R E P O R T  R E S U M E S

ED 018 827 CG 001 582

THE EFFECTS OF SONIC ENVIRONMENT OF INDIVIDUALIZED INSTRUCTION IN LEARNING DIFFICULT AND EASY TASKS BY HIGH ACHIEVERS.

BY- MCCARTHY, EDWARD H.
AMERICAN EDUCATIONAL RESEARCH ASSN., WASH., D.C.

PUB DATE FEB 68

EDRS PRICE MF-$0.25 HC-$0.48 10P.

DESCRIPTORS- *HIGH ACHIEVERS, GRADE 6, *LEARNING, *TASK PERFORMANCE, AURAL STIMULI, PSYCHOACOUSTICS, RESEARCH PROJECTS, *SOUND EFFECTS, METROPOLITAN ACHIEVEMENT TESTS, MEANINGFULNESS OF ALL POSS. CVC TRIGRAMS

THE SIXTH-GRADE STUDENTS OBTAINING THE 80 HIGHEST MEAN SCORES ON THE METROPOLITAN ACHIEVEMENT TEST FORM D WERE RANDOMLY ASSIGNED TO GROUPS OF EASY OR DIFFICULT TASKS WITHIN EACH OF FIVE DECIBEL LEVEL GROUPS. THE LEARNING TASKS WERE TAKEN FROM THE MEANINGFULNESS OF ALL POSSIBLE CVC TRIGRAMS (ARCHER, 1960). THE APPARATUS INCLUDED A TAPE RECORDING OF A CONSTANT WHITE NOISE AND THE EARPHONES TO ELIMINATE ALL NOISE FOR CERTAIN GROUPS. A TWO-WAY FIXED EFFECTS ANALYSIS OF VARIANCE WITH REPLICATIONS WAS CARRIED OUT. ON BOTH THE EASY AND DIFFICULT LEARNING TASKS, PERFORMANCE WAS CURVILINEAR, INCREASING FROM THE 0 TO THE 55 DECIBEL LEVEL GROUP, AND DECREASING FROM THE 55 TO THE 85 DECIBEL LEVEL GROUP. SIGNIFICANT DIFFERENCES WERE FOUND--(1) BETWEEN THE 0, 20, AND 55 DECIBEL LEVEL EASY TASK GROUPS, (2) BETWEEN THE 55, 70, AND 85 DECIBEL LEVEL DIFFICULT TASK GROUPS, AND (3) BETWEEN PERFORMANCE ON THE DIFFICULT AND EASY LEARNING TASKS WAS HIGHEST AT THE 55 DECIBEL LEVEL FOR A CONSTANT WHITE NOISE. STUDENTS LEARN BEST WITH A MODERATE AMOUNT OF NOISE, AS COMPARED TO NO NOISE, OR EXCESSIVE NOISE. THIS PAPER WAS GIVEN AT THE 1968 ANNUAL MEETING OF THE AMERICAN EDUCATIONAL RESEARCH ASSOCIATION (CHICAGO, FEBRUARY 7-10). (PS)

# The Effects of Sonic Environment of Individualized Instruction In Learning Difficult and Easy Tasks by High Achievers.

Edward H. Mc Carthy

Education Department

Bucknell University

School plant facilities in Metropolitan areas are unavoidably subjected to extraneous noises from automobiles, trucks, airplanes, trains, commerce, and industry; in addition, extraneous noises from within the school plant are audible within the classroom, including: unit ventilators, florescent lighting, or the noises from an individualized instruction program where students move about the room to use the various instructional materials. When these extraneous noises become evident to the students engaged in a learning task requiring close attention, the students will either stop or continue with the task. What happens then? Does their work suffer, and if so how much?

The purpose of this study was to see what effects a constant meaningless noise has on high achievers in the sixth grade while learning a task requiring the use of short term memory.

Previous research dealing with the effects of a sonic environment on learning has dealt with the influence of noise on adult performance in visual-motor tasks. Results from these studies indicate that performance decreases when the decibel level of the noise is above normal hearing conditions.

The hypotheses tested in this study are:

1. There will be significant differences in achievement on an easy learning task between the 0, 40, 55, 70, and 85 decibel level groups of meaningless noise.
2. There will be significant differences in achievement on a difficult learning task between the 0, 40, 55, 70, and 85 decibel level groups of meaningless noise.
3. There will be significant differences in achievement between the easy learning tasks and the difficult learning tasks.

## METHOD

The subjects used for this study were sixth graders from the Milton Junior High School, Milton, Pennsylvania, who had the 80 highest mean scores on the Metropolitan Achievement Test Intermediate Form D. The 80 subjects were randomly assigned to groups of easy or difficult tasks within each of the five decibel level groups.

The learning tasks were taken from, the Meaningfulness of all Possible CVC Trigrams (Archer, 1960). The easy learning tasks consisted of the CVC Trigrams randomly selected from 70 percent to 100 percent meaningfulness. The difficult learning tasks consisted of the CVC Trigrams randomly selected from 1 percent to 30 percent meaningfulness. The CVC Trigrams were used because they provide a large quantity of material of fairly uniform difficulty. The Trigrams were entirely lacking in previously established associations between one item and another, so all subjects had the same chance of learning the difficult or easy tasks. The CVC Trigrams were presented by paired-associates in a form similiar to the individualized mathematics and social studies program that the sixth graders are presently enrolled in.

The apparatus included a tape recording of a constant white noise (meaningless noise), used because of its very low association value, and earphones, used by subjects in the zero decibel level group to eliminate all noise.

The study was run for three days. Each day the subjects received a set of instructions in homeroom. When the subjects arrived at the testing room, the noise was playing. After completing the learning task and test, the subjects returned to their original classes.

The subjects were randomly placed in one of the difficult or easy task groups, and in one of the following decibel level groups: 0, 40, 55, 70, and 85.

The 40 decibel level is equivalent to a quiet whisper or soft talking; the 55 decibel level is equivalent to the sound of an average office or a suburban street; the 70 decibel level is equivalent to the sound inside a subway train; and the 85 decibel level is equivalent to the sound of a noisy office or a busy city street.

A two way fixed effects analysis of variance with replications was used to analyze the data.

## RESULTS

On both the easy and difficult learning tasks, performance was curvilinear, increasing from the 0 to the 55 decibel level group and decreasing from the 55 to the 85 decibel level group.

An analysis of variance showed significant differences between the 0, 40, and 55 decibel level groups working on the easy task, and significant differences between the 55, 70, and 85 decibel level groups working on the difficult task.

An analysis of variance showed a significant difference between performance on the difficult and easy learning tasks.

## DISCUSSION

The results show that performance on both difficult and easy learning tasks was highest at the 55 decibel level for a constant white noise. This constant meaningless noise is comparable to the hum from the florescent lighting or the unit ventilators as found in most school classrooms, while the 55 decibel level is equivalent to a moderate to busy office noise. The noise created by students moving about the room to use the

various instructional materials within an individualized instruction program is likewise similar in nature to the constant meaningless white noise.

In summary, the results of this study tend to indicate that students learn best with a moderate amount of noise (55 decibels) than with no noise (0 decibels), or with an excessive amount of noise (85 decibels).

## FUTURE RESEARCH

In the near future, another study will be conducted employing a constant meaningless noise (constant white noise), an intermittent meaningless noise (intermittent white noise), a constant meaningful noise (a teacher reading to a class constantly), and an intermittent meaningful noise (a teacher reading to a class intermittently).

This study will be conducted in a Dial Access Retrival Research Center allowing each student to select his own noise level.

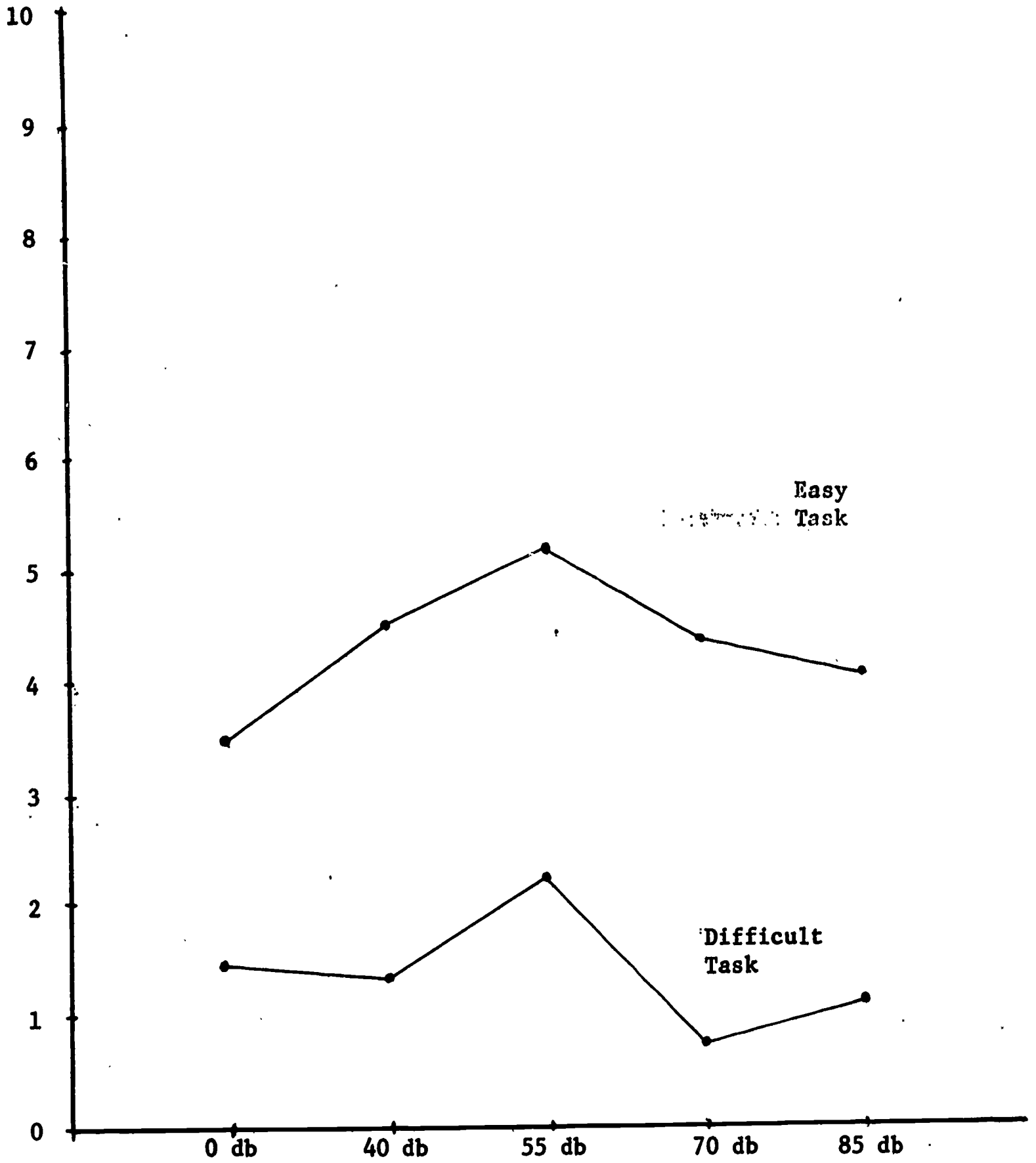
It is hoped that the additional variables of the intermittent and meaningful noise will further enrich the field of research of sonic environment.

THE MEAN OF THE TEST SCORES FOR THE THREE DAYS, FOR THE DIFFERENT DECIBEL GROUPS AND LEARNING TASKS

| Decibel Group | Test Results for difficult task | Test Results for easy task |
|---|---|---|
| 0 | 1.47 | 3.58 |
| 40 | 1.33 | 4.56 |
| 55 | 2.28 | 5.08 |
| 70 | .69 | 4.45 |
| 85 | 1.09 | 4.21 |

The total possible points for each learning task test was 10.

THE MEAN PERFORMANCE FOR THREE DAYS AS A FUNCTION OF THE LEVEL OF NOISE



## References


1. Archer, J. E., "Re-evaluation of the meaningfulness of all possible CVC triagrams," Psychological Monographs. 1960, 74, 1-23.

2. Bailey, B., "Engine-room noise on board merchant ships", International Labor Review. 1963, 282-304.

3. Beranek, L. L., "Noise," Scientific American. 1966, 215, 66-76.

4. Berlyne, D. E., Borsa, D. M., Hamacher, J. H. and Koenig, D. V., "Paired-Associate learning and the timing of arousal," Journal of Experimental Psychology. 1966, 72, 1-6.

5. Berrien, F. K., "The effects of noise," Psychological Bulletin. 1946, 43, 141-161.

6. Blitz, J., Elements of Acoustics. London: Washington Butterworths, 1964.

7. Broadbent, D. E., "Noise, paced performance and vigilance tasks," British Journal of Psychology. 1953, 44, 295-303.

8. Broadbent, D. E. "Effects of noises of high and low frequency on behavior," Ergonomics. 1957, 1, 21-29.

9. Broadbent, D. E., "Effect of noise on an "intellectual" task," Journal of the Acoustical Society of America. 1958, 30, 824, 827.

10. Broadbent, D. E., and Little, E. A., "Effects of noise reduction in a work situation," Occupational Psychology. 1960, 34, 133-140.

11. Carson, H., "The influence of attitude and distraction," Journal of Experimental Psychology. 1938, 22, 532-546.

12. Clark, W. E., and Pietrasanta, A. C., "Community and industrial noise," American Journal of Public Health and the Nations Health. 1962, 51, 1329-1337.

13. Creswell, W. H., Huffman, W. J. and Lehmann, M.S., "An investigation of the effects of various noise levels as measured by physiological performance and energy expenditure," The Journal of School Health. 1965, 35, 312-314.

14. Dardano, J. F., "Relationships of intermittent noise, intersignal interval, and skin conductance to vigilance behavior," Journal of Applied Psychology. 1962, 46, 106-114.

15. Donley, R., "East range symposium, IV. principles of noise control," Journal of Occupational Medicine. 1965, 7, 222-226.

16. Ebling, P.R., and Hughes, J.P., "An epidemiologic approach to in-plant noise problems," Industrial Medicine. 1965, 34, 508-512.

17. Fiske, D. W. Maddi, S. R., Functions of Varied Experience. Homewood, Illinois: The Dorsey Press, Inc., 1961

References 2


18. Fleischer, M.S., and Freeburne, C.M., "The effect fo music distraction upon reading rate and comprehension," The Journal of Educational Psychology. 1952, 43, 101-109

19. Fletcher, J.L., "East range symposium, VI. criteria for assisging risk of hearing damage," Journal of Occupational Medicine. 1965, 7, 281-283.

20. Flexner, J., "How noise affects schoolwork," School Board Journal. 1932, 84, 85-86.

21. Freeman, G.L., "Changes in tension-pattern and total energy expenditure during adaptation to distracting stimuli," American Journal of Psychology. 1935, 52, 354,360.

22. Glorig, A., "The problem of noise in industry," American Journal of Public Health. 1962, 51, 1338-1346.

23. Goodfriend, L.S., "Measurement of noise," Noise Control. 1961, 7, 4-12.

24. Gray, R.W., "Solutions to the paper mill noise problem," Industrial Medicine. 1966, 35, 257-258.

25. Harmon, F.L., "The effects of noise upon certain psychological and physiological processes," Archives of Psychology. 1933, 147, 1-81.

26. Hays, W.L., Statistics for Psychologists. New York: Holt, Rinehart and Winston, 1966.

27. Hirose, K.I., Matsumoto, H., Morita, S. and Obata, J., "The effects of noise upon human efficiency," Journal of the Acoustical Society of America. 1934, 5, 255-261.

28. Jerison, H.J., "Paced performance on a complex counting task under noise and fatique conditions," The American Psychologist. 1954, 9, 399-400.

29. Jerison, J.J., "Effects of noise on human performance," Journal of Applied Psychology. 1954, 43, 96-101.

30. Kryter, K.D., "The meaning and measurement of perceived noise level," Noise Control. 1960, 6, 12-27.

31. Laird, D.A., "The measurement of the effects of noise on working efficiency," The Journal of Industrial Hygiene. 1927, 9, 431-434.

32. Lumio, J.S., "Noise and hearing ability, the incidence of hearing defects induced by noise in Finland," Industrial Medicine. 1965, 35, 404-406.

33. Maas, R.B., "East range sumposium, VII. hearing conservation in industry: and an insurance company's view of the problem," Journal of Occupational Medicine. 1965, 7, 330-333.

34. McBain, W.N., "Noise, the "arousal hypothesis, and monotonous work," Journal of Applied Psychology. 1961, 45, 309-317.

References 3


35. Morgan, J.B., "The effect of sound distraction upon memory, "American Journal of Psychology. 1917, 28, 191-208.

36. Newman, E.B., "Psycho-physical effects of noise," Noise Control. 1955, 1, 16-21.

37. Park, J.F., and Payne, M.C., "Effects of noise level and difficulty of task in performing division," Journal of Applied Psychology. 1963, 47, 367-368.

38. Peterson, A. P., and Gross, E.E. Handbook of Noise Measurement. West Concord, Massachusetts: General Radio Company, 1963.

39. Rabbitt, P., "Recognition: memorey for words correctly heard in noise," Psychonomic Science. 1966, 6, 383-384.

40. Sabine, P.E., "The problem of industrial noise. American Journal of Public Health. 1944, 34, 265-269.

41. Samuel, W.M., "Noise and the shifting of attention," Quarterly Journal of Experimental Psychology. 1964, 16, 264-267.

42. Sanders, D.A., "Noise conditions in normal school classrooms," Exceptional Children. 1965, 31, 344-353.

43. Shelly, M.W., "Learning with reduced feedback information," Journal of Experimental Psychology. 1961, 62, 209-222.

44. Smith, K. R.,"Intermittent loud noise and mental performance," Science. 1951, 114, 132-133.

45. Travers, R.W., Research and Theory Related to Audiovisual Information Transmission. University of Utah, Bureau of Educational Research, 1964.

46. Whitly, P.L., "The influence of music on memory," Journal of General Psychology. 1934, 10, 137-150.

47. Winer, B.J., Statistical Principles in Experimental Design. New York: McGraw-Hill Book Company, 1962.

48. Woodhead, M.M., "An effect of noise on the distribution of attention," Journal of Applied Psychology. 1966, 50, 295-299.

49. Woodworth, R.S., and Schlosberg, H., Experimental Psychology. Henry Holt and Company, 1958.