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Running head: REDUCING FALSE MEMORIES

Speeded retrieval abolishes the false memory suppression effect: Evidence for the Distinctiveness Heuristic

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Abstract

We examined two different accounts of why studying distinctive information reduces false memories within the DRM paradigm. The impoverished relational encoding account predicts that less memorial information, such as overall famililarity, is elicited by the critical lure after distinctive encoding than after non-distinctive encoding. By contrast, the distinctiveness heuristic predicts that participants use a deliberate retrieval strategy to withhold responding to the critical lures. This retrieval strategy refers to a decision rule whereby the absence of memory for expected distinctive information is taken as evidence for an event's nonoccurrence. We show that the typical false recognition suppression effect only occurs when the recognition test is self-paced. This suppression effect is abolished when participants make recognition decisions under time-pressure, such as within 1 second of seeing the test item. These results are consistent with the distinctiveness heuristic account that a time-consuming retrieval strategy is used to reduce false recognition responses.

Speeded retrieval abolishes the false memory suppression effect: Evidence for the Distinctiveness Heuristic

There has been growing interest in mechanisms and procedures that reduce the occurrence of false memories (e.g., Dodson & Schacter, 2001, 2002a, 2002b; Gallo et al., 2001; Hege & Dodson, submitted; Schacter, Israel, & Racine, 1999; Smith & Hunt, 1998; see Dodson, Koutstal, & Schacter, 2000 for a review). For example, with the DRM paradigm (e.g., Roediger & McDermott, 1995) an increasing number of studies show reductions in false memories for related lure items when studied items were encoded in a distinctive manner, such as being presented with distinctive fonts, as pictures, as anagrams, and so forth (e.g., Arndt & Reder, 2003; Dodson & Schacter, 2001; Hicks & Marsh, 1999; Schacter et al., 1999; Seamon et al., 2003).

Two different mechanisms can explain why studying distinctive information reduces false memories. One mechanism that we call the distinctiveness heuristic refers to a metacognitive retrieval strategy whereby people infer that an item is novel when they fail to remember expected memorial information about this item (e.g., Dodson & Schacter, 2002; Schacter et al., 1999; for similar ideas see Brewer & Treyens, 1981; Collins et al., 1975; Johnson, Hashtroudi, & Lindsay, 1993; Hicks & Marsh, 1999; Strack & Bless, 1994). Despite a test item's high degree of familiarity, as in the case of a related lure item in the DRM paradigm, the absence of memory for expected distinctive information is evidence for an item's novelty. This retrieval strategy deliberately counters familiarity-based responses that, if left unchecked, would contribute to the occurrence of false memories.

An alternative mechanism for reducing false memories is one that we call impoverished relational encoding (Dodson & Hege, 2003; Hege & Dodson, submitted). According to this account, studying distinctive information interferes with the encoding of relational information. As related lure items are associated with studied items, decreased memory for relational information would decrease responses to the critical lures. This account builds on Hunt and colleagues' distinction between item-specific and relational information (e.g,., Hunt & McDaniel, 1993; Smith & Hunt, 1998; see also Arndt & Reder, 2003). Focusing on the characteristics of the item, via distinctive encoding, may reduce false memories because it decreases the spread of activation from the studied items to the related lure (e.g., McEvoy, Nelson & Komatsu, 1999; Roediger, Balota & Watson, 2001; Roediger, Watson, McDermott & Gallo, 2001) or it decreases gist representations (e.g., Brainerd, Wright, Reyna & Mojardin, 2001).

The central difference between the foregoing mechanisms concerns the memorial information that is evoked by the related lures in the DRM paradigm after participants have encoded the items in a distinctive manner. The distinctiveness heuristic predicts that related lures will elicit a high degree of familiarity which must be countered via this retrieval strategy. By contrast, the impoverished relational encoding account predicts that the critical lures will elicit less familiarity after the studied items were encoded in a distinctive than in a non-distinctive manner.

There is conflicting evidence in favor of both accounts. We (Dodson & Hege, 2003; Hege & Dodson, in press) observed that when participants were given recall instructions that should have disabled the distinctiveness heuristic, the critical lures were still less likely to come to mind after picture encoding than after word encoding. That is, regardless of whether participants were instructed to recall studied items only or to recall both studied items and items that were related to what was studied, such as critical lures, participants in a picture-encoding condition were less likely to report the critical lures on either recall test than were participants in a word-encoding condition. Thus, in contrast to the distinctiveness heuristic but in support of the impoverished relational encoding account, the related lures appear less available in general after distinctive encoding of the studied items. Further support for the impoverished relational encoding account comes from Arndt and Reder (2003) who presented some DRM lists at encoding in distinctive fonts and other lists in standard fonts. Participants showed lower false recognition rates to critical lures that were related to the lists of items presented in the distinctive than in the non-distinctive fonts. These results pose problems for the distinctiveness heuristic account because it would predict reduced false recognition rates to all critical lures, as opposed to the observed selective reduction. Overall then, the foregoing studies support the impoverished relational encoding's prediction that critical lures elicit less memorial information (e.g., less likely to come to mind, less familiar) after distinctive encoding of the studied items.

However, Schacter, Cendan, Dodson and Clifford (2001) provided evidence in favor of the distinctiveness heuristic with a test instruction manipulation similar to the one used by Hege and Dodson (in press). Whereas Hege and Dodson examined recall performance, Schacter et al examined recognition performance when participants were provided with test instructions that should either disable or evoke the use of the distinctiveness heuristic. Specifically, when particpants received inclusion recognition instructions to endorse both studied items as well as related items that matched the theme of previously studied items, there were no significant differences between the two encoding conditions in responses to critical lures. By contrast, when participants received standard recognition instructions to endorse studied items only, fewer critical lures were falsely recognized after picture encoding than after word encoding. This pattern of data suggests that a retrieval strategy underlies this false recognition suppression effect because it is essentially turned off and on with a retrieval manipulation.

However, an alternative interpretation of the foregoing results, consistent with the impoverished relational encoding account, is that inclusion recognition instructions allow participants to compensate for a critical lure's lesser familiarity after picture encoding than after word encoding. For example, after studying "desk, seat, sit, table, etc." participants could endorse the critical lure "chair" on an inclusion recognition test, not because "chair" evokes a strong sense of familiarity, but because participants are aware that "chair" is related to what was studied. This awareness would allow participants to recognize critical lures on the test even though the lures themselves evoke little familiarity or other memorial information. Thus, there appear to be no data from the DRM paradigm that unambiguously support the distinctiveness heuristic hypothesis.

The present study examined the distinctiveness heuristic and impoverished relational encoding hypotheses by comparing performance under speeded and non-speeded recognition conditions. If the reduction in false recognition after picture encoding is due to a deliberate and effortful retrieval strategy, then responding under time pressure at test should disrupt the use of this retrieval strategy. Specifically, under non-speeded conditions we should replicate existing studies and observe lower false recognition rates of the critical lures after picture encoding than after word encoding. By contrast, speeded recognition conditions should disable the use of the distinctiveness heuristic and, therefore, eliminate or reduce the false recognition suppression effect that occurs after picture encoding as compared to word encoding. Thus, this experiment is a deciding test of the distinctiveness heuristic hypothesis.

Method

Participants. One hundred twenty-six University of Virginia undergraduate students participated in this study (83 female and 43 male), with 21 participants in each condition.

Design and Materials. A 2 (encoding condition: picture vs. word) x 3 (time pressure: self-paced, 1000 msec, 750 msec) between-participants design was used. The stimuli consisted of 273 black and white pictures, used by Schacter et al. (1999), which were based on the lists used by Roediger and McDermott (1995). These items were divided into 21 lists of semantically related items. Each list consisted of 12 related items and one critical, nonpresented lure. For counterbalancing purposes, the 21 lists were divided into three sets of seven lists so that, across participants, each list appeared at study and also served as a source for new words on the test. Each participant studied 14 lists with 12 items per list. The recognition test consisted of 14 false targets (nonpresented, critical lures), seven false target controls (critical lures from seven non-studied lists), 28 true targets (studied items), and 14 true target controls (unrelated new items), for a total of 63 test items. There were an additional 80 unrelated items that were used in a separate practice session. The recognition test items were presented as words for all participants, regardless of encoding condition (e.g., Schacter et al., 2001).

Procedure. There were three consecutive stages: encoding; a practice phase for responding quickly; and a recognition test. During the encoding stage, all of the lists of related items were presented as a continuous sequence at a rate of one item every three seconds. In the picture encoding condition, each study item was presented as an auditory word with a corresponding picture; in the word encoding condition, each study item was presented as an auditory word and as a visual word. Participants were instructed to try to remember all of the items because a memory test would follow. After the encoding phase, all participants were given extensive practice with responding under speeded conditions. This practice session consisted of two parts. First, participants were presented with a list of 40 words to remember. These words were unrelated to anything presented during the encoding stage. Then, participants completed a speeded recognition test that was based on only these practice study items.

At the conclusion of this practice phase, participants were presented with the instructions for the recognition test. All participants were informed that this test would consist of words and was based only on the information from the initial encoding phase. They were told to indicate whether each test item was “OLD” (i.e., it or a picture of it had been seen earlier during the study phase) or “NEW” (i.e., it or a picture of it had not been seen earlier during the study phase). Participants in the non-speeded condition were informed that the test was self-paced. By contrast, participants in the 1000 msec and 750 msec conditions were warned that they would have 1 second or 750 msec, respectively, to respond to each test item. In addition, they were informed that if they did not answer within that time limit, “TOO SLOW” would flash on the screen, accompanied by a loud beep. They were asked to respond as quickly as possible, in an attempt to avoid the appearance of the “TOO SLOW” warning. Because it was critical for participants assigned to one of the speeded conditions to respond within the given time limit, an extra incentive was offered at the beginning of the final memory test. Participants were told that if they were able to respond in time, such that “TOO SLOW” appeared fewer than five times (i.e., less than 8% of the total number of test items), they would be paid an additional $2.00. Nearly everyone complied with these directions and was able to respond in time.

Results and Discussion

Table 1 shows the probabilities of responding “old” to targets, target controls, false targets, and false target controls under non-speeded (i.e., self-paced) and speeded test conditions. Figures 1 and 2 present corrected false recognition rates to the false targets and corrected true recognition rates to the studied items, respectively.

As predicted by the distinctiveness heuristic, there was a significant suppression effect after picture encoding, relative to word encoding, in the self-paced condition but not in either of the speeded conditions. That is, participants falsely recognized fewer critical lures after picture encoding (30%) than after word encoding (51%) when the recognition test was self-paced, $t(40) = 2.93$, $p < .01$, replicating previous studies (e.g., Schacter, Cendan, Dodson, & Clifford, 2001; Schacter, Israel, & Racine, 1999). By contrast, there were no significant differences between the two encoding conditions when the recognition test required a response within either 1000 ms, $t(40) = 1.10$, or 750 ms, $t(40) < .40$.

However, the distinctiveness heuristic makes the specific prediction that the false recognition suppression effect (i.e., the difference in false recognition rates between the two encoding conditions) is greater when the recognition test is self-paced than when it is completed under time pressure. By contrast, the impoverished relational encoding account predicts comparable differences between the two encoding conditions at all test conditions. We measured the false recognition suppression effect with difference scores that were derived from subtracting the false recognition rate to the critical lures in the picture-encoding condition from this rate in the word-encoding condition. We then tested the predictions of the two hypotheses by performing a planned weighted contrast of the difference scores from the self-paced condition against the combined speeded conditions, $F(1, 60) = 8.87$, $Mse = .079$, $p < .01$. As predicted by the distinctiveness heuristic, there was a greater false recognition suppression effect in the self-paced condition than in the speeded conditions.

Because there was some variability in false recognition rates of the false target controls, we also performed the foregoing set of analyses on the corrected false recognition rates of the false targets. As with the uncorrected scores, we replicated previous studies in the self-paced recognition condition and observed lower corrected false recognition rates of the critical lures when participants studied pictures (40%) than when they studied words (24%), t (40) = 2.21, p < .05. And, as shown in Figure 1, there were nearly identical corrected false recognition rates between the two encoding conditions under both of the speeded recognition conditions, t's (40) < .40. Importantly, the planned weighted contrast of the difference scores from the self-paced condition against the combined speeded conditions was significant, F (1, 60) = 9.63, Mse = .078, p < ..01. Overall then, this selective false recognition suppression effect in the self-paced recognition condition fits the predictions of the distinctiveness heuristic.

With respect to true recognition performance, Figure 2 shows that participants in the picture- and word-encoding conditions recognized similar amounts of studied items. Moreover, as participants were given less time to respond, true recognition rates declined in the same manner, regardless of encoding condition. Since neither the distinctiveness heuristic nor the impoverished relational encoding account makes precise predictions about true recognition performance we performed a 3 (time pressure) x 2 (encoding) ANOVA of the recognition rates to studied items. This analysis yielded a significant effect of time pressure, F (2, 120) = 19.55, MSe = .03, p < .001, such that speeded responding produced lower correct recognition rates. There were no other significant effects. A 3 (time pressure) x 2 (encoding) ANOVA of the corrected recognition rates revealed the same pattern: a significant effect of time pressure, F (2, 120) = 53.78, MSe = .038, $p < .001$, and no other significant effects. As is readily apparent in Figure 2, at each time pressure interval there was no difference in corrected recognition rates between the two encoding conditions, all t's (40) < 1.68.

The central finding of this experiment is that time pressure – via speeded recognition responses – eliminates the false recognition suppression effect that occurs after picture encoding. However, time pressure affects true recognition rates in the same manner, regardless of encoding condition. These results are consistent with the distinctiveness heuristic account that a time-consuming retrieval strategy is used to reduce false recognition responses.

References

Arndt, J., & Reder, L. M. (2003). The effect of distinctive visual information on false recognition. Journal of Memory & Language, 48, 1-15.

Brainerd, C. J., Payne, D. G., Wright, R., & Reyna, V. F. (2003). Phantom recall. Journal of Memory & Language, 48, 445-467.

Brainerd, C. J., & Reyna, V. F. (1998). When things that never happened are easier to "remember" than things that did. Psychological Science, 9, 484-489.

Brainerd, C. J., Wright, R., Reyna, V. F., & Mojardin, A. H. (2001). Conjoint recognition and phantom recollection. Journal of Experimental Psychology: Learning, Memory, & Cognition, 27, 307-327.

Brewer, W. F., & Treyens, J. C. (1981). Role of schemata in memory for places. Cognitive Psychology, 13, 207-230.

Collins, A., Warnock, E. H., Aiello, N., & Miller, M. L. (1975). Reasoning from incomplete knowledge. In D. Bobrow & A. Collins (Eds.), Representation & understanding: Studies in cognitive science. New York: Academic Press.

Dodson, C. S., & Hege, A. C. G. (2003). Why distinctive information reduces false memories. Paper presented at the annual meeting of the Psychonomics Society, Vancover, B.C.

Dodson, C. S., Koutstaal, W., & Schacter, D. L. (2000). Escape from illusion: Reducing false memories. Trends in Cognitive Sciences, 4, 391-397.

Dodson, C. S., & Schacter, D. L. (2001). "If I had said it I would have remembered it": Reducing false memories with the distinctiveness heuristic. Psychonomic Bulletin & Review, 8, 155-161.

Dodson, C. S. & Schacter, D. L. (2002a). When false recognition meets metacognition: The distinctiveness heuristic. Journal of Memory & Language, 46, 782-803.

Dodson, C. S., & Schacter, D. L. (2002b). Aging and strategic retrieval processes: Reducing false memories with a distinctiveness heuristic. Psychology & Aging, 17, 405-415.

Gallo, D. A., McDermott, K. B., Percer, J. M., & Roediger, H. L. III (2001). Modality effects in false recall and false recognition. Journal of Experimental Psychology: Learning, Memory, and Cognition, 27, 339 - 353.

Hege & Dodson (submitted). Why Distinctive Information Reduces False Memories: Evidence for Both Impoverished Relational-Encoding and Distinctiveness Heuristic Accounts.

Hicks, J. L. & Marsh, R. L. (1999). Attempts to reduce the incidence of false recall with source monitoring. Journal of Experimental Psychology: Learning, Memory, and Cognition, 25, 1195-1209.

Hunt, R. R., & McDaniel, M. A. (1993). The enigma of organization and distinctiveness. Journal of Memory & Language, 32, 421-445.

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. Psychological Bulletin, 114, 3-28.

McEvoy, C. L., Nelson, D. L., & Komatsu, T. (1999). What is the connection between true and false memories? The differential roles of interitem associations in recall and recognition. Journal of Experimental Psychology: Learning, Memory, & Cognition, 25, 1177-1194.

Roediger, H. L., III, Balota, D. A., Watson, J. M. (2001). Spreading activation and the arousal of false memories. In H. L. Roediger, III & J. S. Nairne, I. Neath, & A. M. Surprenant (Eds.), The nature of remembering: Essays in honor of Robert G. Crowder (pp. 95-115). Washington, DC: American Psychological Association.

Roediger, H. L., III, & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. Journal of Experimental Psychology: Learning, Memory, & Cognition, 21, 803-814.

Roediger, H. L., III, Watson, J. M., McDermott, K., B., & Gallo, D. A. (2001). Factors that determine false recall: A multiple regression analysis. Psychonomic Bulletin & Review, 8, 385-407.

Rotello, C. M. (1999). Metacognition and memory for nonoccurrence. Memory, 7, 43-63.

Schacter, D. L., Cendan, D. L., Dodson, C. S., & Clifford, E. R. (2001). Retrieval conditions and false recognition: Testing the distinctiveness heuristic. Psychonomic Bulletin & Review, 8, 827-833.

Schacter, D. L., Israel, L., & Racine, C. (1999). Suppressing false recognition in younger and older adults: The distinctiveness heuristic. Journal of Memory & Language, 40, 1-24.

Seamon, J. G., Goodkind, M. S., Dumey, A. D., Dick, E., Aufseeser, M. S., Strickland, S.E., Woulfin, J. R., & Fung, N. S. (2003). "If I didn't write it, why would I remember it?" Effects of encoding, attention and practice on accurate and false memory. *Memory & Cognition, 31*, 445 – 457.

Smith, R. E., & Hunt, R. R. (1998). Presentation modality affects false memory. Psychonomic Bulletin & Review, 5, 710-715.

Strack, F., & Bless, H. (1994). Memory for nonoccurrences: Metacognitive and presuppositional strategies. Journal of Memory & Language, 33, 203-217.

Table 1

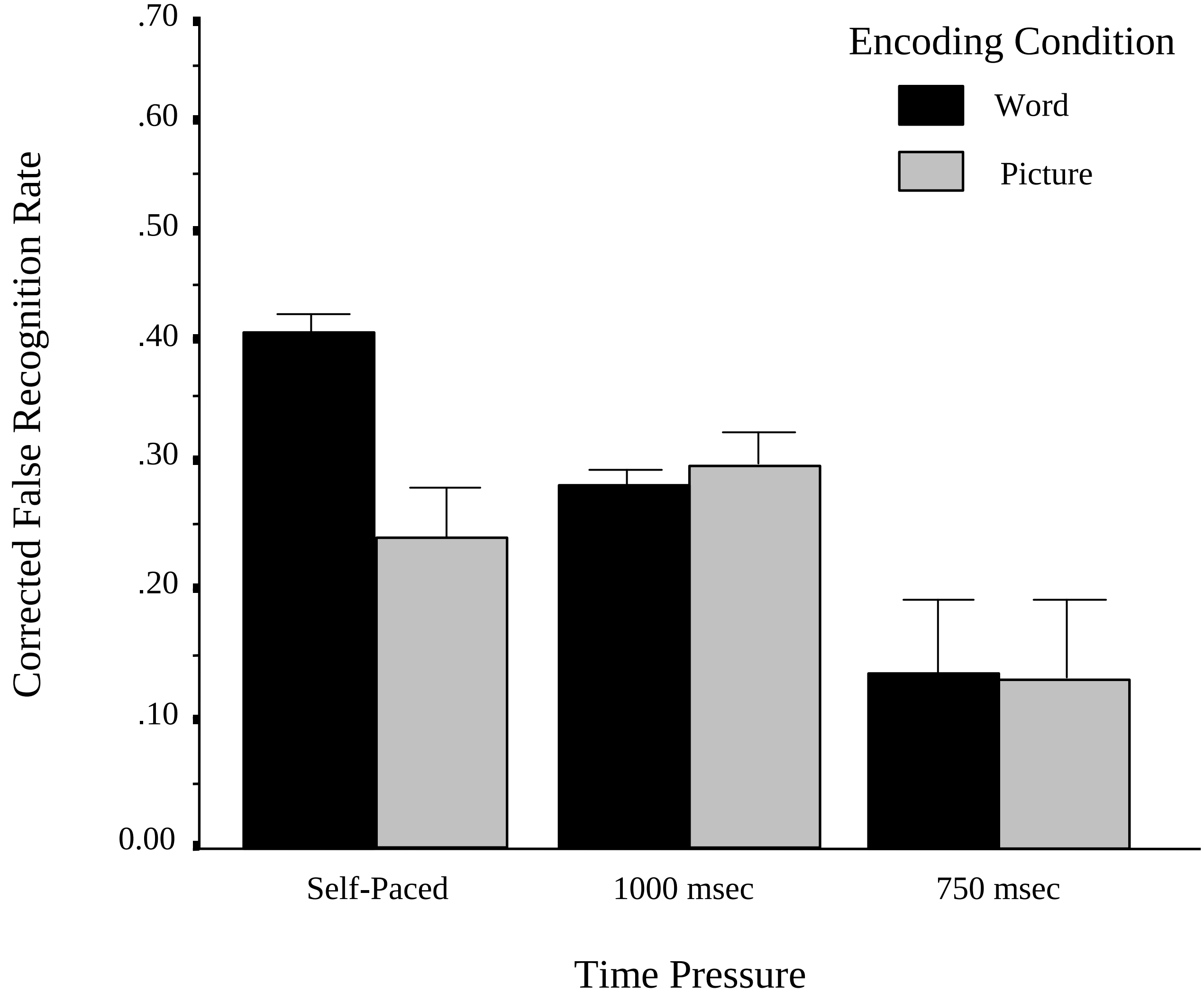
Proportion of "old" responses on the recognition test as a function of item-type, encoding condition and time pressure at test

	Encoding Condition					
	Word			Picture		
	Self-Paced	1000 msec	750 msec	Self-Paced	1000 msec	750 msec
True Targets	.74	.58	.54	.72	.47	.50
True Target Controls	.13	.21	.35	.09	.20	.32
False Targets	.51	.54	.56	.30	.47	.54
False Target Controls	.11	.26	.42	.06	.18	.41

Figure Captions

Figure 1. Corrected false recognition rates for each time pressure condition after studying words or pictures. Vertical bars indicate the standard error of the mean.

Figure 2. Corrected true recognition rates for each time pressure condition after studying words or pictures. Vertical bars indicate the standard error of the mean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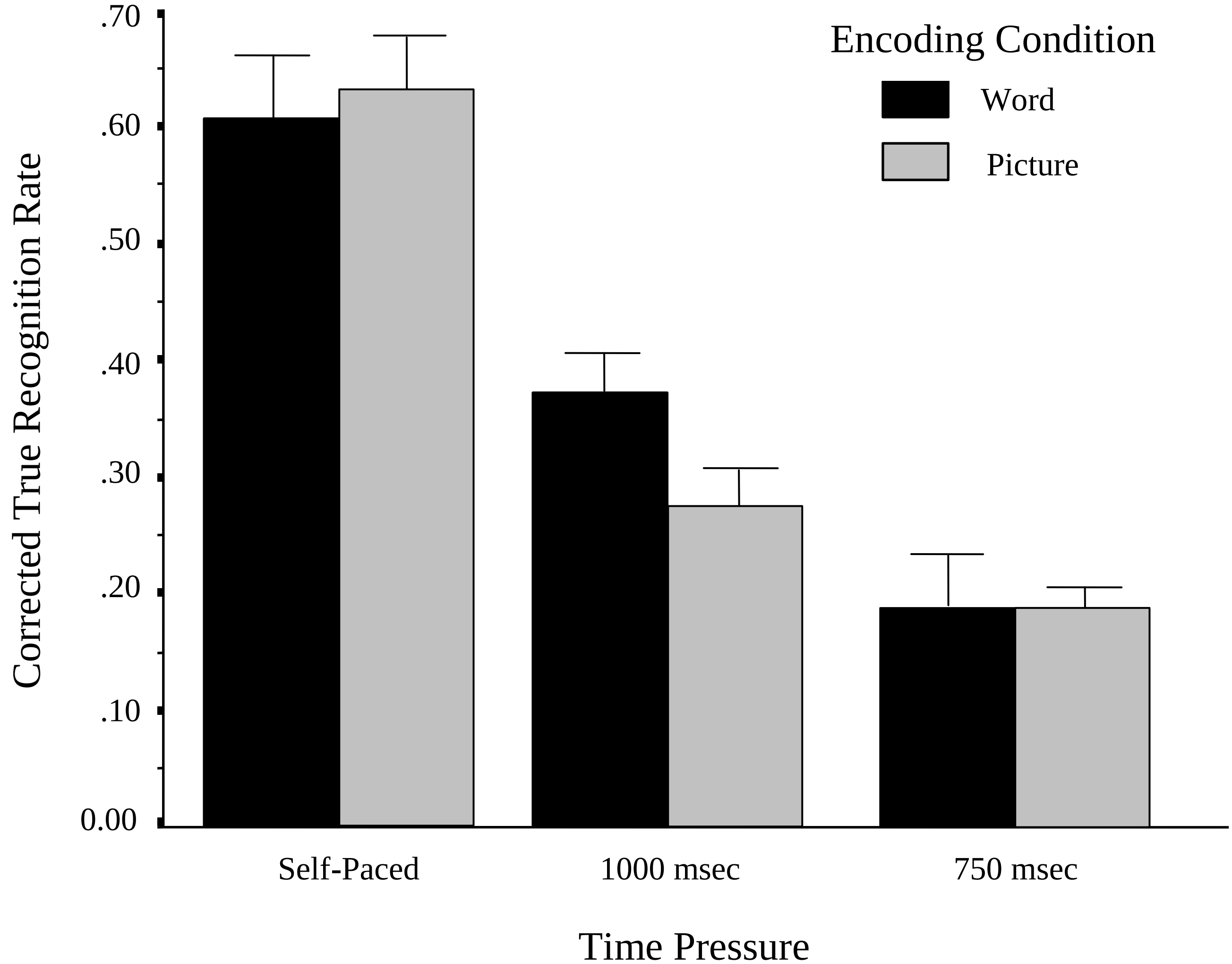
Corrected False Recognition Rate
Encoding Condition
Word
Picture
Self-Paced
1000 msec
750 msec
Time Pressure


Encoding Condition
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Corrected True Recognition Rate
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