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A Study on Annoyance of Interior Noise on Town-Bus

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Abstract

In these days, the size of urban is growing and the function of city becomes complicated. And also, in city, people lives a lot. The life of urban is getting closer and linked with neighboring people in many parts. Especially, when peoples are exposing during using public transportation, even though does not be known, in they were living. Seoul is the most crowded place in Korea. In Seoul,The village buses have been serviced to the narrow streets. And people who use this bus, wants to seek the comfort of the ride, air quality and noise during in vehicle. In this paper, we determine the degree of annoyance with the noise inside the town bus in dB scale. And, such a situation was confirmed annoyance see their effect. The Interior noise did not see a big difference in the new car and the old car. Annoyance but also according to the skill of the bus driver remains the difference was confirmed.

Keywords: *Team Performance, Charismatic Leadership, Voice analysis, Leadership parameter of speech, Voice*

1. Introduction

In these days, the size of urban is growing and the function of city becomes complicated. And also, in city, people lives a lot. The life of human living urban is getting closer and linked with neighboring people in many parts. Especially, when peoples are exposing during using public transportation, even though does not be known, in they were living. Seoul is the most crowded place in South Korea and on the Earth. There are various types of public transportation in Seoul. Among them, The ordinary buses are available for use by citizens on public roads and, the village bus is operated mainly on narrow roads and alleyways than the buses. And people who use this transportation, wants to seek the comfort, clean air quality and noiseless during the ride in vehicle. in Seoul Korea, the average noise levels are 73dB or higher. In particular, civil complaints caused by noise and vibration pollution in urban areas account for about 30%, and the number of complaints about pollution increases year by year. And traffic noise accounted for about 2%. The amount of this complaint is equivalent to the noise generated in the vicinity of the means of transportation, and the complaints about the noise inside the means of transportation have not been collected. However, the noise

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during the use of the town bus also affects the driver as well as the passengers, so research is needed..

In this paper, we determine the degree of annoyance with the noise inside the town bus in dB scale. And, such a situation was confirmed annoyance see their effect. The Interior noise did not see a big difference in the new car and the old car. Annoyance but also according to the skill of the bus driver remains the difference was confirmed.

In this paper, we determine the degree of annoyance with the noise inside the town bus in dB scale. To verify this, we measured and compared the noise levels of old buses and new buses on a town bus that was in operation, and then experimented with the annoyance effect. In particular, internal noises were recorded and analyzed to compare the differences. In Section 2, the environmental noise of the city and town bus interior noise is discussed. In Section 3, we investigated the damage caused by annoyance and noise using the bus. And in section 4 concludes the paper.

2. Urban environmental noise and town bus interior noise

Noise and vibration complaints according to the Ministry of Environment have increased by roughly 11% each year, with vibration noise complaints accounting for 30% of complaints, and the rate of transportation noise complain was increased by 3% and continues to increase. In figure 1, according to the Ministry of Environment's report in [2], there were 56,244 noise and vibration complaints in 2011, translating to a ratio of 33%. These complaints accounted for one-third of environment-related complaints, a 158% increase from 2002. The ratio of vibration noise complaints has continuously increased since then [3]. In figure 2, an examination of the cause of everyday noise in 2011 shows that construction accounted for 65% while transportation took up 2%. The World Health Organization (WHO) cited noise as one of the top three factors affecting quality of life, trailing behind air and water pollution.[4]

The definition of noise is unpleasant to hear any sound. According to the Noise and Vibration Control Act, noises refer to strong sounds produced by machines, tools, facilities, the use of other objects, and human activities. Among the various sounds produced, those that are unpleasant to the ear are regarded as noise. While noise is regulated by law based on noise level and time, the degree of annoyance caused by noise is subjective, which results in different experiences depending on the parties involved. And there is a lot of noise that occurs with human life, which is loath to hear the sound becomes noise to others. Noise can be a somewhat subjective criterion, but the management and use of the size of the sound annoyance may appear slightly different exposure.[5-6]

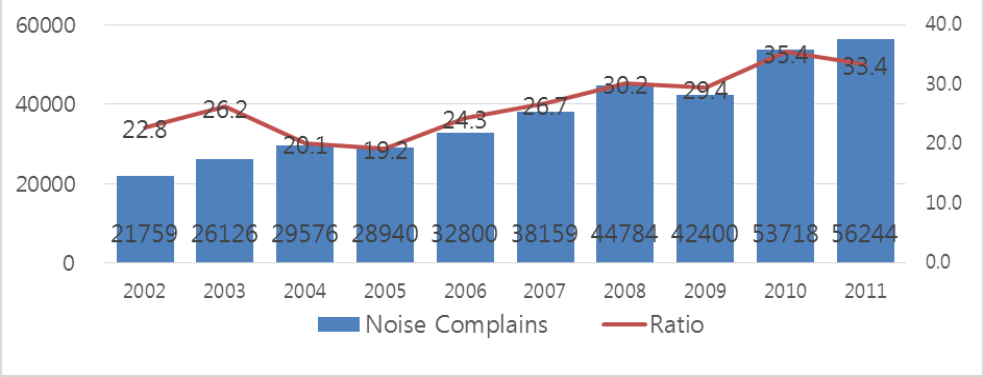

Fig. 1. Compliant occur Trends of noise and vibration

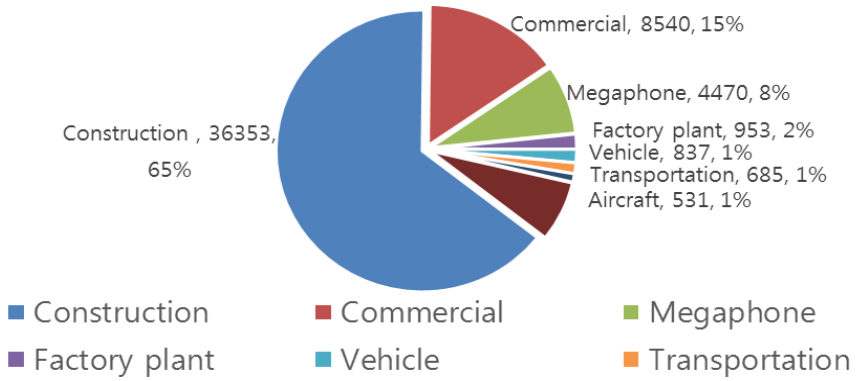

Figure 2. Cause-specific Noise vibration Compliant occur Trends

Today, the most frequent source of noise are the traffic noise, aircraft noise and industrial and factory / business site. The current South Korea classified as such Factory Noise, life noise, traffic noise and aircraft noise in Noise and Vibration Control Act. In this section, the city and life convenience noise, construction site noise and it explains separated by traffic noise and so on. [7]

The impact of noise on humans affect to hearing, or a person cannot concentrate on his work that because of the loud noise, or disturbed to see the TV. And the physical and mental damage is received. This effect will vary depending on the physical properties of sound, a human listening to the sound may be changed according to whether a certain condition. The higher noise level greater impact we receive. In addition, according to the different frequency components of the noise effect and the longer the duration given more influence. The influence of the noise and the impact of noise is continuously repeated to that condition.[6]

Noise health effects are the health consequences of regular exposure, to consistent elevated sound levels. Elevated workplace or other noise can cause hearing impairment, hypertension, ischemic heart disease, annoyance, and sleep disturbance. Changes in the immune system and birth defects have been attributed to noise exposure.[4]

Although some presbycusis may occur naturally with age, in many developed nations the cumulative impact of noise is sufficient to impair the hearing of a large fraction of the population over the course of a lifetime. Noise exposure also has been known to induce tinnitus, hypertension, vasoconstriction, and other cardiovascular adverse effects.[6]

Beyond these effects, elevated noise levels can create stress, increase workplace accident rates, and stimulate aggression and other anti-social behaviors. The most significant causes are vehicle and aircraft noise, prolonged exposure to loud music, and industrial noise. In Norway, road traffic has been demonstrated to cause almost 80% of the noise annoyances reported.[8]

In this paper, directly measured and analyzed noise by boarding a bus and collected. Measurement points were at the back of the driver's seat and at the backest seat of the town bus. Measurements at the back of the driver 's seat were made to verify the driver' s hearing health impact, and the measurements at the back were measured due to the engine room at the rear of the bus due to the structural nature of the bus causing noise. It took about 55 minutes to cycle once on a town bus, and there are various other situations such as uphill, downhill, narrow road, four lane road, anit-speeding bump.

Figure 3 is a graph of the measurement results of the traveling noise of the town bus. The horizontal axis of the figure is time and the vertical axis is dB SPL. It means the average noise level for one minute

according to the bus operation, and the rightmost noise level shows the average noise level inside the vehicle during one operation. Here, 00dB is measured in the loudest section, and the average is 71dB. This is not to a degree that directly affects the hearing of a person, but it can rapidly damage the hearing when talking or using a portable audio device in such an environment. There were two schools on the town bus route, so many students used the town bus. Students used buses, listening to music, watching videos, and so on. During this time, the sound volume generated from the portable sound device was an average of 96dB, and if the noise inside the vehicle did not cause hearing damage, the sound would be a very loud sound, which would be a sound with a risk of hearing damage.

The following figure shows the frequency analysis of the town bus operation. This is because noise is mainly located at a low frequency, and even if a loudness curve, which is a human auditory characteristic, is used, it is necessary to take measures against low-frequency noise, and a part for noise other than noise It seems necessary to prepare countermeasures.

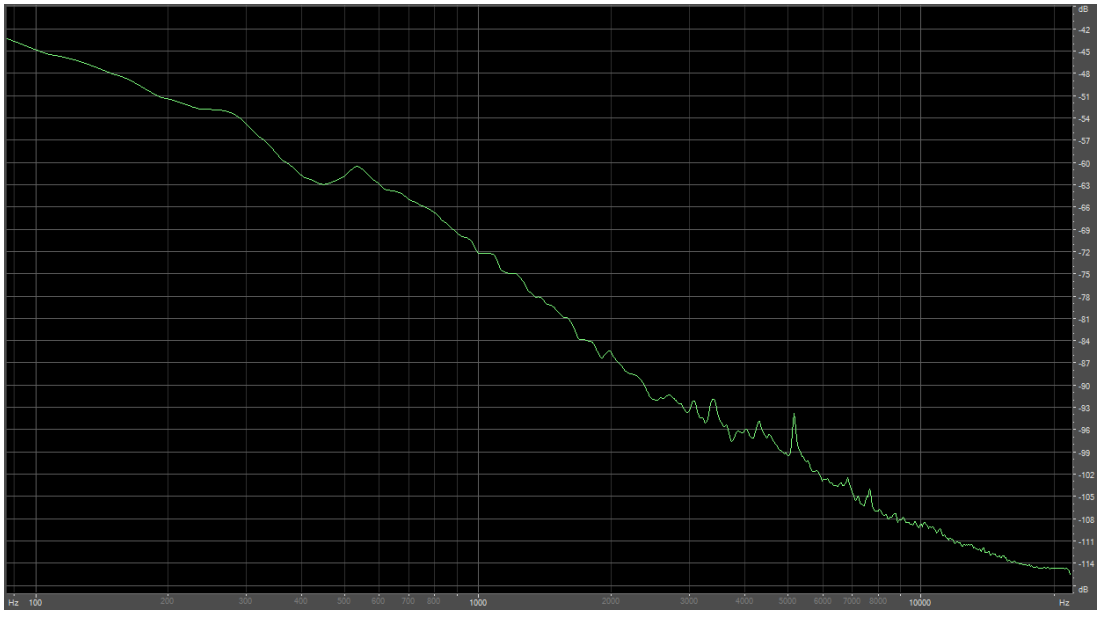

Figure 3. Spectrum analysis of Town-Bus interior noise

3. Annoyance Study

This paper measures the level of human stress on noise pollution. Simulates the loudspeaker noise condition with two healthy men and two women of about 20 years old. The amount of noise fluctuated in the range of 70 to 90 dB, and the subjects recorded a stress level from 0 to 10. Participants also measured the EEG.

In order to analyze the degree of annoyance caused by noise pollution, this study measured the level of stress and analyzed the brain waves of people with noises. In this test, four subjects were recorded, including loudspeaker noise and two mid-20s and two females. Tolerance testing, stress level measurement, and EEG analysis were performed. The noise recorded by the demonstration was reproduced through the monitor speakers in a laboratory with 30 dB background noise, varying the noise level and time.

The noise tolerance test measures the participant's tolerance time for the speaker's noise. Participants were

asked to endure an average of 80 dB of noise while participating in reading or other learning activities, and to leave the laboratory when noise was unbearable. All participants showed a change after one minute, and one of them left the lab in three minutes. The rest of the participants left within five minutes. In two repeat sessions, all participants could not stand the noise for more than five minutes.

In a stress test, the time it takes for the stress level to increase to the next level (of the 10 levels) is measured in the laboratory with 30dB background noise, increasing the noise from 70dB to 90dB in 5dB increments. Stress levels were measured in the form of questionnaires. When a participant was noisy during reading or other learning activities, all stress levels increased at least one step within three minutes. Despite the reduction in noise levels, participants' stress levels did not decrease. In other words, lowering the sound does not reduce the stress of people suffering from noise pollution.

In the third test, the EEG monitoring system was used to measure changes in brain waves. As in the previous test, in a laboratory with 30dB of background noise, the noise increased by 5dB from 70dB to 90dB. Noise We analyzed the brain waves during exposure and rest and measured the time taken to return to normal. Figure 4 shows the results of EEG. The raw column indicates where noise begins, and the green column indicates quiet. The experimental results showed a weak correlation between noise and alpha waves and a stronger correlation between theta and beta waves. In a noisy environment, the participant's brain waves are transformed into a form of stress. On the other hand, relax in a quiet environment.

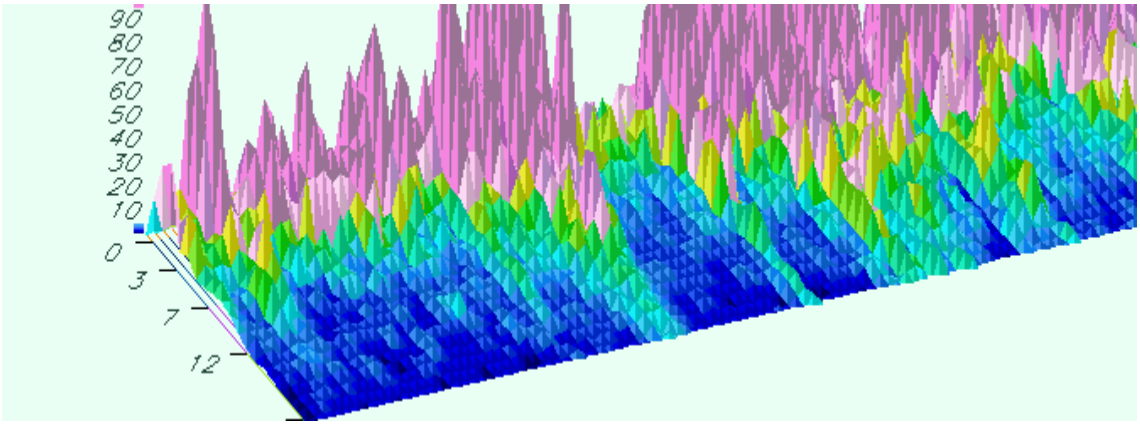

Figure 4. EEG Test result of simulation of bus interior noise condition

4. Conclusions

People living in the city are exposed to noise pollution. Unfortunately, our hearing simply can not close like our eyes. In other words, the sound is easily polluted and can interfere with others. In particular, during the protests, people usually use loudspeakers to make loud sounds. People should be able to withstand when the speaker is in a noisy condition. In particular, residents are highly stressed by these noises.

In this paper, we measured the level of stress and brain waves in human participants exposed to noise pollution. Changes in participants affected by loudspeaker noise were measured using noise immunity, stress levels, and brain waves. Experimental results show that limiting noise duration is a better way to reduce damage from noise pollution than reducing volume. If you are stressed by noise, you will find that people or vehicles holding loudspeakers on the roadside are unhealthy. It may be wise to remove noise pollution too quickly.

References

[1] M.J. Bae, Noise pollution in city, http://www.sorilab.com.

[2] M. J. Bae, Read the world with the sound of Professor BaeMyeongJin, Korean Publishers. Korea, 2013.

[3] S.I. Jang, The Policy Report of Ministry of Environment, Research for loudspeaker noise management system improvements provided, 2009.

[4] Occupational Safety & Health Research Institute, Noise Measure, 2007

[5] J.H. Son, G. Lee and S.I. Jang, "Demographic and Attitudinal Factors that Modify Annoyance from Aircraft Noise," Journal of Korean Society of Environmental Engineers, Vol.29, No.12, 2007.

[6] W.Y. Yang and Y.S. Jo, Digital Signal Processing and MATLAB, BRAINKOREA, 2001.

[7] Y.W Oh, Voice Information Processing, Hong-Reung Press, 1998.

[8] Ji-Soo, O., Kang, J.-J., Lim, M.-J., Lee, K.-Y., "Design and Implementation of an Emotion Recognition System using Physiological Signal," IWIT 10(1), pp.57–62, 2010.

[9] Lee, Y.-S., Park, Y.B., "An acoustic study of feeling information extracting method," IWIT 10(1), pp.51–55, 2010.

[10] Hyung Woo Park, Myung-Jin Bae, "A Study on Acoustic Transfer Characteristics through the Fingers," Convergence Research Letter, Vol.1, No.3, October 2016.

[11] J.W. Kim and M.J. Bae, "A Study on Hearing Loss According to Sound Pressure Level of The Ear-Phone ," KEE Transactions, Vol 32, No. 1, 2009.

[12] H. J. Kwon and M.J. Bae, "A Study on a method of measurement of Noise induced Hearing Loss ," ASK Transactions, 2009.

[13] S.T. Lee, H. W. Park, M. J. Bae, "A Study on a Prevention Noise Induced Hearing Loss to Use Mobile Phone," Proceedings of ASK, 2010.

[14] H.W. Park, A R. Khil, M. J. Bae, "The Improvement of Mobile Phone Voice Quality by Bone-Conduction Device," 2013 IEEE International Conference on Consumer Electronics, pp.397-398, 2013.

[15] H.W. Park, M.S. Kim, and M.J. Bae, "Improvement of voice quality and prevention of deafness by a bone-conduction device," Biotechnol Biotechnol Equip, Vol. 14, No. 28, S14–S20, 2014.

[16] Hyeon Ku Park, Yong Gyu Shin, Hang Kim, Min Jeong Song, Sun Woo Kim, "Evaluation of Sound Quality for Urban Environmental Sound," Proceedings of The Korean Society for Noise and Vibration Engineering, pp.529-534, 2005.

[17] Kim Hong Jee, Yang Sook Ja, "The Effects of Education on the Prevention of Noise-Induced Hearing Loss in Adolescence," Journal of Korean Public Health Nursing, Vol.27, No.2, pp.357-371, 2013.

[18] Eui-Kyung Goh, "Diagnosis of hearing loss," J. Clinical Otolaryngol Vol.14, pp.161-167, 2003.

[19] R. R. Lawrence, R. W. Schafer, Theory and Applications of Dig Digital Speech Processing, PEARSON, 2011.

[20] B. Myungjin, L, Sanghyo, Digital Voice Analysis. Dongyoung publish, 1998.

[21] Woo Chul Park, Snag Bong Lee and Sun hee Lee, Fundamentals of Sound Engineering, Chasong press, 2009.