Table 1
The Difference (Diff) Between Obtained and Predicted Results and the Standard Error of Estimate (SEE) for Each Serial Position of Each Experiment

Serial Position	I Diff	I SEE	II Diff	II SEE	III Diff	III SEE	IV Diff	IV SEE	V Diff	V SEE	VI Diff	VI SEE
1	−0.19	4.84	2.45	3.91	−0.46	3.77	−0.04	5.39	−2.07	7.85	−4.27	11.70
2	−2.49	5.45	−0.76	4.17	−0.41	3.96	−0.41	3.48	−4.20	8.01	−6.05	7.96
3	2.01	5.84	3.75	5.09	0.51	4.04	1.19	4.53	−1.92	6.33	−6.95	8.49
4	0.42	4.82	−0.57	3.10	1.26	3.63	−0.19	4.14	−4.53	6.79	−4.43	7.35
5	−2.31	4.40	0.77	3.48	0.97	3.31	−0.35	3.97	−2.26	5.90	−5.38	7.31
6	−2.94	4.77	−0.82	3.16	1.76	3.52	0.47	4.32	2.89	8.85	−0.09	8.55
7	−0.60	5.46	1.81	3.75	3.07	5.09	0.18	3.80	4.52	9.20	1.55	10.64
8	−0.13	5.79	2.75	4.23	1.20	4.20	0.12	4.63	9.33	14.58	5.27	13.46
9	−0.27	5.96	−0.76	3.72	−5.05	6.41	1.09	4.67			20.25	24.92
10	0.64	5.52	0.71	3.83			2.90	5.73				
11	4.86	8.77	0.88	4.11			2.47	4.72				
12	1.09	9.16	−3.91	6.16			−4.21	7.05				

Ellis (1963) has postulated.

Why does the "distinctiveness function" fit Murdock's original serial learning data and our results on short-term memory, but not those of Murdock? Why is it necessary to reverse the function in order to fit our data? We have no answer to these questions. Perhaps, as Tulving & Madigan (1970) note, "The similarity of one 'serial position curve' to another, of course, is no guarantee that both are consequences of one and the same set of underlying processes [p. 454]."

It seems likely that distinctiveness of serial position may vary depending upon a number of variables—presentation rate, delay of recall, nature of stimuli, and even differences in sensory capacities among Ss (as may be the case with the mental retardate). It seems likely that our particular positional probe tasks would emphasize the role of order or position distinctiveness. Certainly, these results are predicted precisely. Though Murdock's distinctiveness function may not prove invariate, it would appear to be a useful construct.

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Semantic and acoustic labeling*

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Two experiments demonstrate that both semantic and acoustic labels enhance memory. Such data is in disaccord with theories that attempt to dichotomize memory in terms of differential semantic and acoustic encoding.

Dale & McGlaughlin (1970) showed that memory for surnames can be enhanced by using semantic labels. Acoustic labels, on the other hand, were ineffective. This can be explained by assuming a rapid decay of the acoustic trace in memory and would support a long-term memory (LTM)/short-term memory (STM) dichotomy on the basis of different coding systems, i.e., semantic coding being characteristic of LTM and acoustic coding of STM (Baddeley, 1966a, b; Baddeley & Dale, 1966). Some studies, however, have shown semantic influence in STM (Wickens & Simpson, 1968; Wickens & Eckler, 1968), and acoustic coding in LTM (Gruneberg & Sykes, 1969).

Two experiments evaluate an alternative explanation of Dale and McGlaughlin's results. Their acoustic labels were towns and their semantic labels, occupations. This suggests differential retrieval of the two types of label, perhaps based on varying degrees of concreteness (Paivio, 1969). The first experiment replicates Dale and McGlaughlin's study, with an additional condition in which Ss have the labels available during recall. In the second experiment both acoustic and semantic labels are occupations. The two experiments, then, compare the effects of semantic and acoustic labels when both are equally available.

METHOD

Experiment 1

Ss were 40 students enrolled in an introductory course in psychology. The task was free recall. The material to be remembered was a list of 40 surnames, 20 having semantic labels (Mr. Law, the policeman) and 20 having acoustic labels (Mr. Worth, of

Table 1
Mean Number of Names Recalled and Standard Deviation for Each Treatment in Experiment 1

		Acoustic Label		Semantic Label	
		Appropriate	Jumbled	Appropriate	Jumbled
Noncued Group	Mean	2.50	2.30	4.10	2.20
	SD	1.32	1.53	1.25	1.40
Cued Group	Mean	5.30	2.45	7.65	2.65
	SD	2.36	1.50	2.06	1.32

Perth). Two counterbalanced lists were constructed. One list contained 10 semantically and 10 acoustically labeled names of the type illustrated above. The remaining 10 semantically labeled names had their labels interchanged and thus made inappropriate (Mr. Cash, the printer; Mr. Page, the banker). The remaining 10 acoustic labels were similarly jumbled. In the other list, intact and jumbled names were interchanged. The instructions and lists were presented by tape recorder. Names and labels were read at a rate of one every 8 sec. At the end of the presentation, Ss transcribed, across the top of a sheet of paper, a message of 20 random letters, read at a 1-sec rate. They then had 5 min to turn the sheet of paper over, read a short set of instructions, and recall the names. Two independent groups were run. The written instructions for the first group (noncued) directed them to write down the names in order of recall (numbered slots, 1-40, were provided). The second group (cued) were presented with a complete list of the labels (not in the original order) and asked to use these to aid recall of the names.

Experiment 2

Ss were again 40 psychology undergraduates. Counterbalanced lists were presented as before. This time, however, each list contained only 20 surnames and both semantic and acoustic labels were occupations (Mr. Hammer, the carpenter; Mr. Mailer, the tailor). Free recall was again required; the same interpolated task was used. In short, procedure was similar to the noncued group of Experiment 1. Four minutes were allowed for recall.

RESULTS

Experiment 1

The results are summarized in Table 1. Within the noncued condition separate comparison using the t test for dependent groups (all tests were two-tailed) showed that (1) the overall difference between the recall of appropriately labeled names and those with jumbled labels was significant ($t = 3.62$, $df = 19$, $p < .002$); (2) the difference between appropriate and jumbled semantically labeled names was also significant ($t = 4.05$, $df = 19$, $p < .001$); (3) the difference between appropriate and jumbled acoustically labeled names was not significant ($t = 0.75$, $df = 19$); (4) the difference between the effect of appropriate semantic and appropriate acoustic labels was significant ($t = 4.00$, $df = 19$, $p < .001$). These findings replicate those of Dale and McGlaughlin.

Similar statistical analysis within the cued condition revealed equally significant differences in recall between items with appropriate and items with jumbled labels ($t = 9.07$, $df = 19$, $p < .001$), and between appropriate and jumbled semantically labeled names ($t = 10.64$, $df = 19$, $p < .001$). However, in the cued condition the difference between appropriate and jumbled acoustically labeled items was highly significant ($t = 5.02$, $df = 19$, $p < .001$). Appropriate semantic labels were still significantly more effective than appropriate acoustic labels ($t = 5.79$, $df = 19$, $p < .001$).

Comparisons between conditions, using the t test for independent groups, revealed a significant improvement in the effectiveness of both appropriate acoustic labels ($t = 4.63$, $df = 38$, $p < .001$) and appropriate semantic labels ($t = 6.61$, $df = 38$, $p < .001$) in the cued condition. Neither inappropriate acoustically labeled names ($t = 0.31$, $df = 38$) nor inappropriate semantically labeled names ($t = 1.04$, $df = 38$) showed significant differences between conditions.

Experiment 2

The results are summarized in Table 2. Comparisons, again using the t test for dependent groups, revealed that (1) appropriately labeled names were recalled significantly better than inappropriately labeled names ($t = 4.86$, $df = 39$, $p < .001$); (2) the difference between appropriate and jumbled semantically labeled names was significant ($t = 2.72$, $df = 39$, $p < .01$); (3) the difference between appropriate and jumbled acoustically labeled items was significant ($t = 4.45$, $df = 39$, $p < .001$); (4) the difference between the effect of appropriate semantic labels and appropriate acoustic labels was not significant ($t = 0.82$, $df = 39$).

Table 2
Mean Number of Names Recalled and Standard Deviation for Each Treatment in Experiment 2

	Acoustic Label		Semantic Label	
	Appropriate	Jumbled	Appropriate	Jumbled
Mean	2.33	1.35	2.52	1.95
SD	1.31	0.86	0.95	1.02

DISCUSSION

The first experiment showed that when the acoustic labels were available during recall they became effective as memory enhancers. This strongly suggests that the previously found lack of efficiency of acoustic labels (Dale & McGlaughlin, 1970) is not due to a rapidly decaying trace, but to difficulties in the retrieval of the acoustic label. Further doubt is cast on attempted dichotomies of memory based on differential acoustic and semantic encoding. Proponents of mnemonic systems stress the importance of associating images with the items to be memorized (Yates, 1969). It is conceivable that discriminable image formation is easier with the more concrete semantic labels (occupations) than the acoustic labels (towns), and that this would account for the greater availability of the semantic labels. In the second experiment, where both semantic and acoustic labels were occupations, no difference was found in their effectiveness as memory enhancers.

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