate other target. That is, an answer to the question, "Is this a desirable word?," may implicitly involve a judgment regarding whether "this is a desirable word for me" from the participant's perspective. Thus, ironically, it is possible that desirability and SR are confounded but not in the way Ferguson et al. (1983) hypothesized. Future researchers should specifically address the nature of the personal relevance of the to-be-processed words for the participant and how SR and desirability judgments facilitate memory. To date, very few researchers have done this, with the exception of researchers who investigated the effects of self-schematicity on the SRE (e.g., Kuiper & Derry, 1982; Symons, 1990). As researchers continue to examine specific processing strategies that may produce the SRE, these issues should be illuminated.

Theoretical Differences Between Person-Reference and Semantic Processing

The results of several model tests are interesting in that they allow us to speculate about the differences between person-reference and semantic processing. Our conclusions are based on a complex of model tests that were significant (or not significant) for one manipulation class versus the other. Specifically, some model tests were significant for the SR–OR class but not for the SR–semantic class; some, such as stimulus type, show different patterns for the two classes. The results of these model tests allow us to theorize about differences between the SR–OR and SR–semantic manipulation classes and, in general perhaps, between person-reference and semantic encoding.

The first important theoretical model that we tested that reflects differences between person-reference per se (SR–OR comparisons) and SR–semantic comparisons is the model test for stimulus type. Results show that, when nouns were used as stimuli, there was no SRE for the SR–OR class. However, when traits were used as stimuli, the studies obtained a significant mean SRE that was significantly larger than the mean SRE found for nouns. In contrast, in the SR–semantic class, a significant mean SRE appeared when either traits or nouns were used as stimuli, but the SRE was significantly larger with traits than nouns.

Many researchers have speculated about the ways in which traits are represented in memory (e.g., Breckler, Pratkanis, & McCann, 1991). It is interesting that nouns seem to be equally well remembered in both SR and OR (i.e., person-referent) conditions across studies in the SR–OR manipulation class. This finding may have implications for the assertion that nouns are sometimes part of the self-representation (e.g., Klein & Kihlstrom, 1986). If we make the assumption that nouns are not part of the self-representation and the SRE is indeed a "self-based" phenomenon, then SR encoding of nouns should not be expected to pose an advantage for later memory (Maki & McCaul, 1985). However, if we hold to the assumption that nouns are not an integral part of the self-concept (and that, therefore, SR should not facilitate memory for nouns), we must also be able to explain why it is that we find an SRE for SR–semantic manipulations that used nouns as stimuli. The most likely and parsimonious explanation for the finding of no SRE when nouns are used in SR–OR studies is that, of the 26 studies that used nouns, 13 also used imagery tasks, which tend not to find SREs on average, as we discussed earlier. The rest of the studies used nonstandard tasks, either judgments about a nonspecific other (for the OR task; $k = 8$) or tasks that were judged to be unusual and could not be included with other classes. Again, this is an important line of questioning by which processing assumptions about SR versus other kinds of processes could be tested by careful attention to the kinds of stimuli that are presented to participants.

The model test for dependent variable is consistent with our earlier discussion of the effects of organization and elaboration. Results show opposite patterns for recall and recognition in the two manipulation classes. In both manipulation classes, there is a significant difference between studies that used recognition versus those that used free recall. In the SR–semantic class, however, SREs were significantly larger for studies that used recall rather than those that used recognition; in fact, studies that used recognition tended not to observe SREs at all. In contrast, SR–OR studies that used recognition observed significantly larger SREs on average than those that used free recall. It seems then that the presence of retrieval cues following an SR–semantic manipulation provides an advantage following semantic encoding. A recognition task may provide cues that supply an advantage equivalent to that inherent in an OR or SR task, which may have the benefit of a category label to facilitate retrieval. In contrast, the presence of retrieval cues following OR seems to disrupt retrieval, resulting in larger SREs than those obtained with free-recall tasks. It may be that experimenter-imposed retrieval cues may actually interfere with subjective categorical structures imposed by the participant when encoding words about another person. Although this explanation is purely speculative, this pattern may be related to our findings for the next set of model tests, which indicate that OR may be sensitive to interference with short-term memory stores. As a final precaution, we note that we did not compare semantic encoding with OR directly; therefore, care should be observed with regard to comparisons of the two types of processing.

OR Tasks: Sensitive to Disruptions in Short-Term Memory?

The final set of models that we examined are specific to the SR–OR manipulation class and suggest that OR may be particularly sensitive to task restrictions that interfere with short-term memory stores. First, the model for expectation of test shows that there was no SRE when participants expected to have their recall tested following the encoding task but that studies using incidental learning paradigms observed SREs on average. Second, the use of distractor tasks resulted in a larger mean SRE than when distractor tasks were not used in SR–OR studies. Because (a) the expectation of a memory test should increase the use of rehearsal strategies and (b) distractor tasks disrupt any rehearsal strategies that participants may decide to undertake, both of these model tests suggest that rehearsal is disrupted and results in a disadvantage for retrieval following OR that does not affect SR–semantic comparisons. It is interesting that both of these models are consistent with Kuiper and Rogers's (1979) theory that OR may require some sort of rehearsal strategy to be mnemonically effective.

Two interesting continuous models suggest that OR may be sensitive to task restrictions that affect time or short-term memory immediately following encoding tasks: SREs increased (a) as time between encoding and retrieval increased and (b) as length of stimulus presentation decreased. These findings suggest that, the longer the time between encoding and retrieval, the more likely it is that SR will promote more memory than OR. (These patterns also hold true for semantic encoding, although the magnitude of the effect is somewhat smaller.) For OR manipulations, this finding is further support for the idea that OR may benefit from a rehearsal strategy: The longer participants are required to retain the information in short-term memory, the less likely that OR will prove as effective a mnemonic strategy relative to SR.

The finding that SR has an advantage when length of stimulus presentation is briefer for both the SR–OR and the SR–semantic classes is important because it suggests the possibility that SR may promote good retention more quickly than either semantic or OR processing; both semantic and OR processing seem to require more processing time to be mnemonically effective. One interpretation of these findings is that the SRE is "time sensitive": SR may be an especially effective strategy, compared with OR, if participants have to wait a long time between encoding and retrieval or if they have to encode stimuli very rapidly. Thus, our findings suggest that SR may be more spontaneous or automatic in promoting memory than OR.

However, before special mnemonic properties are attributed to SR, we thought it wise to investigate the possibility that these effects exist also when participants refer a word to memory structures that may be very similar to the self in memory (Aron et al., 1991). When these models are tested using only highly intimate others, we found that the short-term memory interference created by either a distractor task or failure to expect a test, as well as the findings with regard to length of stimulus presentation, all fall away when highly intimate others are referenced. However, these model tests with high-intimacy others involved a small number of studies. These possibilities are particularly intriguing and deserve to be investigated in primary-level research.

These findings suggest patterns that have been virtually ignored in the SRE literature until our meta-analysis. Based on our assumption that SR is constant across both manipulation classes, the patterns suggest an important difference between OR and semantic encoding. Because, in the SR–semantic class, the magnitude of the SRE is unaffected by distractor tasks or expectation of a test, we assume that semantic encoding is resistant to the effects of these task parameters on short-term memory.

Conclusions

Researchers repeatedly have asked the question, "Is the self unique?"[4] Although our study cannot directly address questions about the self-structure in memory, it indicates that certain aspects of engaging in an SR task may indeed pose special mnemonic advantages. First, although SR is posited to promote both relational and item-specific processing, even when SR is paired with a task judged to also promote these processes, an SRE emerges. Of course, we have not made assumptions about the degree to which these tasks promote both kinds of processing, but our results suggest that SR is more effective in promoting memory. Results with regard to stimulus items and length of stimulus presentation suggest that SR may be particularly spontaneous and efficient when stimulus items are commonly judged through person reference (e.g., traits; Markus, 1977). Moreover, although SR is superior to OR in promoting memory and even when intimate other targets were judged, we observed that in many ways the referencing of an intimate other appears to have similar effects to SR. For example, even the short-term memory disruptions that we observed disappear for judgments of highly intimate others.

The everyday implications of these findings extend to many different areas. Certainly the power of SR has been underestimated in some areas and, possibly, overestimated in others. One implication of our study is that SR works best to facilitate memory when certain kinds of stimuli are used—stimuli that are commonly organized and elaborated on through SR. When these stimuli are used, however, SR appears to be a very efficient, possibly spontaneous processing mode. Of course, future researchers must address these questions with more direct comparisons of SR, OR, and semantic encoding, with particular attention to differences in the kinds of stimulus material used and their importance to the individual participant. More important, we hope that researchers will address several new potential causal processes suggested by our meta-analysis that may explain why the SRE occurs. Our evidence suggests that SR is a uniquely efficient process; but it is probably unique only in the sense that, because it is a highly practiced task, it results in spontaneous, efficient processing of certain kinds of information that people deal with each day—material that is often used, well organized, and exceptionally well elaborated.

[4] We recognize that there is still debate in cognitive literatures as to the question of the self's uniqueness (Breckler, Pratkanis, & McCann, 1991; Cantor & Kihlstrom, 1987; A. G. Greenwald & Banaji, 1989; Higgins & Bargh, 1987). As Breckler et al. pointed out, it is premature to conclude that the self is a unique structure. For one thing, theoretical models of the self are not sufficiently specified to assert that the self is a unique structure in memory (G. T. Greenwald & Pratkanis, 1984). Moreover, the criteria for uniqueness are unclear, although such criteria have been pursued by researchers in other areas of memory (see Ostergaard, 1992).

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