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On the Formation of Interitem Associative Links in Person Memory

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This research examined the formation of interbehavior associative links in memory in an impression formation task. As subjects read a series of expectancy-congruent, -incongruent, and -irrelevant behaviors describing a target person, they were periodically probed with a recognition task. Across two experiments and four trait replications, recognition latencies for previously encountered behaviors were faster when this task followed the presentation of an incongruent item than when it followed a congruent or irrelevant item. These results demonstrate that the encoding of incongruent information causes previously encountered information to be activated and brought into working memory. This process is most likely responsible for the formation of the interbehavior links between incongruent behaviors and other behaviors that cause incongruent behaviors to be recalled particularly well. A third experiment demonstrated that these results are dependent on subjects' ability to attend carefully to the incongruent behaviors during encoding. These results provide support for a previously untested assumption of current models of person memory. © 1994 Academic Press, Inc.

Recent social-cognitive approaches to impression formation have focused on the manner in which behavioral information about a target person is encoded, stored, and retrieved as part of the impression formation process. A particular focus of this research has concerned the processing of information that is either congruent or incongruent with an initial impression. In the tradition of Asch (1946), this work is concerned with the process of integrating new information with an existing impression.

Much of this work was stimulated by an influential paper by Hastie and Kumar (1979). In their study, subjects were first provided with a

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series of trait adjectives describing a target person that served to create an initial impression or expectancy about that person on a particular trait (e.g., friendliness). Subsequently, they read a series of sentences describing behaviors performed by the target person. Some of these behaviors were congruent with the initial impression, some were incongruent, and some were irrelevant to the initial impression. Subjects were then asked to recall as many of these behaviors as possible. The results indicated that behaviors that were incongruent with the initial impression were recalled with higher probability than impression-congruent behaviors, which in turn were more likely to be recalled than irrelevant behaviors. This finding has been replicated in numerous subsequent experiments (e.g., Bargh & Thein, 1985; Hamilton, Driscoll, & Worth, 1989; Srull, 1981; Srull, Lichtenstein, & Rothbart, 1985; Wyer & Martin, 1986).

Hastie (1980) and Srull (1981) proposed an associative network model of impression formation to explain these results. According to the model, the target person is represented in memory by a central node, to which items of information become attached as they are encoded. In addition, if during the encoding process one behavioral item is in some way compared to or integrated with another behavioral item, an associative pathway directly connecting those two items in memory is formed. The model assumes that this associative activity occurs only during the encoding of impression-incongruent behaviors and not during the encoding of impression-congruent or irrelevant behaviors. This difference in processing occurs because incongruent information is difficult to integrate with the existing impression and requires additional thought, whereas congruent information that confirms the expectancy is processed rather effortlessly, as is irrelevant information.

In support of this view, Stern, Marrs, Millar, and Cole (1984) have shown that, in a self-paced impression formation task, subjects spent more time processing incongruent information than congruent information. Furthermore, research has demonstrated that incongruent information is more likely to stimulate attributional processing during encoding (Clary & Tesser, 1983; Hastie, 1984). Hypothetically, during this "explanation" period incongruent items are retained in working memory and compared to other information that has been previously encoded. As a consequence of this additional processing, direct interitem associative links are formed between incongruent items and previously encountered congruent and incongruent items. However, because congruent information does not stimulate these additional encoding processes, no interitem links are formed between congruent items and other previously encountered items. Behaviors that are irrelevant to the expectancy do not stimulate the formation of interitem links, nor are they linked to incongruent items as they are encoded. The resulting representation of the target person is presented in Fig. 1.

FIG. 1. Associative network representation of trait-congruent, -incongruent, and -irrelevant behaviors.

Having established such a representation of the target person, retrieval processes consistent with associative network models of memory can then account for the recall advantage of incongruent items. Retrieval is initiated at the central person node and traverses down a pathway to recall the first item. Once the first item is recalled, rather than return to the central node and begin again, the search will continue along associative links connecting behavioral items to each other, if possible. If no interitem links emanate from the initially recalled behavior, the retrieval process will return to the central node and again traverse down a pathway to another item. This process continues until the subject can no longer recall additional items.

Because incongruent items are associatively linked to both congruent and incongruent items, there are more retrieval routes leading to them. Therefore, they are more likely to be accessed during recall than are congruent items, which are connected only to other incongruent items, or irrelevant items, which are not linked to any other items. That is, because of the interitem links formed during encoding, there are more

pathways leading to the incongruent items, producing a higher likelihood of their recall.

What evidence is there that such interitem links are formed? Three types of analyses provide support. The first concerns an analysis of the order in which subjects recall behavioral items. If associative pathways are formed in the manner predicted by the model, then following the recall of a congruent item, the next item recalled is more likely to be an incongruent item than a congruent item. This follows from the model because pathways have been formed between congruent and incongruent items, but not between congruent and other congruent items. In contrast, having recalled an incongruent item, the next item recalled could be either congruent or incongruent because interitem links have been formed with both types of item. Srull (1981) calculated the conditional probabilities for recall of congruent and incongruent items, given that the previously recalled item was congruent or incongruent, and found support for the model's predictions. This result has been replicated by Hamilton *et al.* (1989, Experiment 2).

The second type of evidence is based on the analysis of interitem recall intervals. The interval between two successively recalled items that are directly connected to each other should be relatively brief in comparison to the interval between items that are not associatively connected. If the items are not linked to each other, the retrieval process must return to the central node before continuing to the next item, a process that should take longer. According to the model, then, intervals between successively recalled items in which at least one of the items is incongruent should be shorter than intervals in which both items are congruent, or intervals in which at least one of the items is irrelevant. Srull *et al.* (1985) reported data consistent with this prediction of the model.

The third type of evidence for the model comes from studies that have examined the recall of congruent and irrelevant behaviors as a function of the number of congruent, incongruent, or irrelevant items presented. Holding constant the number of congruent items presented, Srull (1981) varied the number of incongruent items included in the stimulus list. According to the model, the number of associative paths leading to the congruent items will increase as the number of incongruent items presented increases, because incongruent items form links with congruent items. Thus, the proportion of congruent items recalled should increase as the number of incongruent items presented increases. This is precisely what Srull found.

In contrast, varying the number of congruent or irrelevant items in the list should have no effect on the proportion of incongruent items recalled, because congruent and irrelevant items do not form links with other items. Srull's data also confirmed these hypotheses.

Finally, Srull *et al.* (1985) demonstrated that, whereas increasing the

number of incongruent items presented did improve recall for congruent items (replicating the previous result), it did not improve recall for irrelevant items. Because incongruent items form links only with expectancy-relevant items, there are no links between incongruent and irrelevant items.

THE PRESENT RESEARCH

Although these studies support the model's contention that associative links between behavioral items are formed only in response to incongruent information, they do not provide any evidence regarding the processes involved in the formation of such links. One particularly important assumption of the model has never been tested—that during the encoding of an incongruent item, previously encountered items are activated and brought back into working memory as part of the comprehension process. It is this spontaneous activation process that is deemed responsible for the formation of the associative links between incongruent and other behaviors, which in turn causes the recall advantage of incongruent behaviors. As previous behaviors are activated, they are compared to the incongruent item and form associative links with it. The purpose of the present research was to test for such a spontaneous activation process.

EXPERIMENTS 1 AND 2

Method

Overview

To determine whether previous items are activated during the encoding of incongruent (but not congruent or irrelevant) items, we inserted a recognition task into the typical impression formation sequence. Subjects were first given an initial trait expectancy about a target person, followed by the presentation of a number of sentences describing behaviors performed by the target. Each behavior was either congruent, incongruent, or irrelevant to the expectancy. While reading these behaviors, subjects were periodically probed with a recognition sentence that asked them if they had seen a given item before. The "prime" item directly prior to the recognition question was either congruent, incongruent, or irrelevant. Subjects' response latencies to the recognition task were used as the dependent measure.

If the encoding of incongruent items causes previous items to be activated and brought into working memory, then target items that follow the presentation of an incongruent prime should show shorter recognition latencies than target items that follow a congruent or irrelevant prime. If those items have recently been activated and are already in working memory, then it should take less time to respond to the recognition question.

We conducted two separate experiments utilizing the exact same procedure. Each experiment included two different trait replications. In Experiment 1 subjects formed expectancies and read behaviors pertaining to the traits "friendly" and "intelligent." Experiment 2 used the traits "adventurous" and intelligent. The intelligent behaviors in Experiment 2 were different from those used in the first experiment. Other than these differences in stimulus replications, the two studies were identical and utilized the same design, materials, and procedures. Therefore, we analyzed the data from both studies simultaneously by

including Experiment 1 vs Experiment 2 as a factor in the design. This strategy permitted an examination of the replicability of findings across studies.

Subjects

Subjects were 297 University of California, Santa Barbara undergraduate students (120 subjects in Experiment 1, 177 in Experiment 2) who were each paid \$5 for their participation in the study. The subjects were recruited from various undergraduate psychology classes. Subjects were run in groups of 1–6 persons at a time.

Stimulus Materials

Thirteen friendly, 13 unfriendly, 13 intelligent, and 13 unintelligent behaviors were selected for use in Experiment 1. Thirteen adventurous, 13 unadventurous, 13 intelligent, and 13 unintelligent behaviors were selected for use in Experiment 2. These behavioral sentences were culled from a large set of behaviors that had been pretested in previous work. The friendly, unfriendly, intelligent, unintelligent, adventurous, and unadventurous behaviors chosen for use were those behaviors that were rated most extremely high and low on their respective trait scales. The behaviors representing each trait dimension were rated neutrally on the other two dimensions. In addition, 12 "irrelevant" behaviors were chosen that were rated neutrally on all three dimensions. The same 12 irrelevant items were used in both experiments.

Procedure

Practice task. Subjects were seated individually at computer terminals and were informed that they would be participating in an experiment concerning impression formation. The computers first presented subjects with 10 practice questions that required them to press keys on the computer marked "yes" and "no." Before the experiment, subjects' handedness was determined, and the yes sticker was placed on the side of the keyboard corresponding to their handedness. The practice items were unrelated to the experiment (e.g., "Is Coke better than Pepsi?"). Among the practice items there were 2 recognition questions that asked subjects if they had seen a particular item before. In one case the target item had been encountered among the practice set, and in the other case it had not. These recognition tasks were included in the practice session in order to minimize confusion and variance during the presentation of such tasks during the actual experiment.

Expectancies. After the practice task, subjects read: "The experiment you will be participating in today involves forming an impression about a person named Bob. Please concentrate on forming this impression as it is important for the experiment." Subjects were then presented with a paragraph describing Bob as either intelligent or friendly (in Experiment 1) or adventurous or intelligent (in Experiment 2) in order to create an initial impression. The expectancy-inducing paragraphs were the same paragraphs used to create expectancies in Hamilton *et al.* (1989, study 2). Only expectancies pertaining to positive traits were used in this study. Previous research has demonstrated that incongruency effects are comparable for positive and negative expectancies (e.g., Hamilton *et al.*, 1989; Srull, 1981).

Following the presentation of the paragraph, subjects were informed that they would be reading about a number of behaviors performed by Bob and that they should continue to concentrate on forming an impression of Bob. Subjects were also informed that they should keep their fingers on the yes and no keys because they would periodically be asked some questions during the course of the experiment. Subjects were not informed that they would be required to recognize the behaviors they read.

Stimulus presentation. The stimulus sets consisted of 36 behaviors. Each behavioral sentence was presented in the middle of the computer screen. Subjects were paced through the sentences, reading one sentence every 6 s. A recognition target item was presented after

every ninth behavior. The item appearing directly before the target is referred to as the prime item. The blocks of 9 were designed such that each block included 3 congruent, 3 incongruent, and 3 irrelevant behaviors. Overall, subjects encountered 12 instances of each type of behavior (congruent, incongruent, irrelevant) plus 4 recognition target items. No more than 2 of the same type of item (e.g., congruent, incongruent, irrelevant) appeared in succession at any point in the stimulus sequence.

Presentation of target items. After every ninth behavior subjects read the following message: "HAVE YOU SEEN THIS ITEM BEFORE? (PRESS "YES" OR "NO")," with the target item presented directly underneath this message. Four kinds of target sentences were used: two test targets and two distractors. The test targets were a previously encountered (old) congruent item and an old incongruent item. The distractors were two items not previously presented, one of which was a congruent item and one an incongruent item. Each type of target was presented once in each stimulus set. The target items were equated for length to decrease the likelihood that recognition would be enhanced by physical properties of the sentences or that response times would reflect differential reading times. For the "old" target items, the target was always the behavior that had been presented five items prior to the prime item. The stimulus sequences were further constrained such that the two items directly preceding the prime item could not be incongruent. The purpose of this constraint was to assure that all activation of previous items during the recognition task was due to the prime item and not due to other recently processed items (Hastie, 1988).

Dependent measure. The computers recorded subjects' responses and their latencies to the recognition questions and continued the program once responses had been made. These response latencies served as the dependent measures in the experiments. In order to ensure that the primed target items were represented in memory, only correct yes responses to old targets in the recognition task were analyzed.

Design

Each experiment was a 2 (trait replication: friendly vs intelligent for Experiment 1; adventurous vs intelligent for Experiment 2) $\times$ 3 (prime: congruent, incongruent, irrelevant) $\times$ 2 (target congruence: congruent, incongruent) factorial design.¹ The trait and prime factors were between-subjects factors, and target congruence was a within-subjects factor. Because the two experiments were identical, we included "Experiment" as a between-subjects factor in the analyses.²

Results

For purposes of data normalization, all analyses were based on a log transformation of the response latencies. Data from 30 subjects who responded incorrectly to the recognition task were disallowed (13 in Ex-

¹ In addition to these variables, the presentation order of the four types of target items was counterbalanced in each experiment. The target presentation order was not a variable of interest and was included merely as an additional control in the experiment. Analyses involving this variable yielded some higher-order interactions that are difficult to interpret because the cell means were based on cell sizes of three to eight subjects. However, it should be noted that none of these interactions modified the prime type main effect. Therefore, all reported analyses collapse across this factor.

² Separate analyses were conducted on each experiment in order to examine trait replication effects. The trait replication variable had no effect in either experiment and did not interact with any other variables. We therefore collapsed across the trait replication factor in our analyses.

FIG. 2. Recognition latencies as a function of prime type.

periment 1 and 17 in Experiment 2).³ Subjects were considered to be outliers if their response latency to at least one of the target items exceeded two standard deviations above the mean of all transformed response latencies. An additional 19 subjects were excluded from analyses on this basis. Thus, the reported analyses are based on the data from 248 subjects. Mean response times are reported in seconds.

We predicted that target items would be recognized faster following incongruent than congruent or irrelevant primes. The response latency data were analyzed in a 2 (experiment) $\times$ 3 (prime type) $\times$ 2 (target congruence) ANOVA with repeated measures on the last factor. This analysis revealed a significant main effect for prime type. As predicted, subjects recognized targets more quickly following incongruent primes ($M = 3.40$) than congruent ($M = 3.59$) or irrelevant primes ($M = 3.72$), $F(2, 242) = 3.13$, $p < .05$ (see Fig. 2). A planned contrast of target latencies following incongruent primes with those following congruent and irrelevant primes was significant, $F(1, 245) = 5.58$, $p < .02$.^{4,5}

³ Analyses indicated that incorrect responses did not vary as a function of the type of target item probed or the type of prime item preceding the recognition task.

⁴ An anonymous reviewer suggested an alternative explanation for these data. Because incongruent items could not appear in the two positions preceding the prime item, an

The prime type main effect was modified by a significant three-way interaction involving the prime factor, the experiment factor, and the target congruence factor, $F(2, 242) = 3.28, p < .05$. Inspection of this interaction revealed that the pattern of means predicted by our hypothesis was evident in all cases, but that the effect was stronger when the target item was incongruent than when it was congruent in Experiment 1 and stronger when the target item was congruent than incongruent in Experiment 2.

Discussion

These data provide the first support for one of the central assumptions of person memory models: that as incongruent behaviors are encoded, previously encountered behaviors are spontaneously activated and brought into working memory. As predicted, subjects recognized target items more

incongruent prime would be the first incongruent item seen in three items. Since there was no such restriction on congruent or irrelevant items, congruent and irrelevant primes would not be the first such items to appear in three items. As such, the reviewer suggested that incongruent primes were perhaps temporally salient, compared to congruent and irrelevant primes. This temporal salience may have stimulated subjects to review their impressions, yielding recognition facilitation relative to the congruent and irrelevant prime conditions. In this alternative interpretation, our results would reflect the effect of stimulus salience rather than incongruency. To test this hypothesis, we identified two behavioral sequences within our design in which congruent primes occurred following an absence of other congruent items in the previous three or four positions. In these cases the congruent prime would have been even *more* temporally salient than the incongruent primes. Recognition latencies following these congruent primes were compared with latencies following identically positioned incongruent primes. The mean latency following congruent primes was 4.28 s and the mean latency following incongruent primes was 4.09 s. These latencies are clearly in the same direction as the prime main effect. In fact, the difference between the congruent and incongruent conditions is identical as in the main effect. So, even within these two sequences, where the congruent primes were more temporally salient than the incongruent primes, we replicated the prime main effect. The means in this analysis are somewhat higher than the means for the prime main effect in the overall analysis. It so happened that both of the relevant congruent prime sequences identified for our analysis preceded the first of the subjects' four recognition trials, and these latencies were compared to the latencies for subjects' first recognition trial that were preceded by incongruent primes. Due to a simple practice effect, subjects' recognition latencies decreased over the course of the four recognition trials, regardless of prime type and target type. Since the means reported above only reflect latencies for the first of the subjects' four recognition trials, they are slower than the means for the overall main effect. Had our analysis involved only latencies for the fourth recognition trial, the means would have been faster than in the overall main effect.

⁵ Although we had no specific predictions regarding responses to new targets, one might predict that they should be responded to with equal speed following all three prime types. Because they were not previously stored in memory, they could not have been spontaneously activated as incongruent primes were encoded. Therefore, it should take equally long to respond "no" to a new item following congruent, incongruent, or irrelevant primes. Indeed, separate analyses on new targets revealed no differences in recognition latencies following the different prime types, $F(2, 244) = .88, p < 1$.

quickly following an incongruent prime than a congruent or irrelevant prime. Past research has demonstrated that the explanatory processes that occur as incongruent behaviors are encoded are responsible for their recall advantage (e.g., Bargh & Thein, 1985; Srull, 1981; Stern *et al.*, 1984). Our data indicate that those explanatory processes include the activation of previously encountered information into working memory.

These data fill an important gap in person memory research. After all, it is this spontaneous activation process that is presumed to create the associative links between incongruent behaviors and other behaviors that yield the commonly found memory advantage for incongruent behaviors. Our data are the first to confirm the existence of such a spontaneous activation process.

EXPERIMENT 3

We conducted a third experiment to further examine the role of this activation process in person memory. Previous research has demonstrated that the recall advantage enjoyed by incongruent behaviors is dependent upon subjects' ability to attend carefully to the incongruent behaviors as they are encoded. If subjects are unable to devote sufficient resources toward explaining the incongruent behaviors, they will be recalled no better than congruent behaviors (Bargh & Thein, 1985; Srull, 1981). The theoretical argument is that, under such capacity constraints, subjects are unable to activate past behaviors to help explain incongruent behaviors. Therefore, incongruent behaviors do not form the associative links with other behaviors that provide their recall advantage.

However, the specific causes for the decreased recall of incongruent information have never been examined in this research. It has merely been assumed that, since incongruent behaviors have no recall advantage, there must have been no spontaneous activation of past behaviors, and therefore, no formation of associative links at encoding. In our third experiment we tested this assumption. The methodology was exactly the same as in Experiments 1 and 2, except that subjects' capacity was constrained during encoding. If the failure to find a recall advantage for incongruent behaviors under such conditions is due to subjects' inability to activate previously encountered behaviors, then imposing a memory load during encoding should nullify the effect observed in our first two experiments. It should take subjects no less time to recognize a behavior following an incongruent prime than following a congruent or irrelevant prime because the behaviors will not have been spontaneously activated.

Method

Subjects

Subjects were 90 University of California, Santa Barbara undergraduate students. Subjects were run in groups of 1-6 and received partial course credit for their participation.

Stimulus Materials

The stimulus materials were the irrelevant behaviors, the friendly, unfriendly, intelligent, and unintelligent behaviors used in Experiment 1, and the adventurous and unadventurous behaviors used in Experiment 2.

Procedure

Aside from the capacity constraint task, all aspects of the procedure were identical to that of the first two experiments, including the practice task, the expectancies, the stimulus and target presentations, and the dependent measures.

Capacity constraint task. Subjects were informed that we were interested in how people formed impressions of others while they were speaking and were instructed to repeat each behavior out loud twice as they formed their impressions. Pretesting had demonstrated that repeating the behaviors twice consumed most or all of the 6-s interim between behaviors. Past research has demonstrated the effectiveness of the behavior repetition task in attenuating the recall superiority of incongruent behaviors (Srull, 1981). Subjects were instructed not to repeat the yes/no questions out loud. Tape recorders recorded the subjects as they formed their impressions.

Design

The experiment was a 3 (trait replication: friendly, intelligent, adventurous) $\times$ 3 (prime: congruent, incongruent, irrelevant) $\times$ 2 (target congruence: congruent, incongruent) factorial design. The trait and prime factors were between-subjects factors, and the target congruence factor was a within-subjects factor.⁶

Results

As a check on the constraint task, we listened to the recordings of subjects as they formed their impressions. The data from 7 subjects who did not follow instructions (i.e., they failed to repeat the behaviors out loud twice) were not included in the analyses. As in Experiments 1 and 2, analyses are based on a log transformation of response latencies. Once again, only correct yes responses to old target items in the recognition task were analyzed. The data from 13 subjects who responded incorrectly to the recognition task were disallowed.⁷ In addition, 3 subjects were identified as outliers (their response latency to at least one of the target items exceeded two standard deviations above the transformed mean of all response latencies) and were excluded from analyses. Thus, the reported analyses are based on the data from 67 subjects. Mean response latencies are reported in seconds.

⁶ As in Experiments 1 and 2, there was a target presentation order variable that was included as an additional control in the experiment. Analyses involving this variable yielded one interaction with the target congruence factor that is difficult to interpret and is based on only a few subjects per cell. Once again, it should be noted that the order variable did not modify the prime type main effect. Therefore, all reported analyses collapse across this factor.

⁷ As in the previous experiments, analyses indicated that incorrect responses did not vary as a function of target item probed or the type of prime item preceding the recognition task.

The response latency data were analyzed in a 3 (prime type) $\times$ 3 (trait replication) $\times$ 2 (target congruence) ANOVA with repeated measures on the last factor. This analysis yielded no significant effects. Of particular interest, recognition latencies were no different following incongruent ($M = 3.10$), congruent ($M = 3.21$), or irrelevant primes ($M = 3.05$), $p < 1$.⁸

Discussion

By limiting subjects' processing capacity at encoding we were able to eliminate the response time differences observed in Experiments 1 and 2. Under such conditions, subjects apparently were unable to retrieve previously encountered behaviors in response to an incongruent prime. These data are consistent with the theoretical assumption that cognitive loads can negate the recall advantage of incongruent behaviors by interfering with the spontaneous activation of previously encountered behaviors during encoding and thus can preclude the formation of interitem associative links. The same conditions that undermine the recall advantage for incongruent behaviors also attenuate the spontaneous activation of previously acquired behaviors during encoding. These data are indicative of the crucial role that spontaneous behavioral activation plays in person memory effects.

With 67 participants, this experiment clearly had less power than Experiments 1 and 2. However, the cell means in this experiment were not in the same direction as those in Experiments 1 and 2. Therefore, increased power would not have led to the conclusion that recognition latencies were shorter following incongruent than congruent and irrelevant primes.

GENERAL DISCUSSION

Associative network models of person memory have been proposed to account for the finding that subjects who have been provided with a trait-based expectancy about a target person are able to recall more behaviors that are incongruent with the expectancy than behaviors that are either congruent or irrelevant to the expectancy (Hastie, 1980; Srull, 1981). A central tenet of such models is that incongruent items achieve greater recall as a direct result of their having formed associative links with other items in memory at encoding. Because incongruent items are difficult to comprehend, they will be retained in working memory longer and will receive additional attention as subjects attempt to integrate these items with their expectancy. During this explanation process it is assumed that previously encountered items are activated and are compared to the incongruent item. It is this activation process that is thought to lead to the formation of associative links between items.

⁸ A separate analysis of new targets again yielded no effects.

The present research provides the first direct support for such a process. The results of Experiments 1 and 2 demonstrated that subjects recognized a previously seen target item more quickly when the recognition task followed the presentation of an incongruent prime item than when it followed either a congruent or irrelevant prime item. These findings demonstrate that when an incongruent item is processed, previously encountered congruent and incongruent items are spontaneously activated and brought into working memory. Experiment 3 demonstrated that this effect does not occur in the absence of sufficient processing capacity. This latter result also suggests that the conditions that inhibit the recall advantage of incongruent information do so by inhibiting the spontaneous activation of behavioral information at encoding.

The support we obtained for our hypotheses is impressive in light of the conservative nature of the methodology used. That is, person memory models suggest that incongruent items, as they are processed, will be compared to *some subset* of previously encountered items that are activated for clarification purposes. The models do not assume that incongruent items will instigate the retrieval of *all* of the previously encountered items. In our experimental procedure we tested whether or not the processing of an incongruent item caused *one particular* previously encountered behavior (the target item) to be made more accessible in memory. Even if all of our subjects were processing the information exactly as the model predicts, it would still be possible that some of them would not access the *particular* item that we used as a target item in the recognition task. If some subjects retrieved a subset of behaviors that did not include that particular behavior, but did include other items, then this would weaken the strength of our effect—even though the predicted process occurred. In fact, given the large number of previously encountered behaviors available for subjects to access, it is impressive that supportive results were obtained.

Behavioral Activation and the Formation of Associative Links

Person memory models state that when an incongruent item is encoded, previously encountered items are activated and compared to the item, thus forming associative links between the items. The present research demonstrates that the encoding of an incongruent item does cause previously encountered items to be activated in memory. In addition, there is abundant evidence that incongruent items form associative links with previously encountered items (e.g., Hamilton *et al.*, 1989; Srull, 1981; Srull *et al.*, 1985). Despite these supportive findings, however, one caveat is in order. Specifically, there is no evidence that the items that are activated as incongruent items are encoded are *necessarily* the items that form associative links with the incongruent item. From our data, we cannot conclude that the items that enjoyed faster recognition latencies following

the presentation of an incongruent prime necessarily formed associative links with the incongruent item when it was encoded. In order to support the model's predictions more fully, it would be necessary to show a direct relationship between those items that are activated when an incongruent prime is encoded and those items that are associatively linked to the incongruent prime. Although our data are consistent with the procedural assumptions of person memory models, they do not prove that they are correct.

Nevertheless, it is highly likely that the spontaneous activation of old behaviors is, in fact, responsible for the formation of interitem associative links. Previous research has demonstrated that the concurrent presence of related items of information in working memory is sufficient to create associations between those items (e.g., Klein, Schell, Loftus, & Skelly, 1993; Moeser, 1977). Furthermore, associations are especially likely to form if subjects engage in strategic encoding processes that encourage comparisons between the items (Seifert, McKoon, Abelson, & Ratcliff, 1986). The sort of explanation and integration processes that have been demonstrated to occur as incongruent information is encoded would certainly seem to fall into that class of strategic encoding processes (e.g., Bargh & Thein, 1985; Clary & Tesser, 1983; Hastie, 1984; Srull, 1981; Stern *et al.*, 1984). Therefore it is highly likely that the spontaneous activation that occurs as incongruent behaviors are encoded is responsible for the formation of interitem associative links.

In conclusion, our research has demonstrated that, as expectancy-incongruent behaviors are encoded, previously encountered behaviors are spontaneously activated in memory. Furthermore, our data suggest that such activation is a crucial determinant of the recall advantage typically found for incongruent behaviors. Moreover, the technique we have used for studying a rather specific facet of impression formation is potentially useful in other domains of person memory research as well. This technique allows for an "on-line" assessment of subjects' processing strategies. Much person memory research (as well as other social cognition research) relies on recall data as the primary dependent measure. Although recall data may tell us a great deal about the representation of information in memory, it does not necessarily tell us about the exact processes through which that representation was created. Techniques such as the one utilized in this research can greatly enhance our ability to draw conclusions regarding the specific cognitive processes that occur during the encoding of information.

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