THE RELATIONSHIP BETWEEN LIFE-TIME NOISE EXPOSURE AND EXPERIENCE OF TINNITUS AMONG YOUNG ADULTS IN THE INTERNATIONAL ISLAMIC UNIVERSITY (IIUM) KUANTAN

ZIRWATU HANANI, B. AUD (HONS.)

Department Of Audiology and Speech-Language Pathology, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota 25200 Kuantan, Pahang, Malaysia

zirwamh@gmail.com

WAN AHMAD WAN ASLYNN, Ph.D. (CORRESPONDING AUTHOR)

Department Of Audiology and Speech-Language Pathology, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota 25200 Kuantan, Pahang, Malaysia

wanaslynn@iium.edu.my

MARINA L. ALISAPUTRI, Ph.D

Department Of Audiology and Speech-Language Pathology, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota 25200 Kuantan, Pahang, Malaysia

marina@iium.edu.my

ABSTRACT

Introduction: Clinical studies have shown that people suffering from tinnitus are at a high risk of developing serious psychological disturbances or serious psychological distress (Erlandsson & Widen, 2004 in Hiller and Goebel, 1998). Thus, the purpose of this study was to determine the relationship between life-time noise exposure and tinnitus experience among young adults in IIUM Kuantan. **Methods:** A cross sectional study was used to determine whether there is any association between tinnitus experiences and life-time noise exposure among 11 young adults in IIUM Kuantan from age of 18 to 35 years old who are exposed to the noise. Hearing assessment was done using otoscopy, tympanometry and pure tone audiometry. Participants were asked to fill in a questionnaire on tinnitus experience, and were fitted with a noise dosimeter that measured their noise exposure during waking hours. Values collected from dosimeter were then converted into cumulative life-time noise exposure which refers to the equivalent noise exposure per year (Jokitulppo, Tolvenen & Bjork, 2005). **Results:** Average cumulative life-time noise exposure of the participants is 72.54 dBA ± 6.9459. Fifty five percent (55%) reported of sometimes having tinnitus. No correlation was found between cumulative life-time noise exposure and tinnitus experience. **Conclusion:** The cumulative life-time noise exposure among young adults in IIUM Kuantan was found to be lower than the level considered as hazardous. Despite reports of tinnitus experience, there was no evidence that the tinnitus was due to noise exposure.

KEYWORDS: *Life-time noise exposure, Tinnitus, Noise dosimeter, Young adults*

INTRODUCTION

In order, to maintain a good quality of life, hearing should not be forgotten as one of the main factors as it can enrich our life and able to make us socialize and having a comfortable working life. Hearing loss that cannot be detected during childhood can be worsening in adulthood if they were exposed to an intense noise exposure during childhood (Gates, Schmid, Kujawa, Nam, D'Agostino, 2000; Kujawa & Liberman, (2006) in Holmes, Widén, Erlandsson, Carver, & White, 2007). Jokitulppo, Bjork, & Akaan-Penttila (1997) quoted from Axelsson et al. (1981); Rytzner & Rytzner (1981); Lees et al. (1985); Borehgrevink (1990) indicate an increased incidence of hearing handicap in teenagers due to leisure noise. The World Health Organization (WHO), (2017) defines environmental noise as noise from all sources with the exception of workplace noise. The sources of the noise could be from transportation, industrial activities, construction sites and leisure activities. As for this research, it is specifically focusing on leisure activities that can contribute to noise such as music, festival, and recreational vehicles. Basner et al. (2014) categorises noises as occupational noise, environmental noise and social noise.

Loud sound encountered during everyday leisure activities is variously referred to as "leisure noise" or "social noise" (Carter, Black, Bundy, & Williams, 2014 quoted from Smith et al., 2000). For this research, the term of leisure noise is used. Most of the participants exposed to leisure noise from listening to music, followed by working with machine, watching movies in cinema and karaoke with an average of one or two hours of exposure per day. While for young Australians, they listed listening to music, going to nightclubs and live music concert would be the chosen leisure activities among young Australians ("The facts on hearing loss", n.d).

Tinnitus as one of the hearing loss symptoms which can be characterised as one or more sounds perceived in one or both ears, alternatively perceived as being in the head, without any external source of sound (Erlandsson and Widen, 2004). Besides, tinnitus will also increase as a consequence of environmental factors, for example exposure to loud noise (Erlandsson and Widen, 2004). This is supported by Williams and Carter (2016) who revealed that there is an increase in persistence of tinnitus with increasing mean cumulative of noise exposure.

METHODS

Subjects

In total, 11 young adults between 18 to 35 years old from the International Islamic University Malaysia (IIUM) Kuantan campus who are exposed to leisure noise volunteered in this research.

Data Collection Procedures

Participants, aged between 18 to 35 years old, who participated voluntarily were asked further questions which were based on the exclusion criteria of this research. The inquiries include information about their exposure to leisure noise and smoke from cigarettes and if they suffer from any otological problems, head or neck injuries or any other long term illnesses

Hearing assessment was done using otoscopy, tympanometry and pure tone audiometry. Participants were asked to fill in a questionnaire on tinnitus experience, and were fitted with a noise dosimeter that measured their noise exposure during waking hours (on average 16 hours). Values collected from dosimeter were then converted into cumulative life-time noise exposure which refers to the equivalent noise exposure per year (Jokitulppo et al., 2005).

Instrumentations

i) Audiometric Testing

Otoscopic examination, tympanometry and pure tone audiometry were conducted in order to make a full hearing assessment as well as excluding the participants who have any otological problem.

ii) Questionnaire

The questionnaire regarding tinnitus was taken from William and Carter (2016), entitled "Leisure Noise and Tinnitus". The questionnaire wa divided into five sections, which are demographic information, ear and hearing history; tinnitus, noise exposure and others. The questions about the factors that may lead to tinnitus were included in the last section.

iii) Noise Logging Dosimeter

Noise logging dosimeter was used to measure the noise exposure level of a person integrated over a period of time. For this research, the dosimeter is worn during the waking hours, it started from the time the subject woke up until they went to bed. The duration was about 16 hours. They only took the equipment off during shower and when taking ablution.

Data Analysis Procedure

All data were analysed using SPSS 20 software according to the proposed data analysis based on the objectives and is summarised in Table 1:

Table 1 Summary of Data Analysis According to the Specific Objectives

OBJECTIVES	EXPECTED DATA	PROPOSED DATA ANALYSIS
To measure life-time noise exposure and tinnitus experience among young adults in IIUM Kuantan	-Noise level, dBA -Tinnitus experience	Descriptive data analysis
To measure the correlation between tinnitus experience and life-time noise exposure among young adults in IIUM Kuantan	-Cumulative noise exposure, dBA -Tinnitus experience	Correlation

RESULTS

LIFE-TIME NOISE EXPOSURE AND TINNITUS EXPERIENCE AMONG YOUNG ADULTS IN IIUM KUANTAN

i) Life-time noise exposure

Table 2 Life-time noise exposure among young adults in IIUM Kuantan

Mean	**72.54 dB**
Standard deviation, sd	6.9459

The measurement of central tendency were computed to summarize the data for the lifetime noise exposure variable while the measurement of dispersion were computed to understand the variability of scores for the life-time noise exposure variable. The followings are the results of this analysis; N= 11, M=72.54, SD= 6.9459. It appears that the average cumulative life-time noise exposure among participants was 72.54 dB with a small standard deviation which means that the life-time noise exposure is not varied among the participants (Table 2). Therefore, the lifestyle of the young adults in IIUM Kuantan is not varied among them regardless of which courses they attended which causes a small variation of the life- time noise exposure among them.

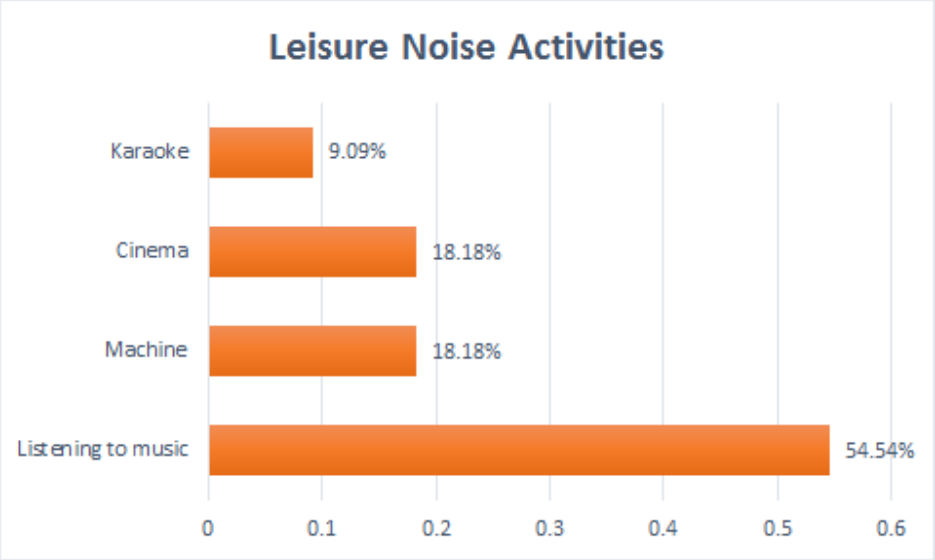

Figure 1 Leisure noise activities among young adults in IIUM Kuantan

The Figure 1 indicates 82% of young adults in IIUM Kuantan claimed that they were exposed to leisure noise by listening to music (54.54 %), working with machine (18.18 %), watching movies in cinema (18.18 %) and karaoke (9.09 %) with an average of one or two hours of exposure per day.

ii) Experience of tinnitus

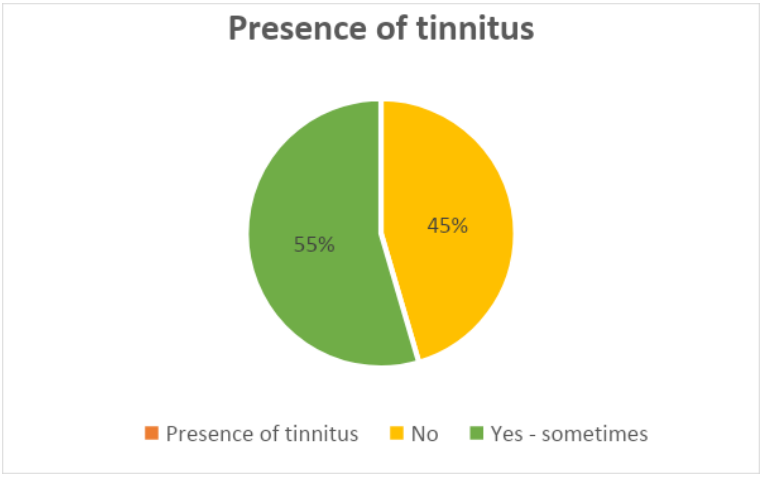

Figure 2 Presence of tinnitus among young adults in IIUM Kuantan

As shown in Figure 2, with the total of 11 participants, most of them reported having a tinnitus sometimes with the frequency of 6 people (55%) followed by 5 participants (45%) did not experience any tinnitus.

CORRELATION BETWEEN TINNITUS EXPERIENCE AND LIFE-TIME NOISE EXPOSURE AMONG YOUNG ADULTS IN IIUM KUANTAN

As shown in Table 3, there is no significant difference between life-time noise exposure and tinnitus experience among young adults in IIUM Kuantan ($p > 0.05$, $r = -0.058$, $n = 11$). Since the finding contradicts the hypothesis, which postulated that there is a significant correlation between these two variables, further discussion will be elaborated in the discussion session.

Table 3 Correlation between life-time noise exposure and tinnitus experience

	Sig value	Correlation coefficient, r
Life-time noise exposure [b]	0.866	- 0.058

b: Spearman correlation

DISCUSSION

THE LIFE-TIME NOISE EXPOSURE AND TINNITUS EXPERIENCE AMONG YOUNG ADULTS IN IIUM KUANTAN

i) Life-time noise exposure

Average cumulative life-time noise exposure among participants was 72.54 dBA which is lower than the level considered as hazardous. This finding corroborates the ideas of OSHA (1998) quoted by Beach et al. (2013) who sets the legal limits on noise exposure in the workplace which is 90 dBA for an 8 hour day.

A comparison with a study by Williams and Carter (2016) regarding the life-time noise exposure among young adults in Australia, shows the life-time noise exposure is 112.7dBA which is more than the current finding. This huge difference of life-time noise exposure among young adults in Australia and IIUM Kuantan might be influenced by the type of leisure noise that have been exposed among young adults in New South Wales, Australia and in Kuantan, Malaysia.

The difference in the common leisure activities between these young adults could contribute to the big gap of cumulative noise exposure among them. As these activities among the young Australians can be perceived as the loudest leisure activities and produced the highest sound levels (Jokitulppo et al., 1997), even though some of the young adults in Kuantan worked with machines too, the sound level is not as high as the activities participated by the young Australians.

ii) Experience of tinnitus

55% of the participants chose "sometimes" as having tinnitus while the other 45% responded with "did not have any tinnitus". While Williams and Carter (2016) found that out of 1359 young Australians, 37% of them reported that they did not experience tinnitus, the rest, which is 63% complained of having tinnitus. Within this 63%, 55.3% answered "Yes, sometimes", 5.1% "Yes, often" and 2.7% "Yes, always present" to describe their experiences with tinnitus. Even though there is a big gap of cumulative noise

exposure level between young adults in Kuantan and Australia, the accounts of "sometimes" to describe the experience with tinnitus are of similar values, with 55% and 55.3% respectively.

Suprisingly, from the 55% of participants who reported "sometimes" having tinnitus, all of them experienced tinnitus in less than one minute after being exposed to a loud or noisy situation (2 participants), when it was very quiet (4 participants) and at any time with no particular situation (4 participants). Prolonged exposure to loud noise may be the cause of a short duration of tinnitus experienced by some people (Harvard Health Publishing, 2017; Coleman, 2014).

Since short duration of tinnitus can be considered as a temporary tinnitus, it is possible that the condition may progress to become permanent once the noise exposure is significant and if there are no proper preventive measures taken to reduce the exposure. With a significant noise exposure, it will not only cause a permanent tinnitusbut serious psychological problems may arise among young adults (Erlandsson & Widen, 2004 quoted from Hiller and Goebel, 1998).

THE CORRELATION BETWEEN TINNITUS EXPERIENCE AND LIFE-TIME NOISE EXPOSURE AMONG YOUNG ADULTS IN IIUM KUANTAN

This study did not find any significant difference between tinnitus experience and life-time noise exposure among young adults in IIUM Kuantan as what have been revealed by Williams and Carter (2016); and Holmes et al., (2007). These authors explained that as the mean cumulative exposure increased, the persistence of tinnitus will also increase in Australia and Sweden respectively. It is claimed by Jokitulppo et al (1997) that ''incidence of hearing symptoms (including tinnitus) seemed to be correlated to increased noise dose''. . A possible explanation might be that the youths from IIUM Kuantan and Australia are involved in different activities, and these activities might yield different noise level. Holmes et al., (2007) stated that the social noise level among young people will affect the reported tinnitus. Whilst Jokitulppo et al. (1997) mentioned that the prevalence of tinnitus in young adults is associated with loud sound exposure during leisure activities in which concerts and nightclubs contributed to the loudest leisure activities that eventually will lead them to the danger of tinnitus.

CONCLUSION

From this study, it was found that there is no significant difference between life-time noise exposure and tinnitus experience among young adults in IIUM Kuantan. Hence, this indicates that despite reports of tinnitus experience among the participants, there was no evidence that the tinnitus was due to noise exposure. Furthermore, no significant difference was found between hearing threshold and tinnitus experience among participants. The cumulative life-time noise exposure among the participants was also found to be lower than the level considered to be hazardous.

ACKNOWLEDMENTS

This research is financially supported by International Islamic University Malaysia (IIUM) under Research Initiative Grant Scheme (RIGS) RIGS 116-131-0295.

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