



(RESEARCH ARTICLE)



Hearing screening in video game players with headphones use

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Abstract

Background: Hearing loss due to noise can cause by entertainment activities. Loud noise resulting from use of earphones with excessive volume and for long periods threatens the safety of the user's hearing.

Purpose: To determine the hearing function of video game players who use headphones.

Methods: This research is a descriptive study with a cross-sectional design. Hearing function of the players were carried out using pure tone audiometry.

Results: Total of 56 subjects were male (100%) and 66.1% subjects had used headphones for <12 months, 7.1% for 12-24 months and 26.8% for >24 months. As many as 87.5% subjects were exposed to headphone noise for <3 hours per day, 10.7% subjects for 4-6 hours per day and 1.8% for >6 hours per day. The volume level of headphones gamers was mostly set at 6 (39.3%). Based on pure tone audiometry, all subjects had normal hearing thresholds at low frequencies (500Hz and 1000Hz) and medium frequencies (2000Hz and 4000 Hz). Only 3 subjects (5%) had an increase of hearing threshold at high frequencies (6000Hz and 8000Hz).

Conclusion: The hearing thresholds for each ear in video game players who use headphones based on frequency groups were identified in this study. An increase in hearing threshold in gamers could be an early sign of hearing loss, then hearing conservation education program should be considered for active gamers.

Keywords: Video game players; Headphones; Hearing thresholds; Noisy entertainment.

1. Introduction

Hearing loss can occur at any age. Hearing loss that occurs before birth or during delivery is called congenital hearing loss/congenital deafness, while hearing loss that occurs after birth is called acquired hearing loss/acquired deafness.¹ Congenital deafness is at risk for mothers with TORCH (toxoplasmosis, rubella cytomegalovirus, herpes simplex, and HIV) infection during pregnancy, babies born prematurely, birth weight less than 1500 grams, neonatal asphyxia, craniofacial abnormalities or a family history of congenital deafness.² Acquired deafness is caused by a buildup of cerumen in the ear canal, ear infections, tumors, noise exposure or age factors.³ Hearing loss due to noise exposure is often found in workers in noisy environments >85 dB. Exposure to high frequency noise, frequent intensity and over a long period of time can cause permanent damage to hair cells and supporting cells in the organ of Corti.⁴ Therefore, workers are required to use ear protection when working in noisy environments, to prevent hearing loss.

Hearing loss due to noise is not only caused by the work environment, but can also be caused by entertainment activities, for example loud music concerts, noisy nightlife, or noise caused by the use of earphones. Earphones are a pair of small

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speakers that are worn very close to the ear. Earphones are often used to listen to music so that the sound quality is clearer. The use of earphones became more widespread among students and teaching staff as an online learning medium when the COVID-19 pandemic began to spread in 2019. The danger of noise also needs to be aware of among video game users who use headphones. Using headphones provides a different feel for players, because the sound produced is clearer and can only be heard by the wearer, so players feel as if they are actually in the game area. Video game enthusiasts are not only students, but also school-age children. It is feared that the habit of playing video games with headphones for a long time will cause permanent hearing loss. Therefore, it is necessary to conduct research regarding hearing screening examinations for video game players who use headphones. It is hoped that the results of the research will provide basic data regarding the description of hearing thresholds in video game players who use headphones, so that preventive measures can be taken against deafness due to loud entertainment.

2. Material and Method

This research is a descriptive study using a cross-sectional design. A questionnaire was used to determine the use of headphones in video game players, then a pure tone audiometry examination was carried out. The subjects in this study were video game players in the online game area who used headphones within age range of 17-35 years. Exclusion criteria in this study were ear infections in the last 7 days, history of hearing loss, history of ear surgery.

Subjects who are willing to become research samples will then undergo medical interview and examination by an otorhinolaryngologist. Subjects who met the inclusion criteria were then subjected to the sample sequentially (consecutive sampling) and performed pure tone audiometry then filled out a questionnaire regarding their habits of using headphones when playing games. Data is displayed descriptively in the form of tables and narratives.

3. Results

In this study, there were 56 research subjects who met the inclusion criteria. A total of 56 subjects were male (100%). The age range for video game players who use headphones is 18-35 years. Most of the subjects were aged between 21-25 years, namely 25 subjects (44.6%), while in the age range 31-35 years there were only 4 subjects (7.1%). Characteristics of video game players who use headphones by gender and age are shown in the Table 1.

Table 1 Characteristics of video game players who use headphones

Characteristics	n	%
Gender		
Man	56	100
Woman	0	0
Age		
18-20 years old	14	25
21-25 years old	25	44.6
26-30 years old	13	23.2
31-35 years old	4	7.1

A total of 37 subjects (66.1%) in this study stated that they had used headphones to play games for less than 12 months, 4 subjects (7.1%) who used them for 12-24 months and 15 subjects (26.8%) who using for more than 24 months. Based on the length of time they used headphones per day, it was found that 49 subjects (87.5%) were exposed to headphone noise for <3 hours per day, 6 subjects (10.7%) for 4-6 hours per day and 1 subject (1.8%) exposed more than 6 hours per day.

The volume of headphones used by video game players in this study was mostly at volume 6, which was found in 22 subjects (39.3%), while volume 10 was found in 4 subjects (7.1%). The distribution of video game players based on length of use of headphones, exposure to headphones per day, headphone sound volume is shown in Table 2.

Exposure to noise can cause auditory complaints and non-auditory complaints. In this study, 17 subjects (30.4%) complained of buzzing/ringing in their ears and 14 subjects (25%) complained of decreased hearing, while the non-auditory complaints found were dizziness (16.1%), nausea (5.4%) and impaired concentration (10.7%). This is shown in Table 3.

Based on pure tone audiometry examination, the average hearing threshold in the right ear of video game players using headphones in the low frequency group with normal hearing threshold was 56 subjects (100%), medium frequency was 56 subjects (100%) and at high frequency was 53 subjects (95%). Meanwhile, in the left ear at low frequencies, the average normal hearing threshold results were obtained in 56 subjects (100%), medium frequencies in 56 subjects (100%) and at high frequencies in 51 subjects (91%), as shown in Table 4.

Table 2 Distribution of video game players who use headphones based on length of use of headphones, exposure per day and headphone sound volume

Characteristics of Video Game Players	n	%
Length of time using headphones		
< 12 months	37	66.1
12-24 months	4	7.1
>24 months	15	26.8
Length of exposure to headphones per day		
< 3 hours	49	87.5
4-6 hours	6	10.7
>6 hours	1	1.8
Headphone sound volume		
5	7	12.5
6	22	39.3
7	10	17.9
8	12	21.4
9	1	1.8
10	4	7.1

Table 3 Distribution of auditory and non-auditory complaints in video game players who use headphones

Type of complaint	Symptom	n	%
Auditory	Ringling/ringing in the ears	17	30.4
	Decreased hearing	14	25
	Dizzy	9	16.1
Non auditory	Nauseous	3	5.4
	Concentration disorders	6	10.7

Table 4 Average hearing threshold of video game players who use headphones based on frequency

Average hearing threshold							
Ear	Status	Low Frequency (n)		Medium Frequency (n)		High Frequency (n)	
		n	%	n	%	n	%
	Normal	56	100	56	100	53	95
Right							
	Increase	0	0	0	0	3	5
Left							
	Normal	56	100	56	100	51	91
	Increase	0	0	0	0	5	9

4. Discussion

In this study, 56 subjects (100%) of video game players who used headphones were male. The age range of video game players who used headphones in this study was 18-35 years, most of the subjects were between 21-25 years, namely 25 subjects (44.6%), while in the 31-35 years age range there were only 4 subjects. (7.1%). This is in accordance with research conducted by Peng et al (2007)⁴, Myung et al (2009)⁵ and Henderson et al. (2010)⁶ who stated that the age group most exposed to noisy entertainment is teenagers and are susceptible to hearing loss.

Decreased hearing function due to noise exposure is influenced by the duration of exposure, noise frequency and noise intensity.⁷ The safe limit for permitted noise is less than 85 dB for maximum of 8 hours per day and safe listening volume is no more than 60 % of the maximum volume.⁸ The use of hearing devices that exceed the safe noise threshold has the potential to cause hearing loss within 10-15 years after exposure.⁹ In this study, 37 video game players who used headphones had played for <12 months (66.1%), 4 subjects (7.1%) had played within 12-24 months and 15 subjects (26.8%) had playing video games using headphones for >3 years. Most subjects stated that they played for <3 hours per day, namely 49 subjects (87.5 %), and only 1 subje

ct (1.8 %) played video games using headphones for >6 hours per day. The volume of headphone sound when playing video games is mostly at a safe volume, namely volume 6 (six), which was found in 22 subjects (39.3 5), while volume 10 (ten) was found in 4 subjects (7.1%).

Hearing loss due to noise can damage the outer hair cells, especially at basal turn of the cochlea.⁷ In mammals, these sensory cells do not regenerate.¹⁰ Sufficient loud sounds exposure further disrupt to other supporting structures in the cochlea result a permanent sensorineural hearing loss.¹¹ Ringing ears or tinnitus can be appeared temporary after exposure of loud sound but sometimes persist as a sign of cochlear injury.¹² In this study, of the 56 subjects who were video game players who used headphones, there were 17 subjects (30.4%) with complaints of tinnitus and 14 subjects (25%) with hearing loss. Other non-auditory complaints included complaints of dizziness in 9 subjects (16.1%), nausea in 3 subjects (5.4%) and impaired concentration in 6 subjects (10.7%).

A pathognomonic sign of noise-induced hearing loss on an audiogram is the presence of a notch at a frequency of 4000 Hz.¹³ Signs of noise-induced threshold shift based on pure tone audiometry examination are a decrease in hearing threshold at frequencies of 3000-6000 Hz, and normal hearing thresholds at frequencies of 500-1000 Hz and 8000 Hz. In this study, of 56 video game players who used headphones, there were 3 subjects (5%) with increased hearing thresholds in the high frequency group in the right ear and 5 subjects (9%) in the left ear. This can be an early sign of hearing loss due to noise exposure.

5. Conclusion

In this research it can be concluded, that the characteristics of video game players who use headphones are as follows: All subjects (n = 56) were male (100%). The largest age group was 21-25 years old, namely 25 subjects (44.6%). Most of the time when they started playing games with headphones was <12 months, namely 37 subjects (66.1%). The duration of headphone use per day was less than 3 hours, namely in 49 subjects (87.5%). The headphone volume used was mostly volume 6 (six), namely 22 subjects (39.3%).

According by the hearing thresholds for each ear in video game players who use headphones based on frequency on right ear we found that with low and medium frequency we found 56 subjects (100%) had hearing thresholds within normal limits, following with high frequency we found 3 subjects (5%) to have an increased hearing threshold. Continue with the left ear we found that with low and medium frequency 56 subjects (100%) had hearing thresholds within normal limits. Continue with high frequency we found 5 subjects (9%) have an increased hearing threshold. An increased hearing threshold at high frequencies can be caused by exposure to noise.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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