Hearing Loss Inquiry using Audiometry

S.Prasath, N.Subhalakshmi, T.Manoj Prasath, R.Vasuki

ABSTRACT--- The etiology of hearing misfortune is multifactorial which makes the analysis a difficult exercise and frequently an unsolved puzzle. While unadulterated tone audiometry is an obligatory examination, others, for example, research facility and radiology depend on clinical assessment. This current report's on the examination of connection between self-detailed commotion presentation amid relaxation activities and audiological indicators including measured hearing threshold levels (HTL) and tinnitus. The research was conducted by cross sectional survey of 1432 individuals from 11 to 35 years old. Methodology included of a full audiometric assessment including otoscopy, pure tone audiometry (PTA), otoacoustic emission (OAE) and tympanometry, hearing loss investigation, diagnosis, evoked response audiometry radiology, deafness.

Keywords— Audiometry,Atoacoustic Emission,Tymapnometry

INTRODUCTION:

Sensorineural hearing misfortune (SNHL) alludes to hearing debilitation coming about because of natural issue of cochlea or the sound-related nerve and its associations in brainstem. Typical hearing relies upon honesty of the sound-related pathway and on vascular, hematological, metabolic and endocrine frameworks. An assortment of etiologies have been ensnared (Table 1), and a wide scope of examinations (Table 2) are accessible. Be that as it may, pinpointing the analysis in sensorineural hearing misfortune can be a difficult exercise. In this paper, we endeavor to advance a convention for the examination of sensorineural hearing misfortune.

Media and logical distributions much of the time imply an expanded rate of hearing misfortune through expanded commotion introduction amid recreation exercises – especially including uproarious music. A few investigations have revealed huge hearing edge moves in youthful populaces ascribed to unreasonable commotion introduction from the expanding cooperation in high clamor relaxation exercises (1-5). Other distributed work provides reason to feel ambiguous about this presumption (6-8). An ongoing complete audit of the writing around there reasoned that discourse to date has been "ostensibly more theoretical than prove based" and that further more clear, unambiguous data is required (9).

Revised Manuscript Received on July 10, 2019

S.Prasath, Assistant Professor, Department Of Biomedical Engineering, Bharath Institute of Higher Education and Research, Chennai. T.N,India.

N.Subhalakshmi, Assistant Professor, Department Of Biomedical Engineering, Bharath Institute of Higher Education and Research, Chennai. T.N,India.

T.Manoj Prasath, Assistant Professor, Department Of Biomedical Engineering, Bharath Institute of Higher Education and Research, Chennai. T.N,India.

Dr.R.Vasuki, Assistant Professor, Department Of Biomedical Engineering, Bharath Institute of Higher Education and Research, Chennai. T.N,India.

It is acknowledged that long haul clamor introduction will cause commotion damage (NI) or hearing misfortune (HL) (for example an unadulterated tone edge move). Given adequate introduction, a huge hearing debilitation (HI) may happen (10). Three imperative components add to clamor presentation: the 'normal uproar's (LAeq) over the span of the occasion; the timespan of the occasion itself; and the quantity of occasions altogether[1-6].

While considering non-work and relaxation clamor it must be perceived that as a person's way of life changes so to do their recreation exercises[13-19]. The introduction to commotion from specific exercises will change amid movement from immaturity to adulthood. Subsequently as way of life changes so noises presentation. In this manner as an individual ages their recreation profile changes and their commotion presentation profile additionally changes (11). In this setting the National Acoustic Laboratories (NAL) established a venture called "Pervasiveness hearing misfortune and its relationship to recreation sound presentation" financed by the workplace of Hearing Services, under their Hearing Loss Prevention Program (12) REI 244/0708. The information introduced here is a subset of the bigger examination.

This investigation set out to test the theory: "Is the apparent increment in recreation commotion introduction detrimentally affecting the consultation strength of youthful Australians, as confirm by hearing limit levels?"

MATERIALS AND METHODOLOGY

Subjects

An example of the NSW populace somewhere in the range of 11 and 35 years of age was enrolled from different associations including secondary schools, colleges, TAFE Colleges and an assortment of working environments from government and private parts. The main criteria was to be inside the objective age extend[7-11].

Members finished a thorough hearing wellbeing, mentalities and conduct review with a specific accentuation on relaxation support including noteworthy clamor[20-29]. This included yet was not constrained to; participation at move clubs, shows, noisy music occasions; individual stereo use; playing a melodic instrument; investment in a band or symphony; gun use; and engine sports, The review was finished, on paper or on-line, preceding participation at an evaluation arrangement for far reaching audiometric testing, Further inquiries identifying with current hearing wellbeing status, ongoing commotion presentation and learning of hearing wellbeing standards were asked amid the arrangement[30-35].

An all out number of 1432(m = 42%,f = 58%) people gave satisfactory data to have the capacity to add to this investigation. The full subtleties of the limits of this gathering were distributed beforehand (13). No individual motivations were offered, however a humble gift for every member was settled on to the philanthropy of decision of each taking an interest association[36-45]. Associations were enlisted from a different scope of zones including city, more prominent metropolitan and rustic areas trying to incorporate investment from a wide scope of financial and statistic foundations.

Audiometric testing

Audiometric testing was carried out on-location. The audiometric test conditions met the requirements of international standards for measuring to a minimum 0 dB HTL with an uncertainty of +5 dB (14). This was managed by choosing quietest, appropriate available location at the test site and by use insert earphones covered by a noise excluding headset (15) thus ensuring that the strict requirements for maximum permissible ambient sound pressure levels as stipulated by ISO 8253-1 (14) were met. Ambient noise conditions were sampled throughout the test session and any results obtained during non-complaint conditions were excluded from the analysis.

Audiometric tests included air-conduction audiometry (500, 1000, 2000, 4000, 6000 & 8000 Hz) and bone-conduction audiometry (500, 1000, 2000, 4000 Hz) if air-conduction thresholds were worse than 15 dB (masked required). Prior to audiometric testing an otoscopic examination was undertaken to exclude occluded ear canals or any other irregularity. All tests were carried out by appropriately qualified, professional audiologists. A comprehensive description of all audiometric tests carried out and detailed hearing threshold levels determined, are presented in detail in a specific report on this aspect of the study (12).

Both distortion product (DPOAE) and transient evoked (TEOAE) were measured. For DPOAE amplitude (two protocols) and signal-to-noise ratio (SNR) parameters were measured in the range 1.5-4 kHz, and for TEOAE reproducibility, amplitude and SNR were measure from 1 – 4 kHz.

Estimation of life-time noise exposure

NAL has investigated noise exposure over many years and has developed specific research tools to gather information on the historic noise exposure of individuals and groups (16). These measures provide data used to estimate cumulative life time noise exposure, by extending the techniques described in International Standard ISO 1999 for calculating the daily A-weighted sound exposure, EA, 8h (10). The ISO technique is extended by summing multiple exposures, from multiple sources over an extended period. This includes all significant exposures over a life time. Cumulative noise exposure is presented in the units of Pascal provides the value hours (Pa2h) rather than Pascal squared seconds (Pa2s) as is used for EA**,**8h. This procedure provides the value of an eight hour continuous A-weighted noise exposure of 85 dB being 1.01 Pa2h rather than 3.64 kpa2s.

The value 1.01 Pa2h represents a significant value as it is the define action level, or Exposure Standard, for exposure to continuous workplace noise in Australia and New Zealand (17). As such it conveniently represents a recognisable indication of the relative risk of hearing loss, or noise injury, for the noise exposed individual. Furthermore, the figure of 1.01 Pa2h represents what can be considered as an “acceptable daily exposure”. This does not represent zero risk, rather it represents what is agreed as a generally acceptable exposure risk. This concept provides the basis for the following discussions.

Accumulated information on typical noise exposure during non-work and leisure activities, particularly those considered ‘high risk’, are used when estimating individual noise exposure (18). An activity is considered to be high risk when it presents a noise risk an order of magnitude greater than that provided by exposure to the recommended Exposure Standard of 1.01 Pa2h.

What is a ‘safe’ as opposed to ‘acceptable’ noise exposure level?

Having established what can be considered as an acceptable level of daily exposure, it is possible to propose a ‘safe’ or ‘low risk’ exposure level. If the acceptable risk is taken to be 1 Pa2h/day then a negligible risk of one tenth of this, 0.10 Pa2h, could be proposed as posing a relatively negligible risk. This is equivalent to a daily exposure, LAeq, 8h, of 75 dB.

Data analysis and Ethics

All statistical calculation were carried out using Microsoft Excel 2010 and/or Statistica Version 10 (Dell P/L). Ethics approval was provided by the Australian Hearing Human Research Ethics committee and with respect to work in schools, the NSW Department of Education and Training – Student Engagement and Program Evaluation Bureau.

RESULT AND DISCUSSION

Nothing that the aim of this study was to examine the relationship between leisure noise exposure and hearing health, the initial analyses of the data were concerned with a comprehensive examination of participant hearing thresholds and/or hearing loss with respect to their cumulative life time noise exposure. Numerous attempts were made, using multiple regression analysis, to relate cumulative exposure to individual threshold levels and combination of threshold levels. This included using thresholds at individual frequencies and the averages of several combinations of threshold levels at selected frequencies. There were no statistically significant correlations found between life time cumulative noise exposure and hearing thresholds.

The information obtained from participants indicates there is an extremely wide variation of noise exposure across the community and that the exposure levels may be expected to produce a permanent hearing threshold shift (PTS) in many individuals. Cumulative exposure ranged

from relatively negligible values up to a maximum of 86.7 kPa2h with an exposure rate of 2.94 kPa2h per year. This is, far beyond the expected occupational exposure for an equivalent individual working in industry if exposed to a level at the Exposure Standard of 1 Pa2h per day for 220 working days per year for forty years, who only receives 8.8 kPa2h.

As is clearly shown from Tables 1 and 3 there is no demonstrated significant hearing loss across the sampled populations. That is there is no evidence of a shift in the noise exposed population where it would be expected on the basis of previous reports (1), (2), (3) and ISO 1999 (10). The threshold distributions down to the 0.90 fractile can be considered as clinically insignificant or unremarkable down to the poorest value of 15 dB across all frequencies. It should be noted that currently there are no recognised normative threshold levels published for any large scale populations younger than 18 years old. The closest applicable set of reference HTLs come from International Standard "ISO 7029 which commence at age 18 years (20). The normative levels presented in Table 1 agree well with those presented in ISO 7029 taking into consideration that in the method under discussion here the minimum HTL measured was 0 dB due to constraints of field testing (19).

It is important to emphasize that these results do not suggest that frequent exposure to loud sound does not and will not affect hearing thresholds, particularly if the existence of International Standard "ISO 1999 Acoustics – Estimation of noise – induced hearing loss" (10).

In interpreting these findings, it is also important to consider that there is evidence that individuals display varying susceptibility to noise exposure in terms of noise injury and hearing loss (10), (22). It may be possible that the variable characteristics of noise in leisure situations produce different outcomes when compared to the more consistent characteristics of workplace noise (23). The range of thresholds (presented in Table 3) associated with the range of exposures for the most highly exposed participants may be indicative of varying individual susceptibility as predicted by ISO 1999.

The results in the current work were closely mirrored in an earlier, on-line survey of exposure to loud leisure noise activities conducted by the National Acoustic Laboratories and the ABC, 'Sound Check Australia' (22). In this study individuals were asked about their participation in high-noise leisure activities and symptoms of hearing damage. Tinnitus question responses indicated experience of tinnitus at: 30% 'never'; 37% 'occasionally'; 18% 'sometimes'; 4% 'often'; and 2% 'always'. There were 9% of survey respondents who selected the 'unsure' category for this question and were excluded from further analysis. If the 'occasionally' and 'sometimes' categories are combined these results closely mirror the current study. Both this study and the current, in fact, represent the same overall Australian population so close agreement is to be expected.

There is a growing body of evidence showing that central auditory processing is slower, weaker and localized differently in the noise exposed human brain. Recent research suggests that noise exposed individuals' auditory skills are adversely affected prior to the clinical measurement of a hearing loss (24), (25). This could be the basis of the frequently made comment 'I can hear OK, but sometimes have trouble following conversation in background noise'.

CONCLUSIONS:

The results her demonstrated that there is no evidence of changes in hearing thresholds or otoacoustic emissions due to noise exposure from leisure activities. However, the experience of tinnitus has been clearly demonstrated to be widespread in the young adult population and there is a strong relation to cumulative noise exposure from noisy activities. Improved, personalized hearing health education messages could draw attention to the experience of tinnitus after early episodes of noise exposure, utilizing this awareness s a facilitator for future personal preventative action by young adults before higher levels of noise exposure are reached.

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