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HEARING OF YOUNG AIRMEN ENTERING NOISE EXPOSURE CAREER FIELDS

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FOREWORD

This research was conducted in the Noise and Hearing Conservation Function, Otolaryngology Branch of the USAF School of Aerospace Medicine, under task No. 775508, during the period November 1970 through June 1971. The paper was submitted for publication on 23 July 1971.

Guidance and assistance in preparing the hearing data contained in this report were provided by Margaret F. Allen and Robert L. Dedeke of the Biometrics Division.

This report has been reviewed and is approved.



EVAN R. GOLTRA, Colonel, USAF, MC
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13. ABSTRACT

Median hearing levels were determined for 225 young airmen who were entering training for occupations involving exposure to potentially hazardous noise. The values were extracted from hearing conservation data forms received from Sheppard AFB, Texas. The medians were compatible with those reported for three other groups of young adult men. These median hearing levels were determined to establish an appropriate reference for assessing the hearing of individuals exposed to potentially hazardous noise.

ABSTRACT

Median hearing levels were determined for 225 young airmen who were entering training for occupations involving exposure to potentially hazardous noise. The values were extracted from hearing conservation data forms received from Sheppard AFB, Tex. The medians were compatible with those reported for three other groups of young adult men. These median hearing levels were determined to establish an appropriate reference for assessing the hearing of individuals exposed to potentially hazardous noise.

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I. INTRODUCTION

The USAF Hearing Conservation Data Repository at Brooks AFB, Tex., is made up of audiograms on Air Force personnel who are training for or are assigned to potentially hazardous noise. This repository is, in part, in existence to provide for the identification of specific groups in which excessive hearing loss is occurring. Categories of groups include base, occupation, and age. An obstacle in fulfilling the repository's goal has been the absence of suitable reference hearing levels. A number of hearing level references are available (1, 2, 3), but none are directly applicable to audiograms received at the Hearing Conservation Repository.

The population receiving hearing tests in the USAF hearing conservation program is a selective (noise exposure) group. AFR 160-3 (4) prohibits the employment in a potentially hazardous noise of any person who has a significant hearing loss. This should result in a group with more acute median hearing levels than found in the same age range in the general U.S. population (1) or a comparable non-noise-exposed Air Force group (2, 3). When a person in the USAF hearing conservation program is found to have significantly decreased hearing, he will probably be reassigned to a "noise-safe" area with hearing conservation audiometry no longer required. This means that audiograms reaching the USAF Hearing Conservation Repository may reflect better hearing than that in some other populations.

The goal in this study was to establish reference hearing levels for individuals included in the USAF hearing conservation program. All Air Force audiometers were to be calibrated to the International Organization for Standards ISO-1964 (5) values rather than the older American Standards Association ASA-1951 (6) values by 1 July 1969. Therefore, any reference hearing levels should be based on the newer standard. These reference values are to be used in assessing the hearing levels found in groups of audiograms sent to Brooks AFB, Tex.

II. PROCEDURE

The criterion for the reference group was that it be made up as nearly as possible of —

1. young persons;
2. persons who have not yet been exposed to occupational noise;
3. persons who are representative of those who subsequently work in potentially hazardous noise.

TABLE I

Percentage distribution of hearing levels for 225 airmen
entering training for duties involving exposure
to potentially hazardous noise

Hearing level (dB)	Frequency (Hz)					
	500	1000	2000	3000	4000	6000
Left ear						
0	6.7	30.2	39.1	20.9	25.3	11.1
5	25.8	39.6	32.0	32.9	30.2	20.4
10	25.3	14.7	14.2	18.2	13.3	17.3
15	23.1	11.6	8.0	12.4	15.1	15.1
20	12.4	3.6	4.9	6.2	3.6	10.2
25	6.2	0.4	1.3	4.4	5.8	7.1
30				3.1	1.3	6.2
35	0.4		0.4	0.9	1.3	5.3
40				0.4	1.8	2.7
45				0.4	1.8	1.3
50						0.4
55						0.4
60						
65						0.4
70						0.4
75					0.4	0.4
80						0.4
85						
90						
95						0.4
Right ear						
0	13.3	40.9	51.6	34.7	36.0	15.1
5	35.1	35.6	29.3	31.1	27.1	25.8
10	20.9	15.6	9.8	16.0	12.0	16.0
15	19.6	7.1	6.2	12.0	12.9	17.3
20	7.1	0.9	0.9	2.2	6.2	6.2
25	3.1		1.8	2.7	2.2	7.1
30	0.9		0.4	0.4	0.4	5.3
35					0.9	2.7
40				0.4	0.4	1.8
45					1.3	
50					0.4	0.9
55				0.4		1.3
60						
65						
70						
75						0.4

The group selected was composed of airmen who had just completed their basic military training at Lackland AFB, Tex., and were entering training at Sheppard AFB, Tex., to perform duties expected to involve exposure to potentially hazardous noise. An AF Form 1490, Hearing Conservation Data, is completed on each of these trainees at Sheppard AFB, and one copy is sent to the Hearing Conservation Repository at Brooks AFB. Each AF Form 1490 has a current audiogram entered on it. The sample for this study was drawn from records arriving at Brooks AFB.

A total of 225 forms 1490 were extracted during mid-1970 for this study. These forms were all on Air Force enlisted men from age 19 through 21. All forms were identified as reference audiograms. These audiograms were reference to ISO-1964 values and were obtained with automatic audiometers.

III. RESULTS

The percentage distribution of thresholds at various hearing levels is given in table I. The selectivity in composing this group is apparent when thresholds at 500, 1000, and 2000 Hz are inspected. A hearing level greater than 30 dB is recorded in only two instances, once each at 500 and 2000 Hz in the left ear. The selection criterion eliminates anyone who has an average hearing level in either ear of 30 dB or more for the frequencies 500, 1000, and 2000 Hz. No individual in this sample failed that criterion. It is apparent that some individuals have substantial hearing decrements in the higher pure tone frequencies, up to a 95-dB hearing level which occurred at 6000 Hz for a left ear. It should be emphasized that individuals included in this sample have passed selection criteria upon enlistment and assignment for training. These criteria exclude persons who demonstrate significant hearing losses.

The 50th (median) and 75th percentile hearing levels, ISO-1964 (5), for the 225 Sheppard AFB trainees are given in table II. Median hearing levels range from -0.1 dB (right ear at 2000 Hz) to 10.4 dB (left ear at 6000 Hz).

TABLE II

Percentile hearing levels for 225 airmen entering training for duties involving exposure to potentially hazardous noise

Frequency (Hz)	Left ear		Right ear	
	50%	75%	50%	75%
500	8.5	13.8	5.4	11.5
1000	2.5	6.9	1.3	4.8
2000	1.7	6.5	-0.1	4.1
3000	4.5	11.3	2.5	8.0
4000	4.1	12.1	2.6	10.1
6000	10.4	20.8	7.9	15.9

The median values from table II are displayed graphically in figure 1, along with median values in three other surveys of similar age groups. Values for the other three groups were all originally reported in decibels relative to ASA-1951 (6) calibration standards. Appropriate conversions were applied so that all hearing levels in figure 1 are relative to ISO-1964 (5) calibration standards. The other three groups are —

1. males of the United States population, age 18-24 (1960-1962) (1);
2. 211 USAF basic trainees, age 20-22 (1958) (2);
3. 198 non-job-noise-exposed USAF personnel, age 18-24 (1961) (3).

Spread of medians at each frequency ranges from 3.5 dB (left ear at 500 Hz) to 11.3 dB (left ear at 3000 Hz and right ear at 6000 Hz).

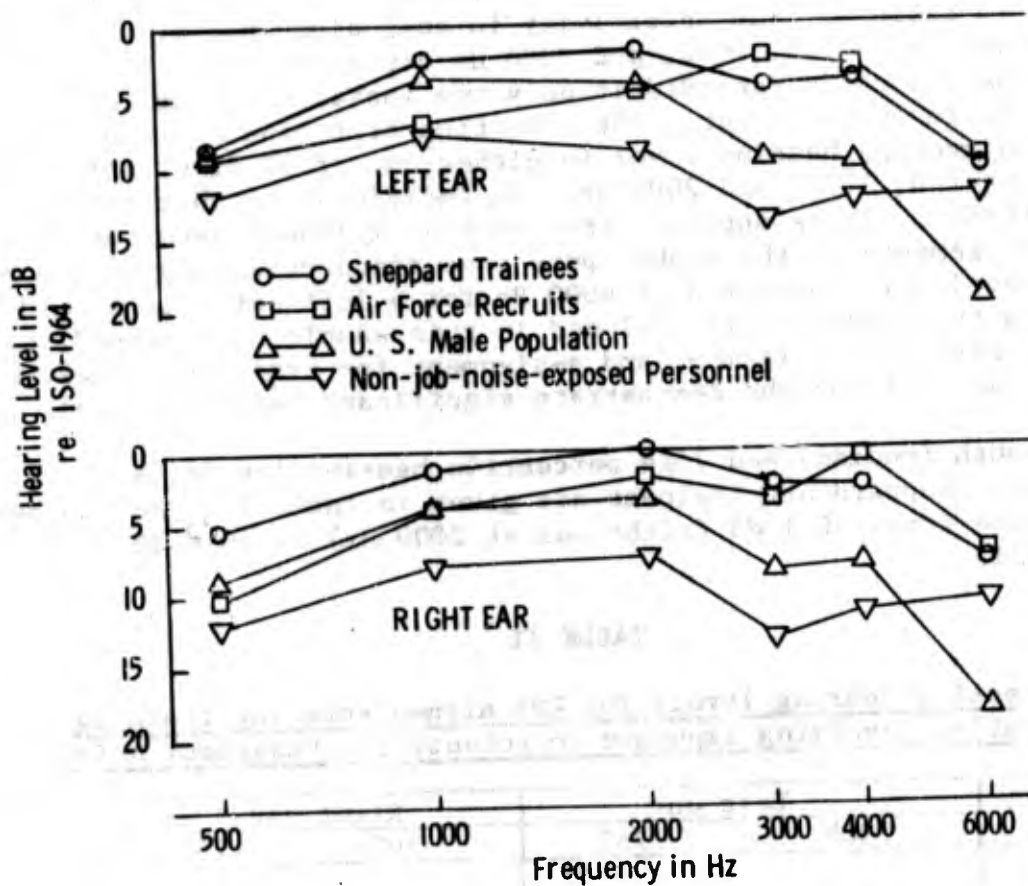


FIGURE 1

Median hearing levels for Sheppard AFB trainees and three other groups.

This is felt to be a relatively narrow range when the diversity of the groups is considered. The median hearing levels for the Sheppard AFB trainees are among the best that are displayed. The United States male population reflects somewhat poorer hearing than the Sheppard trainees. This was an expected result since the U.S. population survey covered all persons, including those with varying degrees of hearing deficits. The relatively poor hearing which appears for the non-job-noise-exposed personnel has no readily apparent explanation.

The compatible relationship of median hearing levels for the Sheppard AFB trainees with other similar age groups lends support to their acceptance as a standard to apply to hearing levels in a noise-exposed population. The average effects of aging will need to be considered when assessing the hearing of older noise-exposed persons, individually and as groups.

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