

Self-Reference and the Encoding of Personal Information

T. B. Rogers, N. A. Kuiper, and W. S. Kirker
University of Calgary, Canada

The degree to which the self is implicated in processing personal information was investigated. Subjects rated adjectives on four tasks designed to force varying kinds of encoding: structural, phonemic, semantic, and self-reference. In two experiments, incidental recall of the rated words indicated that adjectives rated under the self-reference task were recalled the best. These results indicate that self-reference is a rich and powerful encoding process. As an aspect of the human information-processing system, the self appears to function as a superordinate schema that is deeply involved in the processing, interpretation, and memory of personal information.

Present research and theory in personality appear to be placing more and more emphasis on how a person has organized his or her psychological world. Starting with Kelly's (1955) formulation of personal constructs, we see a gradual emergence of a number of avenues of inquiry that use this as their focal point. In person perception, the concept of lay personality theory stresses that the observer's analytic network of expected trait covariations is an integral part of how he processes (and generates) interpersonal data (Hastorf, Schneider, & Polefka, 1970). Bem and Allen (1974), in their embellishment of Allport's (1937) idiographic position, argue that an important determinant of predictive utility of trait measurement is the manner in which the respondent has organized his or her view of the trait being measured. These authors see the overlap between the respondent's and the experimenter's concept of the trait as a necessary prerequisite of prediction. Attribution theory (Jones et al., 1971) is another example of this increased accent on personal organization. Here the emphasis is on how the subject explains past behavior

and how these explanations are organized in an attributional network. The common thread in all of these contemporary research areas is the notion that the cognitions of a person, particularly their manner of organization, should be an integral part of our attempts to explain personality and behavior.

Of concern in the present article is the construct of self and how it is implicated in the organization of personal data. Our general position is that the self is an extremely active and powerful agent in the organization of the person's world. More specifically, the present research was designed to determine if self-reference serves a meaningful function in the processing of certain kinds of information. That is, we attempted to determine the relative strength of self-reference as an agent in the processing of people-related information.

The self is defined as an abstract representation of past experience with personal data. Phenomenologically, it is a kind of vague idea about who the person thinks he or she is. It probably develops to help the person keep track of the vast amounts of self-relevant information encountered over a lifetime. The self, then, represents the abstracted essence of a person's perception of him or herself. A more formal definition of self is to view it as a list of terms or features that have been derived from a lifetime of experience with personal data. More than likely a portion of the list consists of general terms—not unlike traits—that represent the ab-

This research was supported by a grant from the Canada Council. We would like to thank the following persons for their useful ideas and comments on earlier drafts: F. I. M. Craik, E. J. Rowe, P. J. Rogers, H. Lytton, J. Clark, J. Ells, C. G. Costello, and especially one anonymous reviewer.

Requests for reprints should be sent to T. B. Rogers, Department of Psychology, The University of Calgary, Calgary, Alberta, Canada, T2N 1N4.

stracted essentials of a person's view of self. In addition to these general terms, there are also some more specific entries in the self. These relate to less salient and more situation-specific aspects of self-perception as well as to specific behaviors. This definition is supported by Jones, Sensening, and Haley (1974). They simply asked subjects to describe their "most significant characteristics." The most frequent entries in the obtained response protocols were positively worded terms such as *sensitive*, *intelligent*, and *friendly*. These appear to be the general terms in the self and appear to resemble traits. Jones et al. (1974, p. 38) also present a single response protocol. Of interest here is the tendency for conditionals (e.g., such situational hedges as *sometimes*) to emerge later in the protocol. Furthermore, as the protocol develops, the entries tend to relate to more specific situations than did the earlier terms (e.g., "have a hang-up about authority figures"). These latter entries appear to be the specific terms in the self.

One of the main functions of the self is to help the individual process personal data. When a person encounters a situation involving personal information, this structure is activated and becomes part of the available information-processing system. For example, when students encounter a list of characteristics of a psychopathological state (e.g., in an introductory psychology lecture), they tend to interpret (and attempt to remember) these by referring them to their own views of self. Such a strategy could lead to the "medical student syndrome," where students begin to see themselves in the varying states described by the lecturer. In extreme cases, some students can be convinced they are raving lunatics—despite repeated warnings of the instructor. Other examples of this self-reference phenomenon can occur in situations involving personal feedback, expressive behaviors, and the processing of information about other people.

The central aspect of self-reference is that the self acts as a background or setting against which incoming data are interpreted or coded. This process involves an interaction

between the previous experience of the individual (in the form of the abstract structure of self) and the incoming materials. The involvement of the self in the interpretation of new stimuli imparts a degree of richness and fullness to the input because of the availability of the immense amounts of previous experience embodied in the self.

The interaction between new input and previous experience, postulated to be central to self-reference, has been modeled in the cognitive literature under the concept of schema or prototype (Bartlett, 1932; Posner & Keele, 1968). For example, subjects shown a series of dot patterns tend to abstract a prototypical visual pattern and use it as a standard in a memory task (Posner & Keele, 1970). In personality, several recent papers have suggested that personal data are processed using schemata or prototypes. Markus (1977), using a series of measurements, categorized subjects by whether dependence was part of their self. Schematics, or those with dependence as part of their self, were those who rated themselves as extreme on several dependence items, as well as indicating that they viewed dependence as important. Aschematics were midrange on dependence and low on importance ratings, representing subjects who did not have dependence in their general concept of self. On the basis of impressive convergent evidence, Markus (1977) found that schematics and aschematics showed differences in how they processed personal data. For example, schematics were more resistant to incorrect personal information than were the aschematics. These data suggest that the traits, such as those found in the self, serve an important function in processing certain kinds of information.

Cantor and Mischel (1977) tested the proposition that traits function as prototypes using a recognition memory task. Subjects were shown a series of statements that represented an introvert. When faced with a task requiring recognition of these statements from among some new introvert statements, subjects tended to misidentify some of the new items as having been original statements. This suggests that the concept of in-

trovert mediated subjects' processing of the initial set of statements. This mediation was postulated to be in the form of a prototype, which represents an abstraction of the concept of introvert from the initial items. The observed memory bias for new, yet conceptually related items reflected the involvement of this abstraction.

The Markus (1977) and Cantor and Mischel (1977) data indicate that traits are implicated in information-processing functions. They appear to be involved in the organization, storage, and retrieval of personality-related information. Our view of self places these traitlike schemata or prototypes as general terms in the feature list making up the self.

Rogers, Rogers, and Kuiper (Note 1) explored the manner in which this set of schemata is involved in processing personal data. They hypothesized that the self functions like a grand or superordinate schema. If the self is a schema, it should be possible to observe the kinds of memory biases documented by Cantor and Mischel (1977). In one study (Rogers et al., Note 1, Experiment 2), subjects filled out self-ratings on 84 adjectives. Two and a half months later, these same subjects participated in a recognition memory study involving these same adjectives. They first saw a randomly selected set of 42 of the words, and then had to recognize these from among the total set of 84. If the self was involved as a schema, subjects should tend to falsely recognize new items that were rated as self-descriptive (i.e., Posner & Keele, 1970). Each subject's recognition protocol was divided into high, neutral, and low self-descriptive categories on the basis of their self-ratings. Performance for the 42 items initially shown in the recognition study was not affected by degree of self-reference. However, performance on the new or distractor items (correct rejects) became poorer as degree of self-reference increased. In other words, more false alarms occurred as the adjectives became more self-descriptive. This clearly confirms the prediction derived from viewing the self as a schema.

To review, self-reference can be seen as a process involving the schema of self. This process involves the interaction between previous experience with personal data and new stimulus input. When self-reference is involved, it should provide a useful device for encoding or interpreting incoming information by virtue of accessing the extensive past experience abstracted in the self. Contact with the reservoir of history embodied in the self should provide considerable embellishment and richness to an incoming stimulus. Rogers (in press) explored this possibility using recognition memory for personality items. Subjects instructed to "read the item, decide if it describes you, and use this to help your memory" performed significantly better than subjects receiving either no or different (i.e., imagery) instructions. These data, in combination with some older research (e.g., Cartwright, 1956), indicate that explicit instructions to use the self in a memory task increase performance, which supports the claim that self-reference serves to enrich input.

This enriching aspect of self-reference is the focal point of the present article. Our major concern is how powerful self-reference is as an encoding device. More specifically, self-reference is compared to several other encoding processes in an effort to determine the relative degree of richness and embellishment that self-reference imparts to the encoding of adjectives.

The experimental manipulation used in the present context is an incidental recall paradigm, in which subjects make different kinds of ratings on a set of words. For example, a subject rates whether a given word means the same as a target word. This would be a *semantic rating*, as the subject must extract the meaning of the word to perform the task. The same subject rates whether another word is written in big letters. This is a *structural coding task*, since all the subject has to do is inspect the structure of the stimulus item rather than extract the meaning of the word. Other words are rated on a *phonemic task*, which involves deciding whether a word rhymes with a target. The *self-reference rat-*

ing, which subjects perform on some of the words, involves the respondent's deciding whether the word describes him or her. When the rating task is completed, each subject has rated one fourth of the words on each of the four rating tasks. These four tasks are thought to vary in depth, or semantic richness, from the structural task as the most shallow to the semantic and/or self-rating task as the deepest. The test of coding strength comes when the subjects are given a surprise recall task at the conclusion of the ratings. According to Craik and Lockhart (1972), words that have been deeply coded during the rating task should be recalled better than words with shallow coding. This manipulation permits us to determine the relative deepness of self-reference as a coding device.

Craik and Tulving (1975) have done a series of studies using this methodology. They have restricted their efforts to the structural, phonemic, and semantic types of tasks. Their results indicate that recall (or recognition) is best for semantic tasks and poorest for structural ratings, with phonemic in the middle. These data are interpreted as support for the position that the strength of the memory trace is "a positive function of 'depth' of processing, where depth refers to greater degrees of semantic involvement" (Craik & Tulving, 1975, p. 268). Presumably the rating tasks (structural, phonemic, etc.) force the subject to code the word to a specific level, and the incidental recall is a function of the depth of these tasks. These kinds of results have emerged quite consistently in the cognitive literature (e.g., D'Agostino, O'Neill, & Paivio, 1977; Klein & Saltz, 1976; Schulman, 1974; Walsh & Jenkins, 1973).

Of particular concern in the present study is the comparison between incidental recall for words rated under the semantic and self-reference tasks. Both of these tasks involve semantic encoding, but there is an important difference between them. The self-reference task forces the subject to use the self in the rating task, whereas the semantic task does not. The self-reference/semantic com-

parison permits assessment of the degree to which the self aids in producing a stronger trace, in contrast to usual semantic encoding. If the self is an active agent in the encoding of personal data, we predicted that the self-reference rating would produce good incidental recall in this depth-of-processing paradigm. If incidental recall of the self-reference words is superior to that for semantic words, the hypothesis that the self serves an active and powerful role in processing personal data would be supported.

The present article offers two experiments that examine this proposition. The first study involves a close replication of Craik and Tulving's (1975) initial experiments, with the self-reference task included. The second experiment replicates and extends the first study by using a different technique and different semantic rating task.

Experiment 1

This experiment is intended to determine the relative position of self-reference in Craik's (Craik & Lockart, 1972) depth hierarchy. The procedural details have been chosen to closely approximate Craik and Tulving's (1975) initial experiments in an effort to maximize the degree of comparability of the present results.

Method

The study has two main parts. First, subjects rated 40 adjectives on one of four tasks. This involved presenting a cue question, followed by 1 of the 40 adjectives. Subjects answered yes or no to the cue question as it applied to the adjective. The cue questions, along with the manipulations for each task, are presented in Table 1. After completing the ratings, subjects attempted to recall the adjectives in the second part of the study.

Materials. The main items for this study were 40 adjectives that were deemed appropriate for a self-description task. They were chosen to represent a broad spectrum of possible characteristics and were selected from all of the trait descriptions found in Jackson's (1967) *Personality Research Form A Manual*. Thirty-eight of the adjectives, selected to be familiar to the subject population, came from this source. Two other adjectives (shy and outgoing) were added to make up the total of 40.

We used *Rogel's Thesaurus* to construct a further set of 40 synonyms for the semantic tasks. The

Table 1
Examples of the Rating Tasks

Task	Cue question	Manipulation
Structural	Big letters?	The adjective was either presented in the same size type as the question or twice as large.
Phonemic	Rhymes with xxxx?	xxxx was a word that either rhymed or did not rhyme with the adjective.
Semantic	Means same as yyyy?	yyyy was either a synonym or unrelated word to the presented adjective.
Self-reference	Describes you?	Subjects simply responded <i>yes</i> or <i>no</i> to indicate the self-reference quality of the presented adjective.

final synonyms chosen represented consensus among the three authors.

The phonemic task dictated a second supplementary list of 40 words that rhymed with the main adjective set. The authors generated a set of possible rhyming words, and consensus among ourselves was the final criterion for selection. Most (90%) of these words were adjectives.

A third supplementary list of nonsynonym, nonrhyming words was also required, so that one half of the cue questions could result in a *no* rating. Kirby and Gardner's (1972) set of adjectives was consulted to derive this list. Again, author consensus regarding the nonrhyming and nonsynonym quality of the adjectives dictated the final list.

A set of eight further adjectives and supplementary words was generated to provide buffer items of four ratings each at the beginning and end of the list. These items, which were constant across lists, were not included in the data analysis. This was intended to minimize the effects of primacy and recency in the incidental recall task.

Four lists of adjectives were constructed, such that 10 adjectives in each list were rated under each cue question, and over the four lists, each adjective was rated under each cue question.

To guard against the possibility that *no*-rated words are recalled differently than *yes*-rated words, each of the four lists was reversed to generate eight lists in total. For example, if in a given list, under the structural task, a word appeared in small letters (generating a *no* response), the reversed list would have the word presented in big letters (generating a *yes* response). The one exception to this counterbalancing was the self-reference task. Here it was impossible to have experimental control over *yes* and *no* responses, since the person's view of self would dictate his or her response.

In all lists, order of the cue questions was randomly assigned in blocks of eight trials, such that each combination of cue question and expected response was represented once every eight trials.

Procedure. Subjects were tested individually. Ini-

tial instructions did not indicate that recall was expected. All stimuli were displayed on a television monitor driven by a PDP8/1 computer, which also recorded the ratings and rating times. Including the four buffer items at the end and beginning of the list, there were 48 rating trials. Each of these consisted of (a) a 3-sec presentation of the cue question, (b) a 500-msec blank interval, (c) presentation of the target adjective, which was terminated by the subject's response, indicated on a two-button response panel placed comfortably in front of the subject, and (d) a 2-sec intertrial interval before the next cue question was presented. After the rating task, the subject was given a piece of paper and was asked to recall, in any order, the adjectives he or she had rated. Three minutes were allowed for recall.

Subjects. Volunteers from the introductory psychology subject pool served as subjects. There were 32 subjects (16 female and 16 male) with an average age of 20.2 years. Each was paid \$1.50 for participating. Subjects were randomly assigned to the eight list conditions, yielding 4 subjects per order.

Results and Discussion

For each subject, the number of adjectives recalled as a function of rating task (structural, phonemic, etc.) and observed *yes* or *no* rating was calculated. The means of these figures are presented in the top panel of Table 2. A 4 (rating tasks) \times 2 (*yes/no* rating) two-way analysis of variance revealed a significant main effect of rating task, $F(3, 93) = 29.01$, $p < .001$. Newman-Keuls tests indicated meaningful differences ($p < .05$ or better) in the recall for all points in this main effect except for the structural-phonemic comparison. The main effect of rating was also significant, $F(1, 31) = 4.22$, $p <$

.05, indicating superior recall for words given a *yes* rating. The Rating Task \times Rating interaction was also significant, $F(3, 93) = 3.47$, $p < .05$. Post hoc tests of this interaction revealed a meaningful *yes/no* difference for the self-reference rating, $t(31) = 2.62$, $p < .05$.

The overall pattern of these results is similar to that typically found in the literature (e.g., Experiments 1, 2, and 3 in Craik & Tulving, 1975). The main effect of rating task is used to suggest that the depth to which items are processed during the rating task determines the strength of the memory trace. As recall is a function of trace strength, the present results support this position.

Of central interest is the finding that the self-reference task develops a stronger trace than the semantic task, as shown by the significant recall differences between these two conditions. This result clearly supports the idea that self-reference functions as a powerful coding device. In the case of self-reference ratings, the subject uses his or her concept of self to respond to the adjective. The self-ratings involve comparison of the incoming adjective with the terms and sche-

mata that are part of the self (see Rogers, 1974). This comparison culminates in the subject's *yes/no* response, which leads to a strong and specific encoding of the rated item. During the recall phase of the study, items with this detailed and specific encoding are easily retrieved, producing good recall performance.

In the semantic rating task it is unnecessary for an elaborate structure such as the self to be involved. Rather, the subject accesses his associative memory (e.g., Estes, 1976) for the target adjective and makes his synonymity judgment from this. The resulting trace is not as specific or detailed as that involved with self-reference. Clearly, the access of associative memory produces a more detailed trace than either the structural or phonemic tasks. However, when compared to self-reference, the trace derived from a synonymity judgment is relatively weak. This difference in the specificity of the self-reference and semantic tasks seems to be the major reason for the inferior incidental recall of the semantically rated words.

The time required to make the ratings is typically used to monitor the effectiveness

Table 2
Recall, Rating Time, and Adjusted Recall as a Function of Rating Task and Rating for Experiment 1

Rating	Rating task				Total
	Structural	Phonemic	Semantic	Self-reference	
	Mean recall				
<i>yes</i>	.28	.34	.65	1.78	3.05
<i>no</i>	.06	.34	.68	1.06	2.14
Total	.34	.68	1.33	2.84	5.19
	Mean rating time (msec)				<i>M</i>
<i>yes</i>	1,267	2,177	2,255	3,194	2,223
<i>no</i>	1,474	2,104	3,006	2,689	2,318
<i>M</i>	1,371	2,141	2,631	2,941	2,271
	Mean adjusted recall				<i>M</i>
<i>yes</i>	.05 ^a	.08	.14	.30	.14
<i>no</i>	.01	.06	.12	.29	.13
<i>M</i>	.03	.07	.13	.30	.13

^a This figure represents the mean (over 32 subjects) of the number of recalled *yes*-rated structural items divided by the number of *yes* ratings made on the structural task.

of the experimental manipulations in this paradigm. Further, these reaction time (RT) data provide convergent evidence for self-reference as a useful encoding task. The RTs from the present study were sorted separately for each subject into *yes/no* by rating-task categories. The means are presented in the middle panel of Table 2. Only the main effect of rating task was significant in this analysis, $F(3, 93) = 10.35$, $p < .001$. A clear linear trend in RTs is evident in these data, indicating maximal RT for the self-reference rating task.¹ This analysis replicates Craik and Tulving (1975) and is clearly compatible with the recall data presented above, supporting the involvement of the self as a coding device.

The finding that *yes*-rated words are recalled better than *no*-rated words occurs in other studies and has a number of interesting implications. Craik explains these data by arguing that in the case of *yes*-rated words, the "encoding questions or context forms an integrated unit with the target word" (Craik & Tulving, 1975, p. 291). Presumably this integrated unit forms a stronger trace than less integrated ones (*no*-rated words), thereby augmenting recall. The interaction observed in the present data indicates that this *yes/no* difference occurred only for the self-reference case, which suggests that items viewed as self-descriptive (*yes*-rated words) form a "more integrated unit" than do non-self-descriptive terms. These results strengthen even more our view of self, as it appears that terms that match the subject's self-view become more integrated than those that do not match. This finding is consonant with both Markus's (1977) and Cantor and Mischel's (1977) finding that personal data are processed using schemalike structures.

There are several aspects of these data that require examination before the previous conclusions are fully warranted. The *yes/no* difference in recall for self-reference words could be due to a differential number of *yes* responses as a function of rating task. Since experimental control over the number of *yes* responses was not possible for the self-reference task, this is a distinct possibility. For

each subject, the number of *yes* responses made under each rating task (maximum = 10) was calculated. The means were 5.00, 4.34, 4.06, and 6.13 for the structural, phonemic, semantic and self-reference tasks, respectively. A simple analysis of variance on these figures revealed a significant effect, $F(3, 93) = 16.99$, $p < .001$, indicating that number of *yes* responses is related to rating task. The deviations from 50% *yes* responses for the phonemic and semantic tasks are due to the difficulty of constructing exact rhymes and synonyms for the adjectives.

More important than the significant variation in number of *yes* responses is the possible effect this might have on the recall data. Since it is already known that *yes*-rated words are better recalled (e.g., Craik & Tulving, 1975), it is possible that self-reference recall was superior because subjects made more *yes* responses in the self-reference task. To assess this, the recall data were transformed to a proportion score that adjusts for differential numbers of *yes* responses. Specifically, a particular subject's recall of *yes*-rated words under a specific rating task was divided by the number of *yes* ratings the subject made while doing the task. This transformed score represents the proportion of recalled words the subject rated as *yes*. Similarly, the *no*-rated word recall under a given rating task can be divided by the number of *no* responses made on this rat-

¹ It is possible that items with large RTs are better recalled, calling into question this interpretation. If study time is the important factor, its effects should be observable *within* each task as well as across tasks. Thus, within a given rating task, the items with the longer study times should be recalled better. To explore this, the 10 RTs under each of the four rating tasks were subdivided separately for each subject into a fast and a slow subset (5 RTs in each). The recall for these subsets was analyzed in a 4 (rating tasks) \times 2 (fast and slow study times) two-way analysis of variance. The study-time hypothesis predicts significant effects for the terms involving study time. The analysis indicated only the expected main effect of rating task, $F(3, 93) = 30.85$, $p < .001$. This analysis weakens the study-time interpretation and reinforces the interpretation that the recall data are due to the qualitative nature of the various encoding tasks.

ing task to provide a score representing the proportion of recalled words rated as *no*. Note that this is a subject-specific correction that reflects recall corrected for differential numbers of *yes* and *no* ratings. The means of the adjusted recall scores are presented in the bottom panel of Table 2. An analysis of variance of these data revealed only a main effect of rating task, $F(3, 93) = 31.63, p < .001$. The important recall difference between semantic and self-reference survived this adjustment ($p < .01$), but the *yes/no* difference for the self-reference task did not. This analysis reaffirms self-reference as a coding tool but questions the possibility that *yes*-rated items form a more integrated unit.

In summary, the data from Experiment 1 provide evidence that self-reference is a powerful encoding device. The superior incidental recall of adjectives rated under the self-reference task, in combination with the RT data, suggests that self-reference provides a rich and powerful encoding. The involvement of self in the rating task provides a good encoding unit, which functions effectively as a memory cue.

Experiment 2

It is possible that the superiority of self-reference encoding documented in Experiment 1 is specific to synonymy ratings. Maybe other kinds of semantic tasks would produce equally powerful results. Semantic

tasks can be thought of as a family of judgments, all of which involve the extraction (and possibly some elaboration) of the meaning of the target item. Such tasks as synonymy ratings, judgments of semantic specificity, and deciding whether a word fits into a sentence frame can be considered members of this semantic family. Experiment 2 employed meaningfulness ratings as the semantic task. Since recall is a function of meaningfulness (see Noble, 1952; Paivio, Yuille, & Rogers, 1969), this encoding task should be very beneficial for recall, particularly for words given a *yes* rating. If self-reference emerges as superior to meaningfulness ratings, evidence confirming the strength and reliability of self-reference as an encoding device will be provided.

A second purpose of this experiment is to explore the robustness of the self-reference findings. Experiment 1 was performed using fairly tight experimental controls. The present experiment deviates from this by using a group testing procedure. Craik and Tulving (1975) and Klein and Saltz (1976) have used similar procedures and replicated the findings from more rigorous paradigms, suggesting that the self-reference finding should stand up in this group procedure.

Method

The four rating tasks used for this experiment are outlined in Table 3. Subjects were given a

Table 3
Rating Tasks and Mean Adjusted Recall for Experiment 2

Rating task	Cue question	Definition	Mean adjusted recall		
			<i>Yes</i> rating	<i>No</i> rating	<i>M</i>
Structural	Long?	Rate whether you feel the word is long or short.	.21	.18	.20
Phonemic	Rhythmic?	Rate whether you feel the word has a rhythmic or lyrical sound.	.20	.18	.20
Semantic	Meaningful?	Rate whether you feel the word is meaningful to you.	.23	.15	.19
Self-reference	Describes you?	Indicate whether the word describes you.	.33	.31	.32
<i>M</i>			.24	.21	.23

rating sheet which indicated which of the four tasks they were to perform on a given word; this was indicated by the cue questions from Table 3. After the subjects had read the task cue to themselves, an adjective was read aloud by the experimenter, and the subjects made their *yes* or *no* responses on the sheet. After the ratings, subjects turned over their rating sheets and attempted to recall the adjectives.

Materials. The 40 adjectives used in Experiment 1 made up the target items in this study. Four different task orders were generated, such that each adjective was rated under each task considered across the four orders, and within each order one fourth of the words were rated under each task. Within each list the order of tasks was randomized in blocks of four, such that each task was represented once in every four trials.

Procedure. Subjects were run in one group. After instructions, the experimenter read the item number, said the word *task* (which cued the subjects to read the cue question), and then read out the adjective. After 40 such trials, subjects were given 3 minutes to recall, in any order, as many of the adjectives as they could. Subjects were not expecting this free-recall task.

Subjects. Twenty-seven students in a fourth-year summer class served as subjects. The mean age was 27.7 years.

Results and Discussion

For each subject, recall as a function of rating task and rating was calculated. These figures were converted to adjusted recall scores following the procedures for Experiment 1. The means of the adjusted recall scores are presented in the far right columns of Table 3. Analysis of variance of the adjusted recall scores produced a lone significant main effect of rating task, $F(3, 78) = 4.20$, $p < .01$, and a meaningful semantic/self-reference recall difference ($p < .05$).

Experiment 2 demonstrates self-reference recall superiority when a meaningful rating task is used. This kind of task has been previously implicated in recall, resulting in a seemingly powerful semantic encoding task. However, the present results indicate that self-reference still is the more useful encoding task in this paradigm.²

Taken in total, the results of these experiments indicate that self-reference induces superior incidental recall compared to a diversity of strictly semantic rating tasks. The important thing is that self-reference appears

to produce recall that is superior to any other task ever used in the incidental recall paradigm. This by itself attests to the power of self-reference.

General Discussion

As a test of encoding strength, the depth-of-processing paradigm forces the subject to process stimuli to a specific depth by having the subject rate the words on different tasks. During the rating task a memory trace of the rated word is created. Tasks that are deep or semantically rich produce strong traces, which in turn serve as useful cues in the incidental recall of the rated words. The relative power of an encoding device is correlated with incidental recall in this paradigm. The present data indicate unequivocally that words rated under the self-reference task show superior recall. This indicates that self-reference represents a powerful and rich encoding device. Clearly, self-reference produces a rich encoding unit that can function effectively during information processing (see also Markus, 1977; Rogers, in press; Rogers et al., Note 1).

The major difference between the semantic and self-reference encoding tasks lies in the involvement of self in the latter rating. The self is a superordinate schema that contains an abstracted record of a person's past experience with personal data. The richness of self-reference encoding shown in the present article is due to the access of this schema. The semantic rating task does not force involvement of a powerful schema, and hence fails to induce as powerful and rich an en-

² The same pattern of results has been replicated twice for this group procedure using different semantic rating tasks. Typically this group procedure fails to replicate Craik and Tulving's (1975) findings for the structural, phonemic, and semantic tasks (see Table 2). This is probably due to the rating tasks used. For example, in the structural task some subjects may have rated whether the word was a "big" word (rather than long), which would be a semantic task. Regardless of this problem, the important semantic/self-reference difference clearly emerged in all studies using the group procedure.

coding unit. The mere act of making a self-referent decision produces such powerful internal reactions that the attending memory trace is stronger than any observed in the present experimental situation.

In order for self-reference to be such a useful encoding process, the self must be a uniform, well-structured concept. During the recall phase of the study, subjects probably use the self as a retrieval cue (e.g., Moscovitch & Craik, 1976). In order for this to be functional, the self must be a consistent and uniform schema. This property of the self is also shown by Rogers et al. (Note 1), who were able to predict memory performance with a measure of self taken 2½ months earlier. The present data support the contention that the self is a well-structured and powerful schema. Presumably the self-referent decision activates the superordinate schema of self as well as the salient subschemata. The strength of the trace developed from this activation suggests that a consistent and well-structured schema underlies these decisions. This consistency produces a rich and effective encoding unit, which accounts for the present data.

The present data permit some further statements about the schema properties of the self. Considering the four experiments reported here (including the two supplementary studies in Footnote 2), it has been consistently found that *yes*-rated items are better recalled than *no*-rated items in the self-reference task.³ These data support the schema view, since *yes*-rated items would fit more easily into the schema, and thereby form a more integrated encoding unit (Schulman, 1974). Such a pattern of results is compatible with Markus (1977) and Cantor and Mischel (1977) and further reinforces a view of the self as a schema.

The data indicating that the self is a schema prompt consideration of how the various traits (i.e., subschemata) and specific elements (i.e., individual behaviors) are organized within this structure. The terms of the self are organized in an hierarchical fashion, with the most central traits represented initially. At first blush, it seems rea-

sonable to think that this hierarchy relates to extremity. That is, the initial trait in the self would be a person's most extreme trait, followed by the second most extreme, and so on, until meaningful traits for the person were exhausted. This simple extremity organization may hold for some persons, but another aspect of the traits must also be considered. Specifically, the salience of a trait for a person also adds to the organization of self. For example, a person who views him or herself in the midrange on "friendly," may perceive this characteristic as exceptionally important, and thereby have it included in the self. Markus (1977) included this consideration when she used importance ratings in her definition of schematics. This aspect of traits or constructs has also been discussed under the labels of centrality (Snygg & Combs, 1949) and salience (Jackson, Note 2). The important thing to note is that the traits involved in a person's self are not necessarily the most extreme ones. Rather, they represent a mix of salience and extremity.

The inclusion of specific behaviors in the self derives from the work in cognition. Posner and Keele (1968) postulate that a person stores both the prototype and some indication of how a given stimulus deviates from this norm. This means that a schema, by virtue of its abstract property, must also contain specific data indicating aspects of the previous input that do not conform to the abstracted structure.

In sum, the self contains a set of ordered features. The ordering appears to be from general to specific, with the general terms (e.g., traits) ordered by a combination of salience and extremity. The general terms can serve as schemata when studied independently of a person's idiographic view of self (e.g. Cantor & Mischel, 1977; Markus, 1977).

The present data stress how the self can

³Statistical significance for this difference tends to disappear in the adjusted recall analyses. However, the consistent emergence of the effect across this series of experiments (even in the adjusted recall data) suggests a substantial effect.

become involved in the encoding of personal data. Focusing on the organizational properties of the self is by no means new (e.g., Bertocci, 1945; Gergen, 1971). In fact, as early as James (1890) the self has been postulated to be an active agent in the overall human cognitive apparatus. The present research adds to this tradition by providing a strong empirical test of a proposition deriving from such a view of self. Our emphasis is upon the information-processing functions of the self, specifically relating to self-reference as an encoding device. This represents a *neo-mentalistic* approach (Paivio, 1975) to the self. While behavioral evidence (i.e., memory performance) is the key element in this approach, the focal concern is upon the inferred construct—in this case, the self.

It should be noted that there are certain classes of information likely to receive self-reference encoding. Only after certain contextual information indicates that the self may be a functional aid to processing will the schema be activated. In the present context, we forced this process with the encoding task. In real life situations, it seems likely that the self would be functional in a number of situations involving feedback of personal data, such as conversations, expressive behaviors, and attempts to assess personal impact on others. The kinds of situations that activate this schema or possible individual differences in the frequency and intensity of the involvement of self in data processing may prove to be very useful extensions of the present formulation.

Probably the main advantage of the process-oriented view of information processing underlying our approach to self is the opportunity to move toward less descriptive models of social behavior. If we understand the processes and mechanisms underlying the processing of personal information, we will have a real opportunity to construct substantive models based on hard experimental findings (see Sechrest, 1976). For example, the finding that the self induces certain biases during the processing of personal data (Cantor & Mischel, 1977; Markus, 1977) can be related to the cross-situational con-

sistency issue. As noted by Bem and Allen (1974), our intuitions tell us that there are cross-situational consistencies in behavior, even though the research data do not tend to confirm this. Our process approach would interpret this as follows: (a) Personal data are processed using the self (e.g., Experiment 1). (b) The self induces people to view novel but self-relevant data as having been previously experienced (Rogers et al., Note 1). (c) Therefore new personal data will appear to conform to expectation (i.e., fit into the scheme), which could produce a perception of consistency. This interpretation focuses upon the organizational and biasing aspects of the human information processor, which provides an alternate construction of these important data. Although the utility of this interpretation rests on further empirical tests, the amenability of such a model to direct experimental scrutiny argues in its favor.

In summary, the present article offers data to suggest that self-reference is a very potent encoding device. The pattern of results indicates that the use of self during the encoding of adjectives produces as elaborate and integrated a memory trace as has been found using the present experimental paradigm. These data suggest the self is an extremely important aspect of the processing of personal information. In the realm of human information processing it is difficult to conceive of an encoding device that carries more potential for the rich embellishment of stimulus input than does self-reference.

Reference Notes

1. Rogers, T. B., Rogers, P. J., & Kuiper, N. A. *Recognition memory for personal adjectives: Some evidence for self-reference as an aspect of memory*. Unpublished manuscript, University of Calgary, 1977.
2. Jackson, D. N. *A threshold model for stylistic responding*. Paper presented at the meeting of the American Psychological Association, San Francisco, September 1968.

References

- Allport, G. W. *Personality: A psychological interpretation*. New York: Holt, 1937.

- Bartlett, F. C. *Remembering*. Cambridge, England: Cambridge University Press, 1932.
- Bem, D. J., & Allen, A. On predicting some of the people some of the time: The search for cross-situational consistencies in behavior. *Psychological Review*, 1974, 81, 506-520.
- Bertocci, P. A. The psychological self, the ego, and personality. *Psychological Review*, 1945, 52, 91-99.
- Cantor, N., & Mischel, W. Traits as prototypes: Effects on recognition memory. *Journal of Personality and Social Psychology*, 1977, 35, 38-48.
- Cartwright, D. Self-consistency as a factor affecting immediate recall. *Journal of Abnormal and Social Psychology*, 1956, 52, 212-219.
- Craik, F. I. M., & Lockart, R. S. Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 1972, 11, 671-684.
- Craik, F. I. M., & Tulving, E. Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology: General*, 1975, 104, 268-294.
- D'Agostino, P. R., O'Neill, B. J., & Paivio, A. Memory for pictures and words as a function of levels of processing: Depth or dual coding? *Memory & Cognition*, 1977, 5, 252-256.
- Estes, W. K. Structural aspects of associative models for memory. In C. N. Cofer (Ed.), *The structure of human memory*. San Francisco: Freeman, 1976.
- Gergen, R. J. *The concept of self*. New York: Holt, Rinehart & Winston, 1971.
- Hastorf, A. H., Schneider, D. J., & Polefka, J. *Person perception*. Don Mills, Ontario: Addison-Wesley, 1970.
- Jackson, D. N. *A manual for the Personality Research Form*. Goshen, N.Y.: Research Psychologists Press, 1967.
- James, W. *Principles of psychology*. New York: Holt, 1890.
- Jones, E. E., et al. (Eds.). *Attribution: Perceiving the causes of success and failure*. New York: General Learning Press, 1971.
- Jones, R. A., Sensenig, J., & Haley, J. V. Self-descriptions: Configurations of content and order effects. *Journal of Personality and Social Psychology*, 1974, 30, 36-45.
- Kelly, G. A. *Psychology of personal constructs*. New York: Norton, 1955.
- Kirby, D. M., & Gardner, R. C. Ethnic stereotypes: Norms on 208 words typically used in their assessment. *Canadian Journal of Psychology*, 1972, 26, 140-154.
- Klein, K., & Saltz, E. Specifying the mechanisms in a levels-of-processing approach to memory. *Journal of Experimental Psychology: Human Learning and Memory*, 1976, 2, 671-679.
- Markus, H. Self-schemata and processing information about the self. *Journal of Personality and Social Psychology*, 1977, 35, 63-78.
- Moscovitch, M., & Craik, F. I. M. Depth of processing, retrieval cues, and uniqueness of encoding as a factor in recall. *Journal of Verbal Learning and Verbal Behavior*, 1976, 15, 447-458.
- Noble, C. E. An analysis of meaning. *Psychological Review*, 1952, 59, 421-430.
- Paivio, A. Neomentality. *Canadian Journal of Psychology*, 1975, 29, 263-291.
- Paivio, A., Yuille, J. C., & Rogers, T. B. Noun imagery and meaningfulness in free and serial recall. *Journal of Experimental Psychology*, 1969, 79, 509-514.
- Posner, M. I., & Keele, S. W. On the genesis of abstract ideas. *Journal of Experimental Psychology*, 1968, 77, 353-363.
- Posner, M. I., & Keele, S. W. Retention of abstract ideas. *Journal of Experimental Psychology*, 1970, 83, 304-308.
- Rogers, T. B. An analysis of two central stages underlying responding to personality items: The self-referent decision and response selection. *Journal of Research in Personality*, 1974, 8, 128-138.
- Rogers, T. B. Self-reference in memory: Recognition of personality items. *Journal of Research in Personality*, in press.
- Schulman, A. I. Memory for words recently classified. *Memory & Cognition*, 1974, 2, 47-52.
- Sechrest, L. Personality. In M. R. Rosenzweig & L. W. Porter (Eds.), *Annual review of psychology*. Palo Alto: Annual Reviews, 1976.
- Snygg, D., & Combs, A. W. *Individual behavior*. New York: Harper, 1949.
- Walsh, D. A., & Jenkins, J. J. Effects of orienting tasks on free recall in incidental learning: "Difficulty," "effort," and "process" explanations. *Journal of Verbal Learning and Verbal Behavior*, 1973, 12, 481-488.

Received January 24, 1977 ■