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REPORT ON

TRAINING STUDIES IN VOICE COMMUNICATION:

II. THE USE OF NOISE IN A TRAINING PROGRAM

OSRD Report No. 4261
October 18, 1944

MAR 23 1953

Applied Psychology Panel, NDRC

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Applied Psychology Panel, NDRC
Project SC-67: VOICE COMMUNICATION

Report No. 12, October 18, 1944

REPORT ON TRAINING STUDIES IN VOICE COMMUNICATION: II. THE USE OF NOISE IN A TRAINING PROGRAM

Prepared by

James F. Curtis

for

Voice Communication Laboratory Staff

Approved for Distribution

By
Chief, Applied Psychology Panel

Office of Scientific Research and Development
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New York, New York
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SUMMARY

Probably the most important obstacle to intelligible voice communication in military aircraft is the high noise levels in which communication occurs. Thus, one of the objectives of training in voice communication is to teach techniques that will produce maximum intelligibility under noise conditions.

This report represents data from three experiments designed to yield answers to the following questions involved in setting up such a training program.

(1) Is training in the technique of talking in noise more effective if the students are given experience in simulated airplane noise as a part of their practice?

(2) If experience in such noise is advantageous, during what proportion of the training time should it be given and how should it be distributed through the drill periods?

(3) Can ambient noise of sufficient level and masking effect be produced with equipment that is available to training units?

(4) Can a noise not ambient, but produced electrically in the training interphone network, be used effectively for such practice?

The subjects in the experiments were pilot trainees. Word intelligibility tests administered both before and after training, provided the basic data. The evaluation of results is based on the gain in intelligibility score between the initial and final tests adjusted for differences of initial test scores between groups.

The data obtained show that:

(1) Some practice and experience in speaking and listening in noise is advantageous.

(2) It is possible to give this experience in too large amounts.

(3) The manner in which the noise is used and its distribution throughout the total practice make a difference in the effectiveness of training.

(4) Noise produced electrically within the interphone system can be used without any considerable loss in effectiveness of training.

INTRODUCTION

One of the difficult aspects of voice communication in military aviation is that it has to be carried on in very high noise levels. Noise levels have been measured in a considerable number of multi-engined airplanes. A few measurements on typical combat craft are summarized in Table I.

Table I. Over-All Sound Levels in Typical Combat Aircraft. *

Airplane	Over-All Sound Levels in Decibels †
B-24D	103 - 119
B-25C	103 - 125
A-20B	108 - 128
Vega Ventura (B-34)	104 - 125
SBD-3 (A-24)	115 - 122

Figure 1 presents comparisons between these airplane noise levels and some other types of sound for which average levels have been determined. The importance of noise as an obstacle to voice communication in military aviation is apparent when one notes that the higher noise levels approach the ear's threshold of pain. The air crew work in an environment that is noisier than the typical boiler factory.

Efforts have been made, with some success, to devise equipment for shielding the speaker's microphone or the ears of the listeners from this surrounding noise. But in spite of the best efforts thus far, noise probably still remains the most important obstacle to communication. In addition to the noise of the airplane, others arise within the communication equipment or result from atmospheric disturbances. These may reach sufficiently high levels to make communication impossible. It is obvious, therefore, that one of the prime objectives of a training program in voice communication must be to teach air crew members to to talk so that they can be understood if at all possible in spite of the noise.

In setting up such a training program, that objective poses several questions:

1. Is it necessary or advantageous for the training to be carried on with noise simulating that encountered in aircraft?

2. If experience in such noise is a desirable part of the training, during what proportion of the training time should it be used?

3. Do noise conditions in training need to be as severe as those encountered in aircraft?

4. How should the noise be produced? Does it need to be an ambient noise produced in the training room, or can it be introduced electrically into the earphones of the communication network used in training?

* Abstracted from Sound Level Measurements in U.S. Military Airplanes, National Research Council Committee on Sound Control, OSRD Report No. 624

† All sound level measurements are relative to zero reference level, 10^{-16} watts/cm^2.

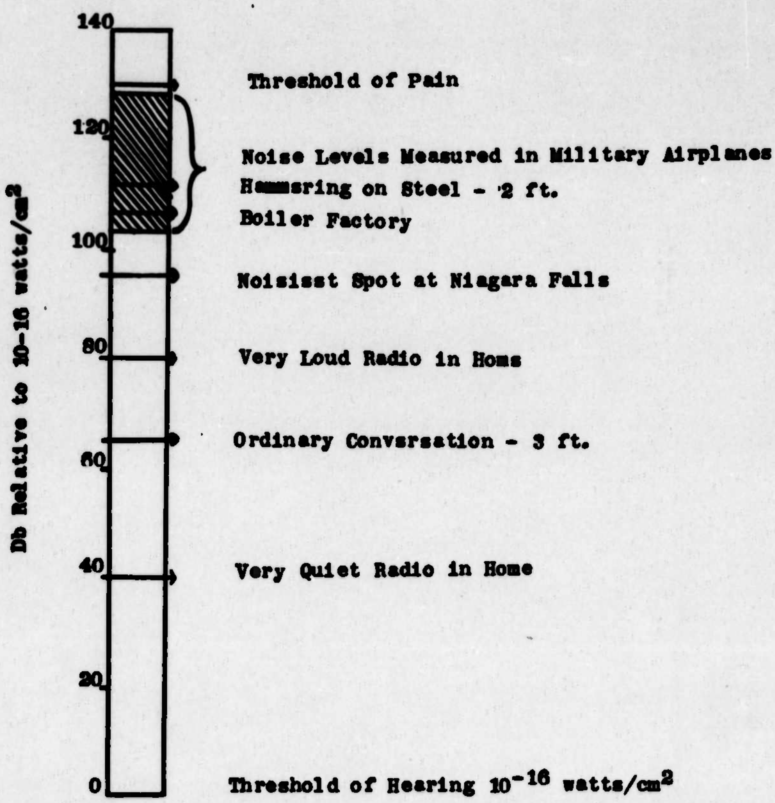

Figure 1. Showing the Very High Noise Levels Found in Military Aircraft by Comparison with Other Common Sources of Noise.

These questions are important, not only in determining the most advantageous training procedures, but also because the answers govern the nature of the installations required, viz., the type and location of the room or rooms, and the equipment required. The experiments reported herein were conducted to provide answers to these questions.

EXPERIMENTAL PROCEDURES AND RESULTS

General

Measurement of Results: The data of the experiments to be described in this report were derived from word intelligibility tests. These tests have been discussed in detail elsewhere. *

Each subject spoke a list of twenty-four words over an interphone system to a group of eight or ten listeners. Both the listeners and speakers were situated in an ambient noise, similar in spectrum to that of an airplane in flight. The noise level in the room was 108 - 110 db. For two of the experiments a rotational testing procedure was used. The subjects took turns as speakers, and acted as listeners during the balance of the testing period. In the other experiment, part of the subjects in each group were used as a listening panel. These subjects were not tested as speakers and were not given training in voice technique. They acted as panels of listeners for testing the speaker groups to whom training was given. Between tests they were used as subjects for other experiments. Both procedures yielded an intelligibility score for each speaker, consisting of the number of correct identifications made by the listeners divided by the product of the number of listeners and the number of words read.

In each experiment, herein reported, an initial test was given preceding the training and a final test followed the training period. Gain scores were obtained by subtracting the initial test scores from final test scores. The means of these gain scores, adjusted by analysis of covariance to allow for initial differences between groups, constitute the criterion measures for comparing the relative improvement shown by groups of subjects following training.

Subjects: The subjects for the experiments were pilot trainees in the first four weeks of training at a basic flying school. They came to the Laboratory in groups of twenty to twenty-four.

Type of training: The type of instruction under study dealt with training in voice technique which aimed at teaching the subjects to speak as intelligibly as

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* Intelligibility Measurement: Techniques and Procedures Used by the Voice Communication Laboratory. Project Report No. 7, OSRD No. 3748, May, 1944 (Restricted)
Training Studies in Voice Communication: I. Can Intelligibility of Voice Communication Be Increased by Training in Voice Technique., OSRD Report No.3862, Voice Communication Laboratory Report No. 8, June, 1944 (Restricted)

possible over interphone and radio equipment under conditions of high noise level. Instructions in the use of the equipment, particularly the correct method of holding the microphone, had been given prior to the initial test. Therefore, the improvement reflected by the gain scores may be considered as being a function of training in good voice using.

The training procedures were fundamentally those of directed drill. Lecture and discussion were used only as necessary to make clear to the subjects what skills they were to practice during the drill periods. The practice materials were, for the most part, messages phrased in R/T procedure, such as pilots and air crew members are called on to speak and understand in flying. Requests by pilots for taxi and take-off instructions, and for landing instructions, instructions from tower to pilot for landing and take-offs, position reports, requests for change of flight plan by pilots, and similar messages, constituted the bulk of the practice materials.

The skills toward which practice was directed were those that experimental results, or practical experience, had demonstrated to be important in producing intelligible speech over interphone and radio under noise conditions: adequate loudness; a pitch level high enough to make possible adequate loudness, but not so high as to reduce intelligibility; clear, precise articulation and pronunciation; proper speaking rate and phrasing of messages. The instructors directed the practice closely to keep it moving as rapidly as possible, to point out faults in individual performances, and to make suggestions for improvement.

Description of Specific Experiments

Three separate experiments were conducted in which the variable of simulated airplane noise, as part of the training experience, was under study. They will be designated as experiments A, B, and C.

Experiment A: This experiment was preliminary in character. As a concomitant variable with other factors under study in this experiment, part of the subjects were trained for a period of two hours with all of their practice in noise. A second group was trained using the same techniques and procedures but with all of their practice in quiet.

This experiment was carried out during the fourth, fifth, sixth, and seventh laboratory periods for the subjects. The time was utilized as follows: fourth period -- initial intelligibility test; fifth and sixth periods -- training; seventh period -- final intelligibility test. The men had participated in a separate experiment during their first three laboratory periods, and as a part of it had taken an intelligibility test during their first laboratory period. Thus they had one hour of experience in talking and listening in noise prior to the initial test of the experiment, or two hours of such experience prior to the beginning of the planned training work.

Figure 2 presents a graphical comparison between the adjusted mean gains of the practice-in-noise and practice-in-quiet groups, and the results from a control group to which the improvement of the other two may be compared. The control group was tested at the same time as the trained groups, but received no planned training in the Laboratory.

The results of the statistical analysis of the comparisons are given in Table II. The data show that both of the trained groups made improvement which was greater than that of the control group by amounts which were statistically significant, at the 5% level of confidence in the case of the practice-in-noise group, and at the 1% level of confidence in the case of the practice-in-quiet group. Therefore, as short a period as two hours produces a measurable improvement, as compared with a control group, either with or without noise as a part of the practice experience.

Table II. Comparison Between: (1) Groups Trained for Two Hours with Practice in Simulated Airplane Noise; (2) Groups Trained for Two Hours with Practice in Quiet; (3) A Control Group.

Comparison	Difference	Standard Error of Difference	"t"
Practice-in-Noise vs. Control	2.8	1.27	2.20
Practice-in-Quiet vs. Control	7.8	1.25	6.24
Practice-in-Noise vs. Practice-in-Quiet	5.0	1.06	4.72

Value of "t" required for significance at the 1% level of confidence -- 2.58
Value of "t" required for significance at the 5% level of confidence -- 1.96

Comparison of the practice-in-noise group with the practice-in-quiet group shows superiority for the latter by an amount which is highly significant statistically, beyond the 1% level of confidence. This finding was contrary to expectation and requires explanation.

It had been predicted that the practice-in-noise group would show the greater improvement because, under noise conditions, the subjects were presented with the same obstacle to intelligible communication that they later had to overcome in real communication situations. It was presumed that practice under such conditions would present more of a challenge to the subjects and result in higher motivation. It was also supposed that more effective practice could be conducted in noise since failure to speak intelligibly would probably be more immediately apparent to both the instructor and the cadets. Practice could, therefore, be more accurately directed.

That the data did not bear out the prediction may be explained in one or more of the following ways:

(1) The subjects' experience in listening and talking in noise, while taking

two intelligibility tests prior to the beginning of training, may have supplied insight into the communication problems resulting from noise, sufficient that the subjects were motivated to practice effectively without additional noise experience during their practice. Experience in the laboratory has shown that the process of taking an intelligibility test, in itself, results in substantial learning. The subjects have an opportunity to observe and make comparisons between a number of voices as to their apparent intelligibility, and to take hints from those voices which seem to them the most intelligible.

(2) It is possible that two hours of practice-in-noise, following the two testing hours, constituted an overly heavy amount of noise experience. As a result, the noise may have been more an irritant that a helpful motivating factor. In other words, it may be that a certain amount of noise experience is necessary to effective training in voice technique for communication in noise, but that it can be overdone and was in this instance.

(3) Perhaps some faulty voice technique and poor speaking can be more easily detected and corrected during practice-in-quiet than during practice-in-noise.

It is impossible to say to what degree the factors just discussed may have operated. It is probable, however, that the second one influenced the results to some extent. Subjective observation of the instructors indicates that in the second hour of training the men were beginning to react negatively to the noise. If true, this helps to explain the lower gain shown by the practice-in-noise group.

The comparison between the two groups is also vitiated by the fact that the practice-in-quiet group had previous experience in noise. As pointed out under (1) above, previous experience may have been sufficient to give the subjects insight into the problems of talking in noise and to motivate them to practice effectively. The data from the practice-in-quiet group cannot therefore be taken as indicating accurately the results that would be obtained with a group lacking such noise experience.

The results of Experiment A, therefore, are for the most part inconclusive. The one relatively clear indication is that experience in noise, as part of training in a classroom situation, can be given in too large amounts.

Experiment B: This experiment was designed to test the value of noise as a training device more thoroughly and systematically than in the first experiment. It was also set up to confine the experience of talking and listening in noise to the training periods, as much as possible, and thus eliminate the difficulties of interpretation of results which obtained for Experiment A. Accordingly, the testing procedure was modified slightly. Instead of the usual rotational procedure whereby every subject acted as both speaker and listener, a listening panel of eight to nine was selected from each group of subjects. For both the initial and final tests, the men listened to the speakers and wrote the words as they heard them. If a member of the listening panel was absent from either the initial or final test, his paper was not used in determining the speaker scores for either test.

The men constituting the listening panel were not tested as speakers and were not given training in voice technique. They functioned only as the listening panel for testing the men who were given training in voice technique. The usual intelligibility testing procedure was carried out, except that the speakers did not act as listeners and were in the testing room only for the length of time required to read their test lists. Hence they did not have the opportunity to compare variou voices with respect to intelligibility in noise, nor did they become tired and annoyed by long exposure to the noise. Comparisons could thus be made between different amounts and distributions of noise experience during training, without the complication resulting from prior experience in talking and listening in noise as a part of the testing situation.

Six variations in the amount and distribution of noise experience were tested during a three-hour training period. The content or subject matter of the training was substantially as described above and was kept as constant as possible for all six experimental groups. The variations in use of noise during practice were as follows :

(1) N-N-N. This group had noise for all practice in all three training periods. At the beginning of each hour a few minutes were spent on instructions concerning the particular objectives of voice technique on which to practice for that day, and the practice procedure was explained. The rest of the hour was spent practicing in noise.

(2) Q-Q-Q. With this group all practice was carried out in quiet. The same type and amount of instruction was given at the beginning of the hour as for the N-N-N group.

(3) 1/2N-1/2N-1/2N. With this group, one-half of each day's drill was carried out in noise and one-half in quiet. As with the foregoing two groups, a few minutes at the beginning of the hour were required for instructions necessary to that day's practice. There followed equal periods of drill in quiet (one-half of the remainder of the hour), and in noise (the balance of the hour). The practice in quiet always came first. During this time, each subject was given a chance to work toward the particular objectives for that day and to get criticism and suggestions from the instructor. Each subject was then given an opportunity to practice similarly in noise.

(4) 1/2N-Q-N. With this group the noise was distributed as indicated by the symbols. The half period of practice in noise during the first hour was used as a motivational period. Each subject was given a message

to read over the interphone network, in noise. Another subject was asked to repeat the message as he heard it. If the message had not been sufficiently intelligible to permit its being read back accurately, the original speaker was asked to give it again. Intelligibility, or the lack of it, thus became immediately apparent, and an opportunity was furnished each man to see the importance of practicing for increased speech intelligibility. The balance of the first hour was used in lecture and discussion on proper voice technique for speaking in noise. Hour two was used as a practice period to work on correct voice technique in quiet. Hour three was a practice period in noise, providing an opportunity to apply to a noise situation the voice techniques previously practiced in quiet.

(5) N-Q-Q. This group experienced noise during their first hour of training, but not in the second and third hours. The first hour was used as a motivational period, in the same fashion as for the 1/2N-Q-N group, except that the procedure was carried out for the full hour. Hours two and three were used as instructional and practice periods in quiet; a few minutes at the beginning of the hour were used for giving instructions, the bulk of the time for practice.

(6) Q-Q-N. This group experienced noise only during the last of the three training periods. The first two hours were used for instruction and practice-in-quiet. The last hour was used to apply the previously practiced skills in a noise situation.

The adjusted mean gains of the six groups are represented by Figure 3. Table III summarizes the statistical analysis of the data. Besides the adjusted mean gains of the group, the Table gives comparisons between the adjusted mean gain for each experimental group and all other groups. For example, the following data are found in the first row of the table: (1) the adjusted mean gain of the 1/2N-Q-N group; (2) the differences between the adjusted mean gain for this group and each of the other experimental groups; (3) the standard errors of these differences; (4) student's statistic for each of these comparisons (the ratio of the difference in means to the standard error of the difference).

Two methods (1/2N-Q-N and N-N-N) appear superior to the other four. The difference between the two methods is slight (1.2 score points) and not statistically significant ("t" = 0.49). The differences between the four less effective methods are also slight (Maximum difference 1.9 score points), and short of statistical significance (largest "t" = 0.75). The differences between the two best methods and the other four are of greater magnitude, however, ranging from 4.3 to 7.3 score points, and yield t-ratios which are larger than can probably be attributed to experimental error. The first two methods of using noise as a part of practice in voice technique are therefore superior to the other four.

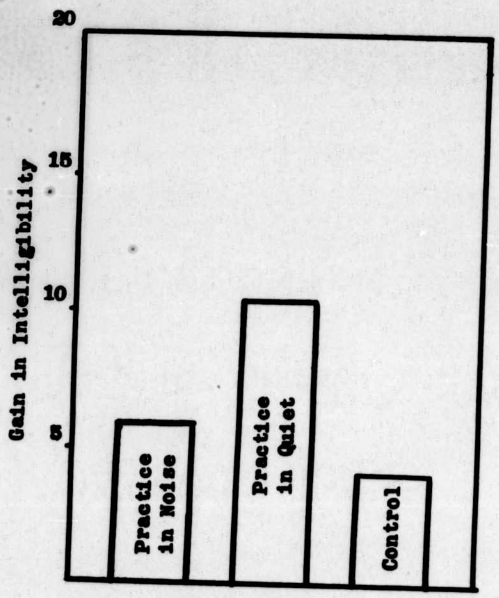

Figure 2. Adjusted Mean Gain Intelligibility Score for: (1) A Group Trained for Two Hours with Practice in Simulated Airplane Noise; (2) A Group Trained for two Hours with Practice in Quiet; (3) A Control Group.

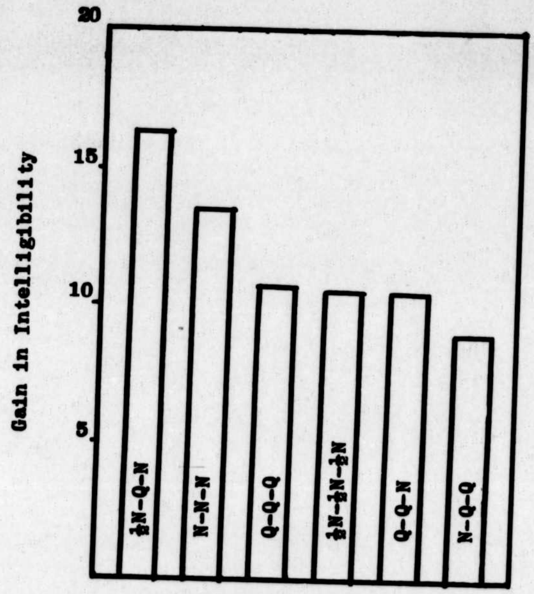

Figure 3. Adjusted Mean Gain in Intelligibility Score for Six Groups Trained for Three Hours with Various Amounts and Distributions of Practice in Noise.

Table III. Adjusted Mean Gains and Summary of Statistical Analysis of Data from Six Groups Trained for Three Hours with Various Amounts and Distribution of Practice in Noise.

Adjusted Mean Gain			Comparison with Other Groups				
			N-N-N	Q-Q-Q	1/2N-1/2N-1/2N	Q-Q-N	N-Q-Q
1/2N-Q-N	16.3	Mean Diff.	1.2	5.5	5.8	5.8	7.3
		S.E. Diff.	2.43	2.41	2.49	2.51	2.5
		"t"	0.49	2.28	2.32	2.31	2.95
N-N-N	15.1	Mean Diff.		4.3	4.6	4.6	6.1
		S.E. Diff.		2.35	2.43	2.46	2.41
		"t"		1.83	1.89	1.87	2.53
Q-Q-Q	10.8	Mean Diff.			0.3	0.3	1.8
		S.E. Diff.			2.41	2.43	2.39
		"t"			0.12	0.12	0.75
1/2N-1/2N-1/2N	10.5	Mean Diff.				0.0	1.5
		S.E. Diff.				2.52	2.47
		"t"					0.61
Q-Q-N	10.5	Mean Diff.					1.5
		S.E. Diff.					2.49
		"t"					0.60
N-Q-Q	9.0						

"t" required for significance at various levels of confidence:

10 % level of confidence = 1.64
5 % level of confidence = 1.96
2 % level of confidence = 2.33
1 % level of confidence = 2.58

Reference to the previous description of the procedures shows that the two best methods were: (1) one in which noise experience was used as a motivating device during half of the first period of practice, and as a period of application to a noise situation during the third and last period of practice, with the second period used for practice-in-quiet; (2) one in which noise was used throughout all of the practice during three hours of training.

That the latter of these should have shown up as superior seems contradictory to the results of Experiment A, described above, in which the practice-in-noise group showed a substantially smaller gain than the practice-in-quiet group. It must be remembered, however, that the first experiment is not clear indication of the comparison between practice-in-noise and practice-in-quiet, since both experimental groups had noise experience prior to the beginning of the experiment. Experiment B, therefore, must be regarded as a more valid test of the comparison Its results indicate that the use of noise in practice can be advantageous. The two groups specified above showed substantially greater improvement than the group that had no practice in noise during its training periods.

The results also indicate the importance of the manner in which the noise is used. The 1/2N-Q-N group experienced the same total amount of noise as the 1/2N-1/2N-1/2N group, but showed substantially more gain following training. The over-all conclusions from these two experiments seem to be as follows:

(1) Noise, as a part of practice experience, can be an effective aid to training in voice technique for speaking in noise.

(2) The amount of noise experience is important. Results from Experiment A indicate that it can probably be over-done.

(3) The manner in which the noise experience is used is important. It is probably best used to provide motivation and an opportunity to practice under realistic noise conditions.

(4) It is not necessary that all of the practice be in noise. A judicious combination of practice-in-noise with practice-in-quiet is at least as effective as practice-in-noise only.

Experiment C: This experiment was designed to answer two very practical questions. Experiment B had demonstrated that experience in speaking and listening in noise is advantageous in training in voice communication. However, the noise-producing apparatus used in the Laboratory is of a type which would be difficult to procure in quantity. This is particularly true of the large high-fidelity loud speaker used for broadcasting the noise into the room. It would be impractical, therefore, to recommend the use of such equipment for training installations that are to be put into widespread use in AAF schools. It was necessary, therefore to test experimentally the effectiveness of a noise which could be produced with more available equipment.

A second problem was presented by the possibility that some training units might have to be placed in rooms so located that a high level of ambient noise in the training room would be disturbing to work in adjacent rooms. Accordingly, it was important to determine the practicability and effectiveness in training of a noise not broadcast into the room, but introduced electrically into the interphone system. Such a noise has a high level at the ears of anyone wearing a headset coupled into the interphone system, but the room remains quiet.

In order to provide the required answers, four groups of cadet subjects were trained for a period of six hours. A different condition of noise was assigned to each group. The four noise conditions were as follows:

(1) Ambient Noise I. This is the standard Laboratory noise which had been used in most of the previous training experiments. It is produced by an electronic noise generator, amplified by means of a Webster, Model 18 - 50 power amplifier, rated at 50-watts, and broadcast into the room through a Jensen EP - 807 reproducer. The latter is a high quality sixteen inch dynamic speaker, in a base reflex cabinet, with an auxiliary high-frequency "tweeter" and cross-over network. The overall level and sound spectrum of this noise as measured in the room is shown by the solid curve of Figure 4.

(2) Ambient Noise II. This noise was produced with the same type of noise generating and amplifying equipment, but broadcast into the room from a Jensen, Model M - 10, 12-inch electromagnetic speaker. This is a smaller, less costly speaker than the EP - 807. The noise level and spectrum obtained with this speaker are shown by the broken curve of Figure 4. It will be seen that this noise had an overall level slightly higher than Ambient Noise I, and with somewhat greater level in the low frequencies. It had a much lower level in the high frequencies, however, above the 400 - 800 c.p.s. octave band, and preliminary experimentation showed its masking effect on speech to be less. Percentage intelligibility scores obtained for the two noises with a practiced listening panel and four speakers were: Ambient Noise I -- 60.6; Ambient Noise II -- 68.3 .

(3) Noise in the System I. This noise was fed into the system by connecting the output of the noise amplifier across the earphone circuit of the interphone network. Its level was set to provide approximately the same obstacle to communication as that of Ambient Noise I. By preliminary experiment, using a constant group of speakers and listeners, a curve of word intelligibility against level of noise in the system had been established. This curve was used to select levels of noise in the system which would match, in terms of masking of speech as measured by a word intelligibility test, the two ambient noises which were used in the experiment.

(4) Noise in the System II. This noise was produced in the same way as Noise in the System I but was set at a level to match the Ambient Noise II. It had a somewhat lower level than Noise in the System I.

The content or subject matter of the course, and the training procedures, were kept constant between groups. The only variation between the trained groups was in the noise conditions as described above.

In addition to the four groups which were trained with the four different noise conditions, a control group was measured. The subjects composing this group were given initial and final intelligibility tests simultaneously with the subjects composing the trained groups, but received no voice technique training in the Laboratory.

In order to make meaningful comparisons between the results of these groups it was necessary to use a standard noise for the initial and final intelligibility tests for all groups. The noise used was the standard Laboratory noise, designated here as Ambient Noise I. The testing procedure was the rotational one, previously described, in which all subjects act as both speakers and listeners.

Table IV. Adjusted Mean Gains in Intelligibility Score of Four Groups Trained for a Period of Six Hours with Different Noise Conditions and of a Control Group.

Experimental Group	Adjusted Mean Gain
Ambient Noise I	18.8
Ambient Noise II	18.1
Noise in System I	15.7
Noise in System II	18.7
Control Group	5.8

Analysis of covariance on all five groups (4 trained groups and control): $F = 15.05$

Analysis of covariance on four trained groups: $F = 1.07$

Figure 5 and Table IV present the results of Experiment C. As shown in Table IV, two separate analyses were carried out. The first was an analysis of variance of all groups, including the control groups. The F of 15.05 obtained from this analysis is highly significant, indicating that reliable differences between groups exist. Since the differences between the control group and the trained groups were all large and the differences between trained groups were all small, it was thought possible that the magnitude of this F might be accounted for in great part by the differences between the control and experimental groups. A second analysis was therefore made, from which the control group was excluded. The small F of 1.07 obtained from this analysis indicates that there are no statistically significant differences between adjusted gain scores of the four trained groups. The largest difference is approximately three score points.

The analysis therefore indicates that all trained groups made improvement, as measured by gain scores, which was larger than that of the control groups by amounts that are highly significant statistically. The differences between the groups trained with the four variations of noise conditions cannot, however, be regarded as reliable. It is thus impossible to say, on the basis of the above data, that one type or level of noise is better than another for training purposes. The group trained with the lower level of ambient noise made essentially the same amount of improvement as the group trained with the high level noise. Lower-powered amplifiers and

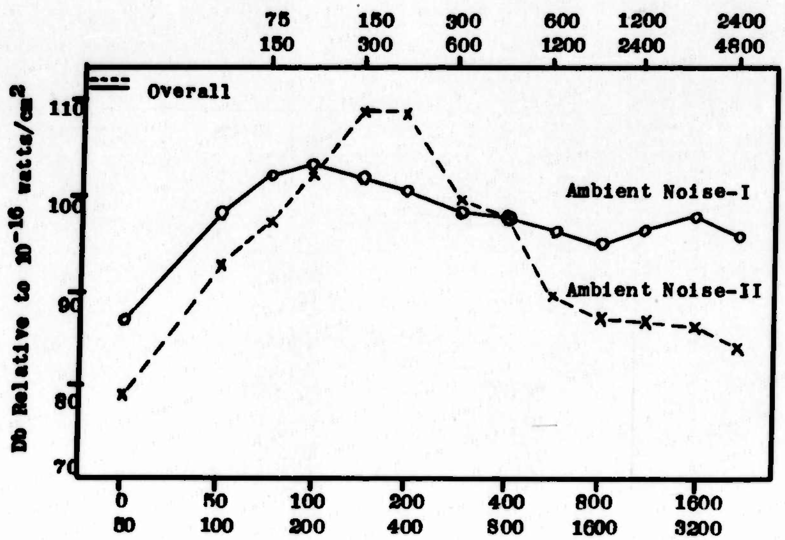

Figure 4. Sound Spectra of Two Ambient Noises Used in Experiment C. The Solid Curve is the Spectrum of Ambient Noise I. The Broken Curve is the Spectrum of Ambient Noise II.

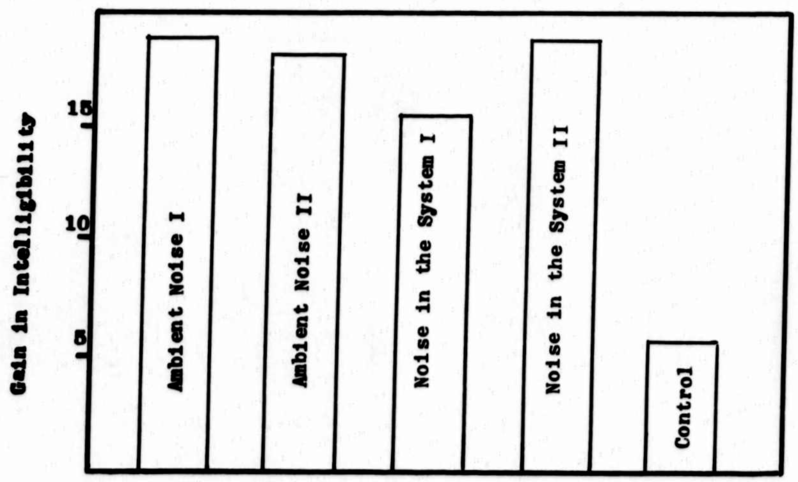

Figure 5. Adjusted Mean Gain in Intelligibility Score for Four Groups Trained with Four Different Types of Noise and for a Control Group.

less expensive reproducing equipment than has been used in the Laboratory appear, therefore, to be entirely practical for use in training installations.

Also it appears to be feasible to use noise in the system if an ambient noise is impracticable or objectionable. The use of noise in the system is not, however, recommended when an ambient noise can be used. Although the distinction is not reflected in the data, the instructors who handled the experimental training groups agreed that use of noise in the system was less desirable administratively. It was their observation that the subjects disliked it and seemed to find it more irritating than the ambient noise. This was particularly true of the higher level of noise in the system. There is also a temptation for the subjects, with noise introduced electrically into the system, to remove the earphones or shift them off the ears to eliminate or reduce the irritating noise. There is thus an added instructional problem when noise in the system is used, since the men must keep their headsets on if any effective practice or drill is to be carried out. In addition the ambient noise situation is much more realistic. For these reasons, it is recommended that ambient noise be used wherever possible. The data demonstrate, however, that noise in the system can be used without marked loss of effectiveness, in spite of its being less convenient.

The recommended level of noise in the system, where it must be used, is a level corresponding to that of Noise in the System II, in Experiment C. Being relatively low, this noise is probably less uncomfortable to the students. Also, though the difference is slight, the data indicate that this level of noise in the system may be somewhat better than Noise in the System I.

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ABSTRACT:

Three experiments were conducted to improve the training in intelligible voice communication in military aircraft. Word-intelligibility tests were administered both before and after training. The data obtained showed that some practice and experience in speaking and listening in noise is advantageous and that it is possible to give this experience in too large amounts. The manner in which the noise is used and its distribution throughout the total practice make a difference in the effectiveness of training. Noise produced electrically within the interphone system can be used without considerable loss in effectiveness of training.

*Psychology Panel

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