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ABSTRACT

The present experiment investigated memory attribute dominance in young children by measuring false recognition responses to associatively and acoustically related words. Second- and sixth-grade children, half of whom were high SES and half low SES, served as subjects. Following Underwood (1969), a shift from acoustic to associative memory attribute dominance was predicted for both the age and social class variables. Contrary to expectations, more associative false recognitions were found at both grade and social class levels. Negative correlations between the associative strength and false positives to associatively related words were also found. Implications for the developmental shift hypothesis are discussed. (Author)

Acoustic-Associative Memory Attribute Dominance

Predicted by Age and SES

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Abstract

The present experiment investigated memory attribute dominance in young children by measuring false recognition responses to associatively and acoustically related words. Second- and sixth-grade children, half of whom were high SES and half low SES, served as subjects. Following Underwood (1969), a shift from acoustic to associative memory attribute dominance was predicted for both the age and social class variables. Contrary to expectations, more associative false recognitions were found at both grade and social class levels. Negative correlations between the associative strength and false positives to associatively related words were also found. Implications for the developmental shift hypothesis are discussed.

SUMMARY

Acoustic-Associative Memory Attribute Dominance Predicted by Age and SES

Verbal memory for units such as words has been conceptualized by Underwood (1969) as a process of abstracting and storing information about the word. He describes this encoded information as an ensemble of many different attributes that are useful in discriminating one memory from another and acting as retrieval mechanisms for a particular target memory.

Recently, two memory attributes have received a great deal of experimental attention because of their developmental significance. Underwood (1969) hypothesized that in young children the acoustic attribute would dominate their memory for words, while in older children and adults the associative-verbal attribute would be dominant. Specifically, it was thought that a developmental shift from acoustic to associative encoding would occur because as the child ages he is exposed to more and more language learning experiences that are associative in nature.

Bach and Underwood (1970) directly tested the developmental shift hypothesis of attribute dominance using a multiple-choice false recognition task. They found the predicted change between second- and sixth-grade subjects. Other investigators, however, have obtained results not fully supportive of the Bach-Underwood findings. Hall (1972) did not find predicted acoustic false recognitions among South American children with fewer years of school attendance. Ghatala and Hurlbut (1973) found that second-grade subjects produced superior recall using conceptual rather than acoustic retrieval cues. Hall and Halperin (1973) found nearly equal numbers of associative and acoustic false recognition responses in 3-, 4-, and 5-year olds. Young (1975) found significant acoustic <u>and</u> associative false recognitions in kindergarten subjects.

Young also found that lower SES subjects produced more false recognitions overall, with a tendency toward more acoustically based errors; a finding in line with numerous studies (e.g., John, 1963; Entwisle, 1968) that suggest the lower-class learning environment depresses a child's ability to produce higher order associations to words, while the middle class environment stimulates this ability.

The purpose of the present study was twofold. First, an attempt was made to replicate the Bach-Underwood (1970) results with second- and sixth-grade subjects. Instead of a multiple-choice recognition procedure, a running recognition procedure was used, and the word lists for both age levels were equated in terms of associative strength of the critical stimulus words (something Bach and Underwood failed to do). Second, subjects were selected on the basis of their social class backgrounds to see if this variable would be predictive of memory attribute dominance. It was expected that lower SES subjects would tend to encode words acoustically while high SES subjects would show a greater tendency toward associative encoding as reflected in their false recognition responses.

Method

Subjects

A total of 200 subjects participated in the recognition memory test phase of the experiment. The four subgroups resulting from the factorial combination of the two between-subject variables of Grade and Social Class (2H, 2L, 6H, 6L) were each represented by 50 subjects. The mean ages of the second- and sixth-grade subjects were 12.1 years and 8.0 years respectively. All of the low SES subjects lived in an economically depressed area of upstate New York and had fathers whose occupational status was either semi-skilled or unskilled (average of 10.4 years of formal schooling). By contrast, the high

SES subjects lived in a small city and had fathers whose occupational status was either skilled or professional (average of 17.0 years of formal schooling).

Word Lists

Prior to administering the recognition memory test, word association data on 100 common words was collected from 25 subjects in each of the four groups. Twelve stimulus-response associates were then chosen for inclusion in the recognition lists so that the mean associative strengths of the critical stimulus (CS), experimental (E_{as}) word pairs were as close as possible (2L = 76%; 2H = 75%; 6L = 75%; 6H = 76%). In addition, 12 acoustically related experimental (E_{ac}) words were chosen by the experimenter; one rhyming word for each CS word. Each of the 24 E words had, immediately adjacent to it, a control (C) word that bore no associative or acoustic relationship to any other word on the list. Finally, there were 15 repeated (R) words (12 occurring twice and three occurring three times), and two filler (F) words (each occurring twice) that completed the lists. Altogether, there were 103 words on each recognition list for the four groups.

Design

The major analysis was performed on the number of false positives given to the E_{as}, C_{as}, E_{ac}, and C_{ac} words. These four repeated measurements for each of the 200 subjects together with the two between-subject variables of Grade and SES yielded sixteen mean scores for false positives, and necessitated a a 2 x 2 x 2 x 2 repeated measures ANOVA with subjects nested within Grade-SES groups.

Procedure

Both the instructions and the recognition memory word lists were recorded by the experimenter on magnetic tape. Each subject was tested individually in his/her school in a room free of distractions. Several practice trials preceded each testing to familiarize the subject with the procedure. As the tape was played the subject said either "yes" or "no" after each word to indicate whether he thought the word had been read earlier on the list. A typical session lasted about 20 minutes.

Results

Figure 1 shows the sixteen mean false positive scores for the acoustic and associative E and C words. The analysis of these data yielded a highly reliable main effect of Word Type ($\underline{F}$ (1, 196) = 96.45, $\underline{p} < .01$), indicating that more false positives were given to E words than to C words to produce a general false recognition effect. Breaking this main effect down for the acoustic and associative E and C words separately, $\underline{t}$ tests for correlated means yielded a value of 3.70 ($\underline{df}$ = 199, $\underline{p} < .01$) for the E_{ac} vs. C_{ac} word means, and a value of 10.80 ($\underline{df}$ = 199, $\underline{p} < .001$) for the E_{as} vs. C_{as} word means.

A Newman-Keuls multiple range test performed on all sixteen means in the experiment revealed that all eight C word means were low and nonsignificantly different from each other. Also, an analysis of variance on the C words alone produced no significant $\underline{F}$ ratios. Therefore, a 2 x 2 x 2 ANOVA on the false positives elicited by the E words only was performed to test the acoustic-associative shift predictions. In this analysis the interaction of Error Type x Grade was not significant ($\underline{F}$ (1, 196) = .08, $\underline{p} > .05$). However, the interaction of Error Type x SES was significant, but only marginally so ($\underline{F}$ (1, 196) = 4.00, $\underline{p} < .05$). Table 1 presents the summary of this analysis.

Several product-moment correlations were performed on the number of false positives given to each E_{as} word by subjects in each of the four Grade-SES groups and the associative strength of that word as determined by the preliminary word association test. All four correlations were negative, and in one instance (6L) the magnitude of the correlation made it statistically significant at the .05 level. The four correlations were: 2H = -.53, 2L = -.49, 6H = -.38, 6L = -.67. The associative E words together with their associative strengths and the number of false positives elicited are shown in Table 2.

Discussion

The significant effect of Word Type in this experiment means that, overall, when a subject committed a recognition error he was more likely to respond to a word acoustically or associatively related to a previous word in the list than to one of the neutral control words. If type of memory encoding can be inferred from a false recognition effect, then both associative and acoustic attributes were established for words in this experiment. However, the degree to which the two attributes were used was by no means equal: Subjects at both grade levels and at both social class levels made more errors to E_{as} words than to E_{ac} words, indicating an absolute dominance of associative encoding in all four groups. These results are at variance with Bach and Underwood (1970) who found absolute dominance of acoustic over associative encoding at the second grade.

Further, the nonsignificant Error Type x Grade interaction for E words meant that even a relative increase in associative errors and concomitant decrease in acoustic errors as a function of higher grade level (age) was not confirmed; a finding damaging to the developmental shift hypothesis (Underwood, 1969). Possibly the pre-experimental equation of the lists in terms of associative strength was a crucial factor. Both second- and sixth-graders seem able to produce implicit responses resulting in false recognitions to approximately the same degree when words are chosen that are equally familiar to both ages. When words are not chosen with this factor in mind (e.g., Bach & Underwood, 1970) then the larger vocabularies and more complex cognitive structures possessed by the older subjects might incline them to more associative errors.

The significant Error Type x SES interaction for E words confirms the prediction made in this experiment, and is in line with the trend recently observed by Young (1975); but the author feels that this marginal result should be considered a tentative one. The number of false positives to E_{ac} words at both social class levels was quite low; so low in fact that none of the pair-wise comparisons of the E_{ac} word means with their control word means was statistically significant. Only by summing acoustic errors over all four groups was a significant acoustic false recognition effect observed. More generally, SES as a variable is qualitative rather than quantitative and has meaning only to the extent that it represents the quality of a subject's previous language experience. It would possibly be more instructive to study specific language learning experiences and attempt to relate these to memory encoding, rather than attempting to infer them from such a global characteristic as social class.

The most curious finding of the present experiment is the set of negative correlations between the associative strengths and false positives elicited by the E_{as} words. On the assumption that associative strength would control the probability of specific IAR elicitation (Underwood, 1965) during learning, which would in turn control the frequency of false positives, it could be predicted that these correlations should be high and positive. Reinspection of the words used on the recognition lists revealed one perhaps unfortunate fact: at least half of the 12 E_{as} words used in each list were antonyms of their previously occurring CS word. Underwood (1965) and Grossman and Eagle (1970) have both found that antonyms tend to behave differently than other verbal associates in drawing false recognitions. Grossman and Eagle found no false recognition effect at all for antonyms, and Underwood found a false recognition effect for antonyms only after the previous CS word had been repeated three times. Why subjects are better able to discriminate antonyms from their previously occurring CS word is not known, but the present negative correlations are due in large part to their presence. All the antonyms were high in associative strength, and of the six E_{as} words with the fewest number of false positives, five in group 2H, three in group 2L, four in group 6H, and five in group 6L were antonyms.

In summary the results of the present experiment offer no support to the developmental shift hypothesis of memory attributes (Underwood, 1969; Bach and Underwood, 1970), and offer only tentative support to the notion that social class is predictive of memory attribute dominance.

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Table 1

Analysis of Variance Summary on

False Positives Elicited by Experimental Words

Source	df	MS	F
Grade (G)	1	1.33	.27
Social Class (C)	1	.06	.01
G x C	1	.01	.002
Subjects/G-C Groups	196	4.93	
Error Type (ET)	1	37.83	27.41**
ET x G	1	.11	.08
ET x C	1	5.52	4.00*
ET x G x C	1	3.42	2.48
ET x Ss/ G-C Groups	196	1.38	

*$p < .05$
**$p < .01$

Table 2

E_{aa} Words for Each Group Listed in Order of Number of False Positives Elicited (X) Together with Their Associative Strength (Y)

	Social Class					
	H			L		
Grade	X		Y(%)	X		Y(%)
	18	tomorrow	64	14	chair	57
	13	chair	58	10	low	88
	12	on	81	10	happy	64
	11	him	68	9	him	75
	10	fast	91	7	bird	74
2	10	father	65	7	old	74
	7	light	88	5	dirty	83
	6	out	76	5	out	77
	5	dirty	78	5	you	65
	4	happy	79	2	soft	75
	4	soft	76	2	short	90
	1	old	83	1	nurse	74
	15	him	63	19	chair	60
	13	short	74	13	him	72
	13	chair	70	12	happy	64
	11	father	74	10	father	75
	11	on	85	8	soft	75
	7	happy	73	7	bird	87
	6	bird	73	6	out	92
	5	out	81	6	on	65
	5	old	81	5	short	76
	5	soft	59	5	dirty	72
	4	dirty	81	4	old	84
	3	low	84	3	low	85

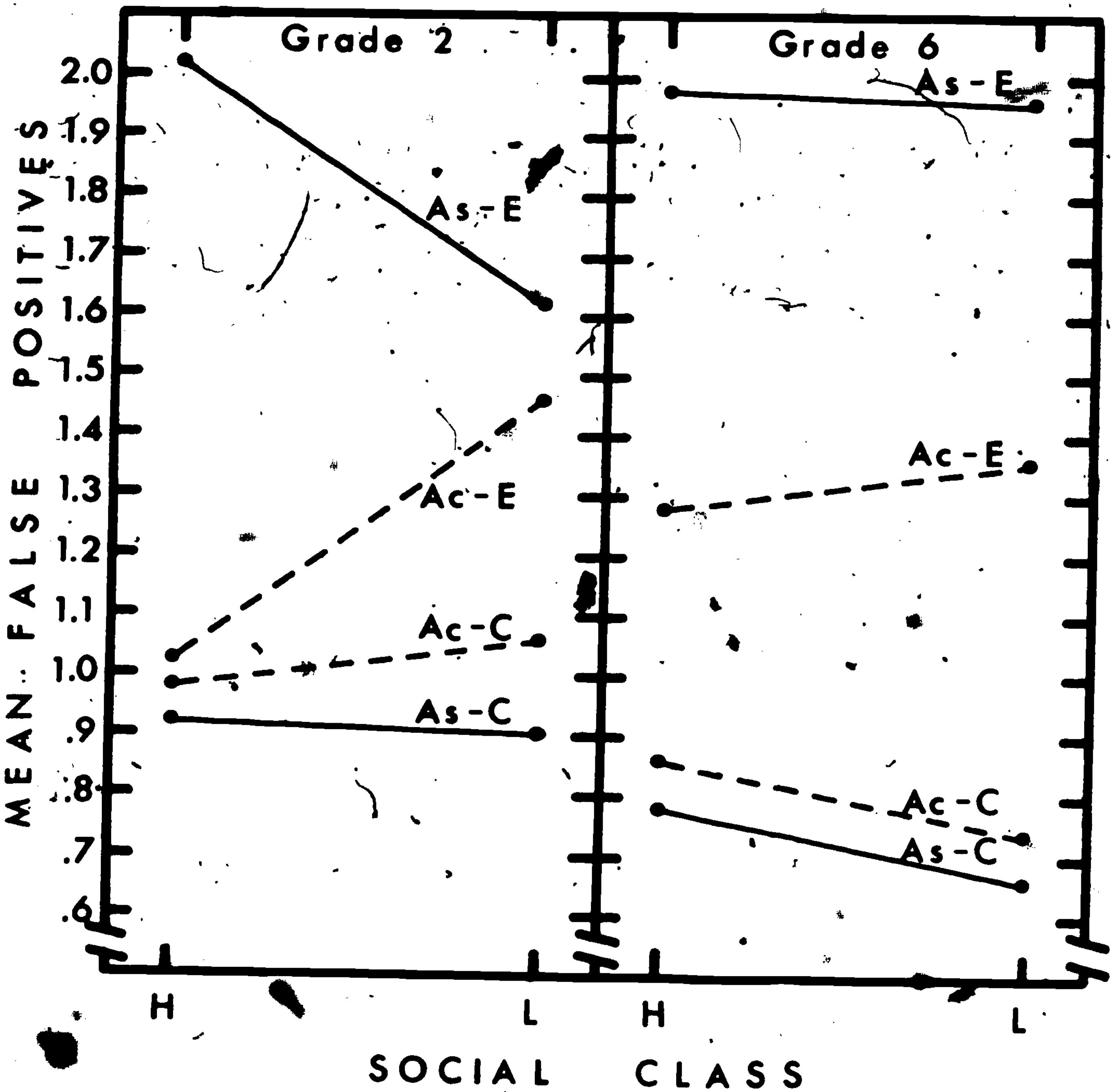

Fig. 1. Mean False Positives Given to Associative and Acoustic Experimental and Control Words as a Function of Grade and Social Class Levels.