AUDIO-VISUAL QUIZ ON HEARING CONSERVATION PROGRAMME

AN INDEPENDENT PROJECT SUBMITTED IN PART

FULFILLMENT FOR THE FIRST YEAR MASTER'S **DEGREE**

IN SPEECH AND **HEARING** *TO THE UNIVERSITY OF MYSORE*

REG. *NO. M-9510*

ALL INDIA INSTITUTE OF SPEECH AND HEARING

MYS0RE-S70 006

INDIA

CERTIFICATE

This is to certify that this Independent Project entitled ***"AUDIO-VISUAL QUIZ ON HEARING CONSERVATION PROGRAMME"*** *is the bonafide work, done in part fulfillment* for *the first year of the Master's Degree in Speech and Hearing of the student with Registration No. M-9510.*

Mysore

May'96

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CERTIFICATE

This is to certify that this Independent Project entitled ***"AUDIO-VISUAL QUIZ ON HEARING CONSERVATION PROGRAMME"*** *has been prepared* under *my supervision and guidance.*

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DECLARATION

I hereby declare *that this Independent Project entitled* ***"AUDIO-VISUAL QUIZ ON HEARING CONSERVATION PROGRAMME"*** *is the result of my own study undertaken under the guidance of* ***Dr. (Miss) S. Nikam,*** *Director, All India Institute of Speech Hearing, Mysore, and has not been submitted earlier at any University for any other Diploma or Degree.*

Mysore

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Reg.No. M-9510

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INTRODUCTION

Inspite of such widespread *harmful effects of noise on human auditory system directly and few other indirect effects that are*

- *Reduction in work efficiency*
- *Physiological changes in heart rate and blood pressure and*
- *Psychological distress.*

There are only few industries were HEARING CONSERVATION PROGRAM is practiced. Also, it is noted that most of the industrial workers were unaware about the hazardous effects of noise, measures available to reduce the effects of noise, to claim for compensation, etc.

These *above mentioned facts made it necessary for a quiz on "Hearing Conservation Programme" that could be informative in addition to being interesting. Quiz on HCP was made to increase the awareness about harmful effects of noise on human auditory systems; use of simple measures to reduce the harmful effects of noise and to improve the quality* of *life.*

The questions were choosen which were informative and easy for the common man and enabled him/her to *gain adequate information on this subject.*

Purpose of *hearing conservation program*

Hearing conservation program or HCP serves the *following purposes:*

i. To prevent industrial employees from developing NIHL on the job.

ii. The HCP also provides a health screening benefit for employees, since non-occupational hearing losses and potentially treatable ear diseases are 'often detected through annual audiograms.

iii. The employer benefits directly by implementing an effective HCP that maintains employees' good hearing, since worker *will remain more productive if their communication abilities are not impaired.*

iv. *Effective HCPs can reduce accident rates and promote work efficiency, as well as reduce the stress and fatigue related to noise exposure.*

v. The HCP is an integral aspect of the employer's *overall policy towards worker health and safety practices. Employee relations are better and job turnover is lower for companies that pay attention to the working environment.*

vi. Effectively implementing an HCP reduces compensation, claims and rising insurance premiums by the employees.

M***ETHODOLOGY***

Subjects

Eight students were randomly selected to participate in the quiz programme. They were divided into four teams randomly as A, B, C and D team respectively. Each team had two participants.

Age range: *17 to 21 years*

Questions

The questions for the quiz were prepared from different books, journals and handouts available in AIISH library. Five rounds of *questions were set up altogether*.

a. *General round*

Questions comprises of general information regarding noise and its effect on human auditory system.

b. Multiple choice question

Each question had 4-5 *options and subjects were requested to answer from any of these options which they found suitable and accurate.*

3. Abbreviation round

Subjects were asked to expand the term which was being asked by the quiz master.

4. Visual round

Here the instrument was displayed on the monitor and respective team was asked to identify and name the *instrument.*

5. Rapid fire round

In this round, questions were asked by the quiz master and teams with the answers were expected to press the buzzer as fast as they could. The team which presses the *buzzer first gets the opportunity to answer.*

Rules for* the *quiz

1. There are five rounds for *the quiz, viz.*

1st round = General round

2nd round = Multiple choice question

3rd round = Abbreviation round

4th round = *Visual round*

5th round = Rapid fire *questions round*

2. Each question has 20 seconds time to answer, if the particular team cannot answer question will be passed to the next team and will be given 10 seconds to *answer.*

3. Each correct answer carries 10 points for *all the* round except the *rapid fire round* where each correct answer carries *2 points. In the* rounds except the 5th one, i.e..

rapid fire round for pass question carries 5 bonus points.

4. There is no negative marking

5. For fifth round, i.e. buzzer round which ever team presses the buzzer first, gets the chance to answer. If the answer is correct carries 2 points and if can't answer it is net passed.

5. For visual round, the monitor will display the instrument for identification.

7. Quiz master's decision is final.

ROUND-1: GENERAL ROUND

Question 1: *What* are the *most direct effects of noise ?*

Question 2: What *is noise ?*

Question 3: *In what ways noise produces harmful effect on hearing ?*

Question 4: What is the *main interest of an audiologist in industrial hearing conservation programme ?*

ROUND-2: MULTIPLE CHOICE ROUND

Question 1: What is the purpose of industrial hearing conservation programme ?

a. Survey *of noise*

b. To *prevent employees from developing noise induced hearing loss on the job*

c. *To measure the hearing of industrial workers*

d. To create awareness about harmful effects of noise

e. All of these

Question 2: As per DRC followed in India, what are the permissible levels of noise at different situations ?

(R = Residential area, C = Commercial area, I = Industrial area)

a. R - *65, C - 75, I - 85 dB*
b. R - 35, C - U5, I - *55 dB*
c. R - 45, C - 55, I - 65 dB
d. R - 75, C - 85, I - 95 dB

Question 3: Ear Protective Device (EPD) control noise at

a. The source of noise generation

b. At the receiver's *end*

c. *In the transmission pathway*

d. *All the three levels - primary, secondary and tertiary*

Question 4: *Who are the personnel involved in HCP (Hearing Conservation Programme) ?*

a. Top managements
b. Middle managements
c. Supervisors
d. Employees
e. *All* of these

ROUND-3: ABBREVIATION ROUND

Question 1: NRR

Question 2: NIOSH

Question 3: NIPTS

Question 4: *DRC*

ROUND-4: VISUAL ROUND

Question 1: SLM

Question 2: Dosimeter

Question 3: Microphone

Question 4: EPD

R0UND-5: RAPID FIRE ROUND

Question 1 : What is HCP ?

Question 2 : Who is the wain professional involved in the field of HCP ?

Question 3 : What are the different types of noise ?

Question 4 : Name two instruments for measuring noise ?

Question 5 : How does an EPD act ?

Question 6 : Impulse noise could be measured with which instrument ?

Question 7 : What are the frequency networks of SLM ?

Question 8 : What does pre-employment audiogram refer to ?

Question 9 : Which microphone is used in noise measurements?

Question 10: With which instrument measurement of hearing can be done ?

Question 11: Can the patient claim compensation due to NIHL from the company ?

Question 12: How frequently hearing should be evaluated for hearing assessment ?

Question 13: What is the difference between temporary threshold shift and permanent threshold shift ?

Question 14: Who should provide the EPD to the industrial worker ?

Question 15: What are the major types of EPDs ?

APPENDIX

INDUSTRIAL HEARING CONSERVATION PROGRAMME

Industrial hearing conservation programme refers to prevent employees from developing noise induced hearing loss on the job. Conservation is defined as, "a careful preservation or protection of something, the planned management of a natural resource to prevent exploitation, distruction or neglect".

"Prevention" means "to keep safe from injury, harm on destruction, to keep alive, intact, free from decay"

- Webster, 1969

Conservation and rehabilitation attempts to minimize handicaps of hearing loss. The most distinctive feature of hearing conservation in an industrial environment is that we have been able to identify a noxious agent that has a pervasive effect on hearing of people working in this environment. Agent is intensive noise. The national safety council has recognized the importance of hearing conservation in industry and has published a comprehensive reference (Olishifski and Harford, 1975) for use by the involved professional.

Noise is defined as complex sound waves having aperiodic and irregular vibrations which is considered as unpleasant and undesired sound.

Effects of noise on hearing

There *is no doubt that hazardous noise conditions produce destruction of auditory sensory cells (Lim and Melnick, 1971), in the cochlea, and that sufficient destruction of these elements will produce hearing loss (Sataloff and Michael, 1973). Many of the hazardous properties of noise can be defined.*

Effects of noise on hearing

Effects of noise on hearing may be divided generally into three categories.

1. Temporary threshold shift

Temporary Threshold Shift (TTS) is a short term effect which may follow an exposure to noise. TTS refers to an elevation in the threshold of hearing which recovers gradually following noise exposure.

2. Permanent threshold shift

Permanent threshold shift (PTS) are those hearing changes which persist throughout the *life of the affected person. When threshold shift is permanent, there is no possibility for further recovery with the passage of time following exposure*.

3. Acoustic trauma

Acoustic trauma refers to damage to hearing from sudden high intensity sound, such as explosion.

Hearing conservation programme should be started immediately if following conditions prevail:

- *Difficulty in speaking while in noise*
- *Heard noises/ringing in ear after working in noise for several hours*
- *A temporary loss of hearing that has the effect of muffling speech and changing the quality of other sounds after several hours of exposure to noise.*
- *Prepared by the subcommittee on noise of the committee on conservation of hearing of the American Academy of Opthalmology and Otolaryngology (AAOO, 1973) for guide for the conservation of hearing on noise.*

Industrial hearing conservation programme should include:

1. *Noise exposure analysis*
2. *Provision of noise control (including hearing protectors)*
3. *Measurement of noise*
4. *Employee and employer notification and education*

2. *Noise exposure analysis*

Noise exposure analysis is done through survey which is complex, highly technical task that requires extensive training. Noise can be hazardous depending upon

- *Intensity of noise*
- *Spectrum of noise*
- *Distribution and duration of exposure during work day*
- *Overall exposure during work life*

Steps* in noise exposure *analysis

i. Site of inspection

Walk through areas which are *considered potentially problematic regarding noise levels. Inquire about 'uptime' and 'downtime' for specific areas and processing machinery.*

ii. Calibration of instrument

Calibrate SLM network and dosimeter which are used for noise measurement. SLM can be calibrated by instruments like piston phone, acoustic calibrators.

iii. Placement of instrument *and* ***orientation***

Vibration of source may be cause erroneous sound level readings. Sound instrument should be *mechanically isolated from any vibratory source. Simple hand hold or*

placement of *equipment on a foam, rubber pad is usually satisfactory. Microphone should be placed at location normally occupied by the ear of the* worker. *Head shadow effect can contaminate the measures by as much as 10-15 dB so it should be taken into account.*

iv. Measurement *protocol*

Confer with appropriate plant personnel and prepare the report.

2. Provision of noise control

Provision of noise control (including hearing protectors) requires highly technical skills. It should be undertaken by acoustic engineers. It should be carried out at three levels:

i. Noise control at the source

ii. Noise control in the transmission path

iii. Using protective measures by the receivers

i. *Noise reduction at the source*

Can be accomplished by careful acoustic design of new equipments, modification of designs of machines in use by keeping the equipment in good repair. A few measures suggested are:

- *By reducing the impact/impulsive forces*
- *By balancing magnetic forces*

- By balancing the rotating masses
- By reducing frictional forces by proper alignment and lubrication
- By using process of dynamic compensation, i.e. using dynamic absorbers which provide a compensating force and reduces structural borne noise, radiated by light not metal vibrating element.

ii. Noise control in transmission path

Noise could be controlled in the transmission path by applying following techniques:

- By increasing distance between source and receiver as far as possible or the alteration of relative orientation of the source and the receiver.

- Careful planning of location of rooms within building with respect to the relative position of the noise source and areas where noise is not desired.

- Adding sound barriers which diverts the noise pathway in open air as using deflecting surface at 45° to the horizontal plane which reflects the high frequency noise towards the sky.

- Use of enclosures for the sound source or receiver suitably designed.

- Mismatch of impedance using acoustic filter and muffler, i.e. energy is reflected by the source.

- Discontinuity in the transmission pathway, i.e. gap of 2 mm between the two walls of a building.
- Educating public

***iii. Using protective measures by the* receiver**

An effective hearing protector serves as a barrier between the noise and the inner ear, where noise induced damage occurs.

Personal hearing protective devices

According to OSHA it is a temporary/interim method of protecting the hearing of a worker. Personal hearing protective devices (PHPD) are divided into

a. enclosures
b. aural inserts
c. semiaural and
d. circumaural

a. Enclosures

It is built into equipment that covers the entire head, eg. helmet.

35 dB attenuation at frequency below 1 kHz and upto 50 dB above 1 kHz can be used with other hearing protectors, reducing the BC sound to some degree. It is expensive and bulky and used in site where protection from impact/flying objects is required in addition to hearing protection.

b. Aural protection

are most popular which are inserted into the ear canal to provide a seal against the canal walls. Commonly known as ear plugs. They are available in three types:

- *formable*
- *custom-mould and*
- *moulded*

Provides attenuation of 5-15 dB below 1 kHz and 15-25 dB above 1 kHz.

c. Semi-aural

are small stoppers which seal against the entrance to the ear canal by the force of a band which is usually worn under the chin or behind the neck. They are most suitable for a brief period of use.

d. Circumaural

Commonly referred as ear muffs which enclose the entire external ears inside a rigid cup.

3. Measurement of noise

Audiometric examination is the one of the available ways to detect an individual's susceptibility to noise. Periodic examination can detect how employee is being affected by noise.

Measurement of hearing

An industrial hearing measurement should involve establishment of individual employee's auditory sensitivity before exposure or at initiation of hearing conservation programme. This comparison serves as reference audiogram. It should be obtained before the employee is hired. The hearing conservation programme amendment (vs. Department of Labour'83) requires that employees exposure to 85 dBA and above have annual audiograms for the duration of their employment in a hazardous noise environment.

Periodic follow ups required which serve to monitor subsequent changes in hearing

- *TTS*
- *The criterion for comparison of annual audiogram to base line is OSHAs as, "A change in hearing sensitivity is defined as any average shift from baseline level of 10 dB or more at frequencies 2 kHz, 3 kHz and 4 kHz*

American Academy of Otolaryngology define criterion for *atological referral as a change in audiological test for either ear which compared with baseline audiogram.*

a. > 15 dB for average 500 Hz, 1 kHz and 2 kHz

b. > 20 dB for average 3 kHz, 4 *kHz and 6 kHz*

Frequently testing in an industrial site warrant construction of sound *treated room.*

Role of audiologist

- *Initiating and maintaining an industrial hearing conservation programme.*

Audiologists frequently involve themselves in consulting roles.

- *Maintaining* test *schedules*
- *Services provided by audiologist*
  - *Hearing testing service*
  - *Education programmes*
  - *Consul tings to employers and employees*
  - *Selection of PHPDs*
  - *Promote industrial hearing conservation programme*

4. *Employee and* employer's *notification and education*

Education of both in hearing conservation programme is prerequisite and vital for *success. OHSA says that testing and education sessions to be given annually atleast to the employees exposed to 85 dBA* or more. The *programme content must be updated every year and delivered to those who project genuine concern about the hearing.*

They should be informed on effects of noise on hearing, purpose and procedure of *audiological test,* proper *set, fitting, use and care of PHPDs. If not conveyed, it can impede success. When done* properly *it can promote*

co-operation from *all* participants. *Effective educational programme requires regular activities throughout the year. It provides information to help employees understand how their hearing thresholds can be compared to expected age; effects, hearing loss will increase the motivational benefits of the audiometric result.*

Educational programmes should involve participation of top managements, medical, audiological, plant nurses, front line supervisors, officials and noise exposed employees.

Record keeping

Record *keeping is an integral part of each phase, not a separate activity*.

It gives information on noise exposure level, location, data and time, audiogram pattern of the employee.

In addition to legal documentation it provides records of employee which is helpful in monitoring the programme and sharing information among HCP team members.

ANSWERS

Round 1: General round

Answer 1: Capacity of noise to produce hearing loss and obvious interference with speech communications produced by masking noise due to background noise.

Answer 2: A complex sound wave having aperiodic and irregular vibrations which is considered unpleasant or undesired sound.

Answer 3: By producing TTS, PTS and acoustic traum

Answer 4: Area of hearing measurement

Round 2: Multiple choice round

Answer 1: e, i.e. all of these

Answer 2: a, i.e. R-65, C-75, 1-85 dB

Answer 3: b, i.e. at the receiver's end

Answer 4; e, i.e. all of these

Round 3: Abbreviation round

Answer 1: NRR : Noise reduction rating

Answer 2: NIOSH: Noise reduction rating, National Institute of Occupational Safety and Health

Answer 3: NIPTS: Noise reduction rating, Noise induced permanent threshold shift

Answer 4; DRC: Damage risk criteria

Round 4: Visual round

Answer 1: SLM

Answer 2: Dosimeter

Answer 3: Microphone

Answer 4: EPD

Round 5: Rapid fire round

Answer 1 : Hearing conservation programme

Answer 2 : Audiologist

Answer 3 : Steady state noise, impulse noise, etc.

Answer 4 : Oscilloscope, SLM

Answer 5 : Reduction of noise at receiver's end

Answer 6 : SLM or oscilloscope

Answer 7 : A, B, C, D linear

Answer 8 : Audiogram done before hiring an employee or first audiogram of an employee

Answer 9 : Electreat

Answer 10: Audiometer

Answer 11: Yes

Answer 12: Three months

Answer 13: One is temporary loss whereas other has permanent effect

Answer 14: Audiologist, management, manufacturer

Answer 15: Enclosures, aural inserts, semiaural, circumaural

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