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The relationships between social class membership and performance on phonemic and nonphonemic auditory discrimination tests were examined. Three socioeconomic groups (upper-middle class (UM), upper-lower class (UL), and lower-lower (LL) class) of 20 subjects each were administered the Wepman Auditory Discrimination Test and nonphonemic auditory discrimination tests of intensity, frequency, and pattern. The socioeconomic status of all Caucasian students within six first-grade classes was determined by ratings on the Index of Status Characteristics. A table of random numbers was used to assign the subjects to each of the socioeconomic groups. On the Wepman test the UM group and the UL group performed significantly better than the LL group. On the nonphonemic auditory discrimination tests, the UM group performed significantly better than did the UL or the LL groups on seven of 12 measures. On no measure was a lower socioeconomic group significantly better than a higher socioeconomic group. Correlations between error scores on the Wepman test and error scores on the nonphonemic auditory discrimination tests seem to indicate that the phonemic and nonphonemic tests measure somewhat different abilities, and the use of combined results is recommended. Tables and references are included. (WB)

RELATIONSHIPS BETWEEN SOCIAL CLASS AND PHONEMIC AND NONPHONEMIC AUDITORY DISCRIMINATION ABILITY

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ABSTRACT

Auditory discrimination ability is related to a number of language skills. That culturally disadvantaged children are deficient in various language skills is frequently cited in the literature. This study examined the relationships between social class membership and performance on phonemic and nonphonemic auditory discrimination tests. Three socioeconomic groups (upper-middle class, upper-lower class, and lower-lower class) of twenty Ss each were administered a phonemic auditory discrimination test and nonphonemic auditory discrimination tests of intensity, frequency, and pattern. On the phonemic auditory discrimination test, the upper-middle class (UM) group and the upper-lower class (UL) group performed significantly better than the lower-lower class (LL) group. On the nonphonemic auditory discrimination tests, the UM group performed significantly better than did the UL or LL groups on seven of the twelve measures. On no measure was a lower socioeconomic group significantly better than the higher socioeconomic group. These results indicate that programs designed to remediate inadequate auditory discrimination ability should take into consideration possible nonphonemic auditory discrimination abilities.

Many children from lower socioeconomic families enter school with learning disabilities which retard their educational development. One relatively common specific learning disability appears to be auditory discrimination.

Auditory discrimination is related to a number of language skills. Children with poor auditory discrimination are more likely to be poor readers (Crossley, 1948; Nila, 1953; Harington, et al., 1955; Wepman, 1960; Thompson, 1961; Christine, et al., 1964) and have poorer articulation (Christine, et al., 1964).

That children from lower socioeconomic environments have poorer auditory discrimination than their more advantaged peers is frequently cited in the literature (Corbin, et al., 1965, p. 12; Bloom, et al., 1965, p. 70; Deutsch, 1963; Silberman, 1964; Clark et al., 1966; Stern, 1966; Jensen, 1967), but few interclass comparative studies on auditory discrimination report data. Clark (et al., 1966) compared the performance of economically disadvantaged and nondisadvantaged children on the Wepman Auditory Discrimination Test (1958). The economically disadvantaged children made significantly more errors ($p < .001$) than did the nondisadvantaged children on this phonemic auditory discrimination test.

Culturally disadvantaged children are frequently deficient in reading skill, too. The results and conclusions of Buder (1966), Knobloch (1953), Sexton (1961), Barton (1963), and Deutsch (1964) indicate that reading ability reflects socioeconomic differences; reading achievement within schools in the

disadvantaged areas consistently falls below grade level, with greater reading retardation occurring within the higher grades.

These studies extend our knowledge of the relationships between auditory discrimination, social class membership, and reading achievement. Phonemic auditory discrimination apparently is related both to the development of various language skills and to social class membership. However, relationships between nonphonemic auditory discrimination and social class membership have not been studied.

A nonphonemic assessment of auditory discrimination has two distinct advantages over phonemic assessment: (1) it overcomes problems associated with differences in dialects, and (2) it permits a more detailed analysis of the dimensions along which language varies (i.e. frequency, intensity, and pattern).

This study, then, was concerned with possible relationships between social class membership and performance on a phonemic auditory discrimination test (e.g., the Wepman Auditory Discrimination Test) and on nonphonemic auditory discrimination tests (e.g., changes in intensity, frequency, and pattern of pure tone auditory stimuli).

METHOD

The socioeconomic status (SES) of all Caucasian students within six first grade classes was determined by ratings on the Index of Status Characteristics (Warner, et al., 1949). A table of random numbers was used to assign 20 Ss to each of three SES groups.

The composition of the three SES groups, lower-lower class (LL), upper-lower class (UL), and upper-middle (UM), is presented in Table 1. Data on SES indicate that each group formed a homogeneous subset which differed significantly ($p < .05$) from the others (Duncan, 1955). Also, the mean Columbia Mental Maturity Scale IQs for the LL and UL class groups were significantly lower ($p < .05$) than the mean IQ of the UM class group.

In order to insure that every S understood and could use the concepts of same and different, the Pictorial Similarities and Differences II subset of the Revised Stanford-Binet Scale (Terman, et al., 1960) was administered. All Ss passed at least nine of the ten items on this subtest. Results from previous hearing examinations indicated no apparent hearing disabilities among any of the Ss.

The assessment of phonemic auditory discrimination was made with the Wepman Auditory Discrimination Test.

A number of experimental tests were devised to assess nonphonemic auditory discrimination (Oakland, 1967). Four nonphonemic auditory discrimination (N.A.D.) tests of intensity, frequency, and pattern were chosen for this study (see Table 2). The tests permit an assessment of a S's ability to discriminate changes in frequency, intensity, or pattern of auditory stimuli. The tests employed puretone stimuli which were one second in duration; an interval of 28 milliseconds separated two or more stimuli that composed a response unit (i.e., pairs of stimuli which were the same or different).

Two intensity tests each had thirty response units, half of which were of the same intensity and half differed in intensity.

The one test of frequency discrimination also contained thirty response units, half of which were of the same frequency and half of which differed in frequency.

The pattern discrimination test consisted of fifty-four response units; each response unit had two sets of stimuli. The first set was the criterion against which the second set was judged to be the same or different. Half of the response units were the same and half were different. The placement of response units within each N.A.D. test was randomly arranged. On all discrimination tests the S's task was to indicate whether the sets of stimuli were the same or different.

Procedure. Each S was seen individually two times for periods of about 45 minutes each. During the initial meeting the Columbia Mental Maturity Scale, the Pictorial Similarities and Differences II subtest of the Revised Stanford-Binet, and the Wepman Auditory Discrimination Test were administered in that order. During the second meeting the N.A.D. test battery was administered. The order of administration varied in order to control for possible order effect.

All tests of auditory discrimination were recorded and administered on Wollensak Magnetic Tape Recorders. Responses

were elicited and recorded during the five-second interval separating response units. No signal was given prior to the commencement of the first stimulus in each response unit.

RESULTS

There was a significant mean IQ difference between groups; therefore, analysis of covariance (Snedecor, p. 401), with the Columbia Mental Maturity Scale IQ scores as the covariate, were used to test the relationships between social class membership and performance on the Wepman Auditory Discrimination Test and performance on the N.A.D. tests.

Phonemic Auditory Discrimination

There were social-class differences on total error scores of the Wepman Auditory Discrimination Test (Table 3). Both the upper-middle class (UM) and the upper-lower class (UL) groups made significantly fewer errors than did the lower-lower (LL) group. Differences between groups on similar pairs of phonemes were not significant (Table 4). However, on phonemes which differ (Table 5) the UM and UL groups made significantly fewer errors than did the LL group.

Nonphonemic Auditory Discrimination

Results of the N.A.D. tests also revealed class differences. On intensity test I (in which pairs of stimuli differed by 6 dbs) group differences on total score (Table 6) and on similar tone pairs (Table 7) were not significant. On tone pairs which differed, however, the UM group made significantly fewer errors than did the UL group (Table 8).

On intensity test II (in which pairs of stimuli differed by 3 dbs) the UM group made significantly fewer total errors than did the UL and LL groups (Table 9). The UM group made significantly fewer errors than did the LL group on similar tone pairs (Table 10); group differences on tone pairs which differed were not significant (Table 11).

Results of the frequency test also revealed class differences. The UM group made significantly fewer total errors than either of the two lower class groups (Table 12). Group differences in similar tone pairs were not significant (Table 13), but on tone pairs which differed the UM group made significantly fewer errors than either of the two lower-class groups (Table 14).

On the pattern test there was a direct relationship between SES and total error scores. The UM group made significantly fewer errors than did the UL group, which in turn made significantly fewer errors than did the LL group (Table 15). The UM group made significantly fewer errors than did the LL group on similar tone pairs (Table 16), but group differences on tone pairs which differed were not significant (Table 17).

Correlations between error scores on the Wepman Auditory Discrimination Test and error scores on the nonphonemic auditory discrimination tests are presented in Table 18. Only seven of the thirty-six correlation coefficients were significantly different from zero ($p < .05$). Therefore, it appears

that the phonemic and nonphonemic tests measure somewhat different abilities.

DISCUSSION

The results of the Wepman Auditory Discrimination Test agree with the findings of Clark (et al., 1966) and Stern (1966) and the conclusions of Bloom (et al., 1965), C. Deutsch (1963), and Silberman (1964): children from the more culturally disadvantaged homes do not perform as well as their more advantaged peers on phonemic auditory discrimination tests.

In addition to differences in phonemic auditory discrimination, the results of this study also indicate that children from lower socioeconomic environments do not perform as well as their more advantaged peers on nonphonemic auditory discrimination (N.A.D.) tests. On seven of the twelve N.A.D. scores, the UM group performed significantly better than the UL or LL groups. The UM group also performed better than the UL or LL groups on four of the five scores which were not significant. On no measures was a lower SES group significantly better than a higher SES group.

Therefore, the UM and UL groups appear to be similar in terms of phonemic auditory discrimination ability. However the UL and LL groups appear to be more similar in terms of nonphonemic auditory discrimination ability.

Only one of the fifteen auditory discrimination scores (frequency test, tone pairs which differed) correlated significantly with IQ scores. Abilities measured by the Columbia Mental Maturity Scale apparently are not related to the abilities measured by the phonemic and nonphonemic tests of auditory discrimination. It appears then, that phonemic and nonphonemic auditory discrimination skills may be more closely related to socioeconomic status than to intelligence.

The results of the present study indicate that some of the N.A.D. tests measure auditory discrimination independently of the Wepman Auditory Discrimination Test. Therefore, the combined use of results from phonemic and nonphonemic auditory discrimination tests may be helpful in developing a differential assessment of auditory discrimination. It may be advisable to tailor different types of remedial instruction for children based on the profile of their phonemic and nonphonemic scores.

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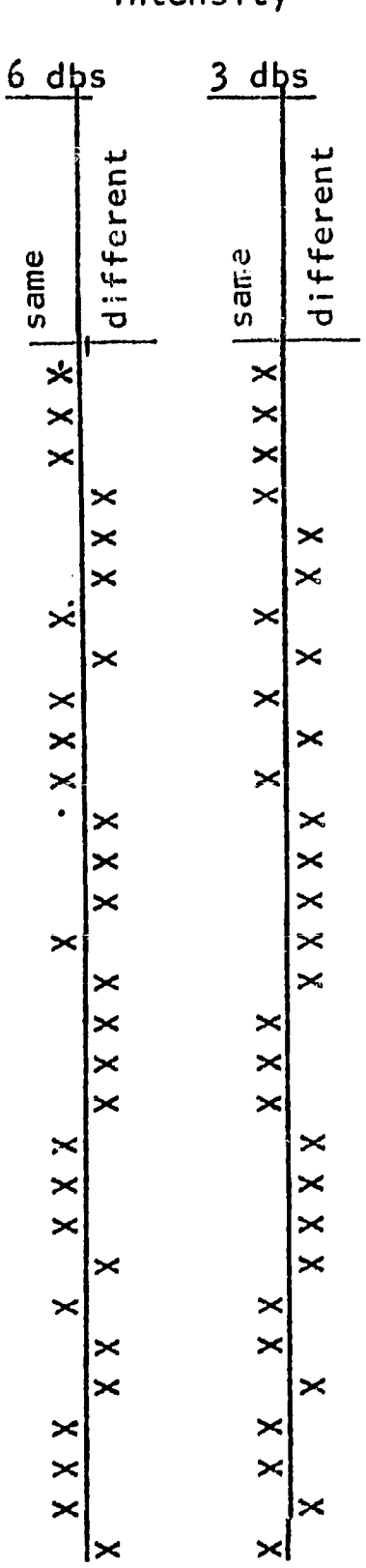
TABLE 1. AGE, INTELLIGENCE, SOCIOECONOMIC STATUS, AND SEX OF THE THREE SES GROUPS

	UM	UL	LL
$\bar{X}$C.A.	83.6	82.4	83.6
$\bar{X}$I.Q.[a]	100.4	94.4	92.4
$\bar{X}$SES[b]	24	60	72
n (males)	10	10	12
n (females)	10	10	8
N (total)	20	20	20

[a] UM > UL=LL ($p < .05$)

[b] UM < UL < LL ($p < .05$)

TABLE 2. TESTS OF NONPHONEMIC AUDITORY DISCRIMINATION



Pattern

00000	00000	00000	00000
00000	00000	00000	0 0
00000	0 0 0	00000	00
00000	00000	00000	00000
00000	0 00	00000	00000
00000	00000	00000	00000
00000	000	00000	0 000
00000	0000	00000	0
00000	00 0	00000	00000
00000	0 0	00000	00 0
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TABLE 3. MEAN ERROR SCORES ON THE WEPMAN AUDITORY DISCRIMINATION TEST: TOTAL SCORE

	UM	UL	LL	Shortest significant ranges
Adjusted means	8.2	10.6	15.3	
UM 8.2		2.4	7.1*	R_2 = 3.6
UL10.6			4.7*	R_3 = 4.3
LL15.3				

*Adjusted mean differences significant at the .05 level

TABLE 4. MEAN ERROR SCORES ON THE WEPMAN AUDITORY DISCRIMINATION TEST: PAIRS OF SAME PHONEMES

	UM	UL	LL	Shortest significant ranges
Adjusted means	.8	.3	.8	
UM.8		.50	.00	R_2=.51
UL.3			.50	R_3=.60
LL.8				

TABLE 5. MEAN ERROR SCORES ON THE WEPMAN AUDITORY DISCRIMINATION TEST: PHONEME PAIRS WHICH DIFFER

	UM	UL	LL	Shortest significant ranges
Adjusted means	7.4	10.3	14.5	
UM 7.4		2.9	7.1*	R_2=3.6
UL10.3			4.2*	R_3=4.2
LL14.5				

*Adjusted mean differences significant at the .05 level

TABLE 6. MEAN ERROR SCORES ON INTENSITY TEST I OF NON-PHONEMIC AUDITORY DISCRIMINATION: TOTAL SCORE

	UM	LL	UL	Shortest significant ranges
Adjusted means	6.2	9.1	9.5	
UM 6.2		2.9	3.3	R_2=3.4
LL 9.1			.4	R_3= 4.1
UL 9.5				

TABLE 7. MEAN ERROR SCORES ON INTENSITY TEST I OF NON-PHONEMIC AUDITORY DISCRIMINATION: SIMILAR TONE PAIRS

	UM	UL	LL	Shortest significant ranges
Adjusted means	2.6	3.4	4.6	
UM 2.6		.8	2.0	R_2=2.0
UL 3.4			1.2	R_3=2.4
LL 4.6				

TABLE 8. MEAN ERROR SCORES ON INTENSITY TEST I OF NONPHONEMIC AUDITORY DISCRIMINATION: TONE PAIRS WHICH DIFFERED

	UM	LL	UL	Shortest significant ranges
Adjusted means	3.6	4.5	6.2	
UM 3.6		.9	2.6*	R_2=2.1
LL 4.5			1.7	R_3=2.2
UL 6.2				

*Adjusted mean differences significant at the .05 level

TABLE 9. MEAN ERROR SCORES ON INTENSITY TEST II OF NON-PHONEMIC AUDITORY DISCRIMINATION: TOTAL SCORE

	UM	UL	LL	Shortest significant ranges
Adjusted means	10.5	14.0	14.8	
UM 10.5		3.5*	4.3*	R_2=3.1
UL 14.0			.8	R_3=3.8
LL 14.8				

*Adjusted mean differences significant at the .05 level

TABLE 10. MEAN ERROR SCORES ON INTENSITY TEST II OF NON-PHONEMIC AUDITORY DISCRIMINATION: SIMILAR TONE PAIRS

	UM	UL	LL	Shortest significant ranges
Adjusted means	2.1	4.2	6.7	
UM 2.1		2.1	4.6*	R_2=2.7
UL 4.2			2.5	R_3=3.3
LL 6.7				

*Adjusted mean differences significant at .05 level.

TABLE 11. MEAN ERROR SCORES ON INTENSITY TEST II OF NON-PHONEMIC AUDITORY DISCRIMINATION: TONE PAIRS WHICH DIFFERED

	LL	UM	UL	Shortest significant ranges
Adjusted means	8.1	8.5	9.8	
LL 8.1		.4	1.7	R_2=2.8
UM 8.5			1.3	R_3=3.2
UL 9.8				

TABLE 12. MEAN ERROR SCORES ON THE FREQUENCY TEST OF NON-PHONEMIC AUDITORY DISCRIMINATION: TOTAL SCORE

	UM	UL	LL	Shortest significant ranges
Adjusted means	4.5	9.6	9.6	
UM 4.5		5.1*	5.1*	R_2=3.2
UL 9.6			0	R_3=3.9
LL 9.6				

*Adjusted mean differences significant at the .05 level.

TABLE 13. MEAN ERROR SCORES ON THE FREQUENCY TEST OF NON-PHONEMIC AUDITORY DISCRIMINATION: SIMILAR TONE PAIRS

	UM	LL	UL	Shortest significant ranges
Adjusted means	1.9	3.0	4.3	
UM 1.9		1.1	2.4	R_2=2.2
LL 3.0			1.3	R_3=2.6
UL 4.3				

TABLE 14. MEAN ERROR SCORES ON THE FREQUENCY TEST OF NON-PHONEMIC AUDITORY DISCRIMINATION: TONE PAIRS WHICH DIFFERED

	UM	UL	LL	Shortest significant ranges
Adjusted means	2.6	5.4	6.6	
UM 2.6		2.8*	4.0	R_2=2.3
UL 5.4			1.2	R_3=2.8
LL 6.6				

*Adjusted mean differences significant at the .05 level.

TABLE 15. MEAN ERROR SCORES ON THE FREQUENCY TEST OF NON-PHONEMIC AUDITORY DISCRIMINATION: TOTAL SCORE

	UM	UL	LL	Shortest significant ranges
Adjusted means	7.7	12.3	16.6	
UM 7.7		4.6*	8.9*	R_2=4.0
UL 12.3			4.3*	R_3=6.0
LL 16.6				

*Adjusted mean differences significant at the .05 level

TABLE 16. MEAN ERROR SCORES ON THE PATTERN TEST OF NON-PHONEMIC AUDITORY DISCRIMINATION: SIMILAR TONE PAIRS

	UM	UL	LL	Shortest significant ranges
Adjusted means	2.8	5.7	8.1	
UM 2.8		2.9	5.3*	R_2=3.4
UL 5.7			2.4	R_3=4.1
LL 8.1				

*Adjusted mean differences significant at the .05 level

TABLE 17. MEAN ERROR SCORES ON THE PATTERN TEST OF NON-PHONEMIC AUDITORY DISCRIMINATION: TONE PAIRS WHICH DIFFERED

	UM	UL	LL	Shortest significant ranges
Adjusted means	5.0	6.6	8.5	
UM 5.0		1.6	3.5	R_2=4.8
UL 6.6			1.9	R_3=5.8
LL 8.5				

TABLE 18. CORRELATIONS BETWEEN ERROR SCORES ON THE WEPMAN TEST OF AUDITORY DISCRIMINATION AND ERROR SCORES ON THE NON-PHONEMIC TESTS OF AUDITORY DISCRIMINATION

Nonphonemic auditory discrimination tests	Wepman Test of Auditory Discrimination		
	Same phonemes	Different phonemes	Total score
Intensity Test I			
Tone pairs which differed	-.03	.12	.11
Similar tone pairs	.07	.03	.04
Total score	.00	.11	.11
Intensity Test II			
Tone pairs which differed	-.17	-.22	-.24
Similar tone pairs	-.02	.33*	.33*
Total score	-.16	.11	.09
Frequency Test			
Tone pairs which differed	-.02	.40*	.40*
Similar tone pairs	-.07	-.12	-.13
Total score	-.05	.21	.21
Pattern Test			
Tone pairs which differed	.03	.33*	.40*
Similar tone pairs	.02	.19	-.13
Total score	.04	.40*	.21

*$p < .05$