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A Study on the Human Sensation of the Reed Wind Sound in ASMR

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Abstract:

The ASMR (Autonomous Sensory Meridian Response) sound, which calms the mind by the human senses, has already been used as a method of healing human beings in Europe and the United States. Among them, the ASMR method using sound is an acoustic healing method that stimulates the human hearing by using the sound in the five senses and makes the mind comfortable. The characteristics of the sound of ASMR have been used in various excavations as a very quiet and calm sound, and they have been continuously explored. In this paper, we investigated the reed wind sound among ASMR sounds. The reed wind sound is one of the representative sounds of ASMR sound. The result of this study is that the sound of the reeds in the reed forest, which are caused by the winds sweeping each other, show a white noise sound component evenly distributed over the whole range of the human audible frequency band. To check the effect of reed wind on people, we tested the body information such as blood pressure and pulse, and conducted interviews and surveys. The results of the physical examination performed while listening to the reed winds showed that healing of the mind and body was comfortable. MOS test and interview results also showed that the sounds of reed winds are driving out of mind and that body and mind are relaxing. Through this study, it was proved that the reed winds produced by the reed forest winds have the effect of comforting and healing people.

Keyword: Five senses, ASMR, Acoustic healing method, Reed wind, MOS test

1. INTRODUCTION

Modern human civilization is causing modern people to experience excessive stress. Uncontrollable stress is the cause of serious illness and mental illness. Modern people do various stress-relieving activities to get rid of the pain of stress. ASMR is in the spotlight as a psychological healing method among various stress relief methods. ASMR is a sound healing method that relaxes the mind by listening to a sound that can be stabilized. ASMR is already used for psychotherapy in the US and Australia, and is actively used by ASMR enthusiasts worldwide for their psychological stability. However, there is no scientifically proven effect on ASMR. Therefore, the study of the correlation between ASMR and psychological stability is expected to help ASMR to relieve stress and psychotherapy of modern people. [1][2]

ASMR has been developed and used in a variety of sounds as the user's individual difference is large. ASMR generally has many types of analogue stimulation such as natural sounds and whispering sounds. Among the ASMR sounds, the sound of wind blowing through reeds is known to be very helpful for psychological stability. In this paper, we tried to verify the correlation between acoustic characteristics and human response for reed wind sound through experiments. Chapter 2 describes ASMR and Chapter 3 describes acoustical analysis. Chapter 4 describes the experiment and the results, and concludes in Chapter 5.

2. WHAT IS ASMR?

ASMR stands for Autonomous Sensory Meridian Response and refers to the sensory experiences of psychological stability or pleasure that are difficult to express in response to visual, auditory, tactile, olfactory, or cognitive stimuli It is recorded in advance. Among them, ASMR sound has been used in various parts of the world for decades as part of psychotherapy using sound. The interest in ASMR sound is also increasing in Korea because of the economical and mental leisure in Korea these days. However, the effect on ASMR has not been scientifically proven, and there is a controversy due to differences in auditory response depending on the individual.[3][4][5]

The ASMR sound should be a soft whisper and a sound that people can take as comfortably as possible. The most common feature of ASMR sound can be judged to be small, repetitive, freshly stimulating sounds. From this point of view, this paper has chosen to study the sound of reed wind, which is a typical sound among ASMR sounds. We analyzed the acoustic characteristics of reed winds and investigated how they react to the human body. The components of the reed wind sound were analyzed by acoustic analysis. The body reaction was measured by comparing the changes of blood pressure and pulse, and analyzed through MOS test and interview.[6][7]

3. ACOUSTIC ANALYSIS METHOD OF SOUND

Sound is basically analyzed based on amplitude, frequency, and duration. The acoustic analysis of sound can be divided into time domain analysis and frequency domain analysis. Time domain analysis can analyze the change in loudness with time. Frequency domain analysis can check the distribution or ratio of each frequency component through the frequency spectrum.

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Spectrogram is a mixture of time and frequency domains. Spectrogram show how the distribution or ratio of each frequency component changes over time. [8][9]

The sound is generally recorded as a value in the time domain, and the FFT (Fast Fourier Transform) is applied to convert the frequency into the frequency domain for multi-angle analysis.

In this paper, LPF (Low Pass Filter) is applied to preprocessing to remove high frequency noise and then converted into frequency spectrum and spectrogram by FFT process. This series of processes was transformed and analyzed using Adobe's Audition program. Figure 1 shows the process of converting reed wind sound into the frequency domain for acoustic analysis. [10][11][12][13]

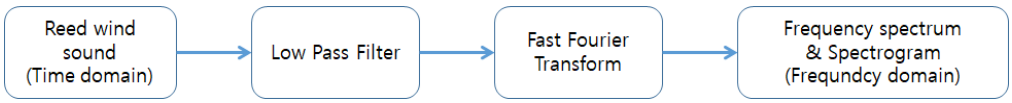

Fig 1. FFT diagram for reed wind sound

4. EXPERIMENT AND RESULT

ASMR is a process of analyzing more closely the reason why the sound has been attracted to modern people. We are studying various characteristics of ASMR sound by extracting and analyzing various sounds one by one. In the second study, we studied reed wind sounds with high preference among ASMR sounds. The study was conducted with an acoustical analysis of reed wind, body change measurement, and mos test. In order to absorb the reed wind for research, we prepared a dynamic directional microphone that can guarantee the recording quality even in the outdoors by covering the tool which prevents wind resistance. The place to record the sound of reed wind was decided by Sangam-dong sky park reed forest. The recorded reed wind sounds were analyzed by acoustic analysis tool based on three elements of sound. In addition, the effect of reed wind sound directly on the human body was studied through body changes and public opinion polls.

For reed wind sound, acoustic characteristics were confirmed through time domain analysis, spectrogram analysis, and frequency spectrum analysis. Figure 2 is a time-domain graph for reed wind sound. The energy for sound in the time domain is obtained by equation (1).

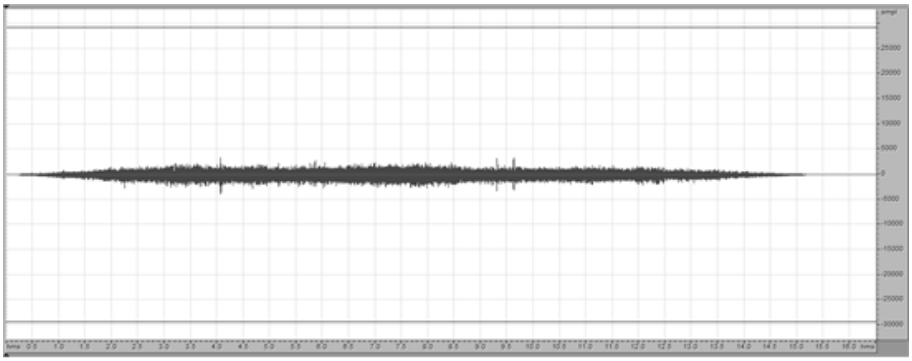

Fig 2. Time domain graph for the sound of the reed wind

$$Time\_energy = \frac{1}{N}\left[\sum_{n=1}^{N}(E_1(n) - E_2(n))^2\right] \quad (1)$$

Looking at the time-domain graph in Figure 2, we can see that the small signal of the reed wind sound continues continuously. In other words, the sound of reed wind is a continuous, whispering continuous sound. In this way, the reed wind sound, which is represented by the thin amplitude of the time domain graph, is analyzed as a sound that can comfort the mind with calm and irritating sound.

Figure 3 shows the spectrogram for the reed wind sound. Looking at the spectrogram in Figure 3, the whole is cloudy. The reason why the spectrogram of the reed wind sound is wholly blurred is because the reed wind sounds quietly and finely with the characteristic of the white noise sound which occurs over the entire audio frequency band. The reed wind sound component has evenly distributed energy in the whole frequency range of audible frequency. The white noise formed from the reed wind sounds relaxes the mind of the person, delicately stimulates it, acts as a stabilizer, and restores the body and mind.

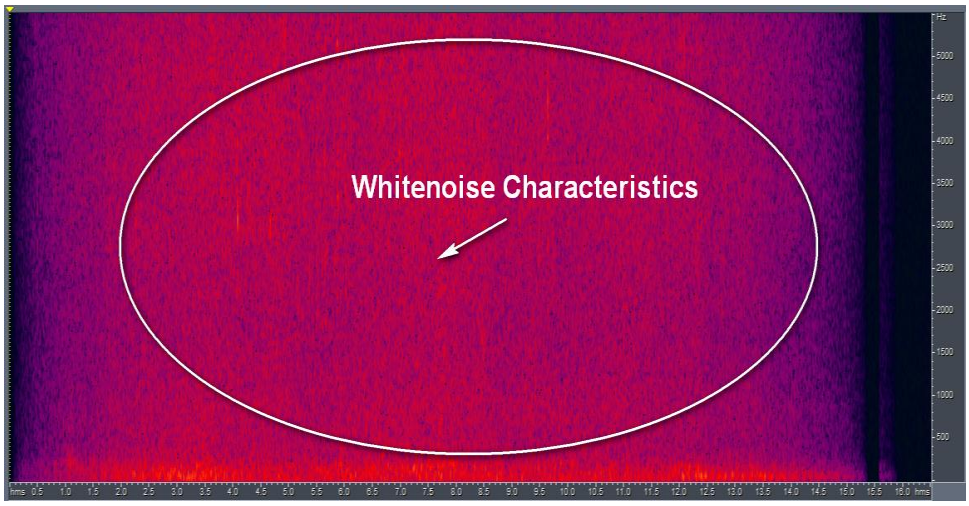

Fig 3. Spectrogram for the sound of reed wind

Figure 4 shows the frequency spectrum of the reed wind sound. Looking at the frequency spectrum in Figure 4, we can see that the reed wind sound is relatively energetic at low frequencies below 200 Hz. In the middle frequency range from 200Hz to 3,000Hz, the sound is reduced by about 14dB than the low frequency band. Also, the sound in the high frequency band draws a falling parabola from the 5,000 Hz part. The frequency characteristic of reed wind sounds on the spectrum graph is that the low frequency band relatively affects the body, the middle frequency band is reduced, the response is calm, and the sound of the high frequency band is gradually dropped to minimize the mental stimulation. This frequency characteristic shows that it has a whispering sound characteristic required by ASMR sound.

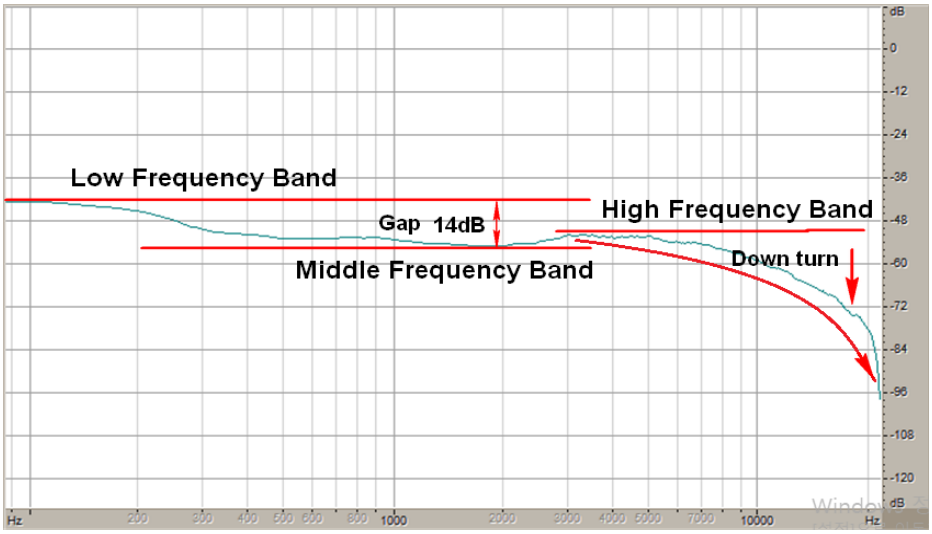

Fig 4. Frequency spectrum by sound of reed wind

In this paper, blood pressure and pulse rate were measured to determine the influence of reed - wind sound on body change during ASMR sound. To measure blood pressure and pulse simultaneously, measurements were performed in a quiet space using an EASY X 800 instrument from EX. Subjects were selected from one of the normal hypertensive patients, one from the normal blood pressure group, and one from the hypotensive group. In the experiment, first, the subject was measured without listening to the reed wind and after resting for about 10 minutes, the reed wind was heard by the headphone, and the body change was measured using a blood pressure monitor and a pulse system.[16][17][18]

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Table 1. Body change after listening to reed wind sound

ASMR Reed wind sound	Before listening			After listening		
Blood pressure and pulse	Systolic	diastolic	pulse	Systolic	diastolic	pulse
hypertensive listener	163	117	91	157	99	83
A listener of Normal blood pressure	130	79	78	129	82	71
hypotensive	102	69	57	117	75	62

Unit: blood pressure - mmHg, pulse - bpm

Table 1 compares the results of the subjects' body changes with the reed wind sound of ASMR sound divided by systolic blood pressure, diastolic blood pressure, and pulse rate, and compared with the data before and after listening. The body temperature change of the subject's reed-wind sound for the reed-wind sound was measured by a hypertensive listener, whose systolic blood pressure was 163 mmHg and diastolic blood pressure was 117 mmHg before listening to the reed-like sound. The systolic blood pressure was 157 mmHg, Diastolic blood pressure dropped to 99mmHg. Of course, the normal range of blood pressure was not reached, but the result of recommending listening to the steady ASMR reed wind sounded as the blood pressure dropped after hearing reed winds.

Listening to normal blood pressure also showed that when the blood pressure was measured, the systolic blood pressure was 130 mmHg and the diastolic blood pressure was 79 mmHg. After listening to reed wind sounds, the systolic blood pressure dropped to 129 mmHg and the diastolic blood pressure dropped to 82 mmHg. The results showed that ASMR effect of reed wind was found in that the stability was found to be closer to the range of normal blood pressure, systolic blood pressure of 120 mmHg to diastolic blood pressure of 80 mmHg. In the case of hypotensive listener, the systolic blood pressure was 102mmHg and the diastolic blood pressure was 69mmHg before listening to reed wind. The systolic blood pressure was 117mmHg and the diastolic blood pressure was 75mmHg after listening to the reed wind sound. Such an experiment is a result of the possibility that ASMR's reed-like sound may prevent the health of modern people caused by abnormal blood pressure. Next, we looked at the changes in heart rate. In the case of pulse rate, the hypertensive listener dropped to 83 bpm after listening to the reed wind, which was 91 bpm per minute before hearing the reed wind. The normal blood pressure listener dropped to 71bpm after listening to reed winds at 78bpm per minute before hearing reed winds. The hypotensive listener went up to 62 bpm after listening to the reed wind, which was 57 bpm per minute before hearing the reed wind. The ASMR sound of reed winds was effective in that the pulse rate was fluid but the high pulse rate was low and the low pulse rate was active in the normal range. These results suggest that ASMR acoustics can be clinically useful to normalize blood pressure and pulse as well as to treat or cure minor illnesses and complications.

The MOS test of the reed wind sound of the ASMR sound was performed by listening to the reed wind and collecting the responses of the responding listeners. For the MOS test, we surveyed 40 listeners to see how the reed wind sounds to the person. Also, we interviewed what they thought when they heard the reed winds sound. As described in Figure 5, said that half of the people, 21, felt coolly relieved from stress and 12 people expressed their feelings as if someone was whispering. 5 people say that the sound of the weak wind is relaxing. Two of them said that the fricative sounded rough and repaired, but most of the listeners responded positively.

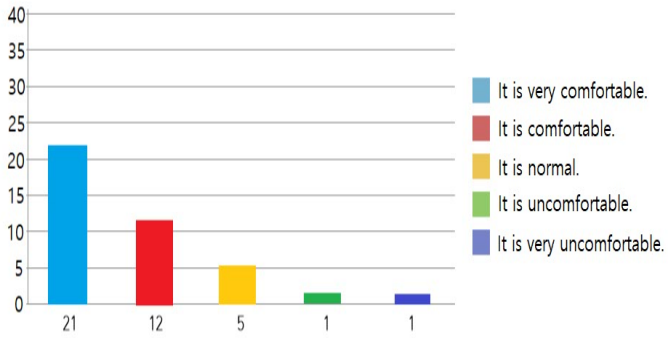

Fig 5. MOS test result for the sound of reed wind

Table 2 summarizes the results of freely asking interviews conducted during the MOS test. The result is also that the reed wind sounded, and the overall wind sound that was heard sounded like a cool feeling, and the stress that was piled up seemed to disappear. The second was the feeling that the feeling of rubbing and whispering was good. Third, the sound of a weak, gentle wind made the body and mind comfortable. However, there were two people who were distracted and nervous because they gave a feeling of raucous noise. These results show that the reed wind sound is suitable for ASMR sound.

Table 2. Interview summary for the sound of Reed Wind

Sound feeling	personnel	evaluation
Feeling of cool	21	It is a feeling of stress disappearing
Feeling of rubbing	12	It feels like whispering
Feeling of low-winded	5	It feels comfortable
Feeling of raucous	2	It does not concentrate.

Acoustic analysis confirmed that the reed wind sound has wide white noise characteristics. That is, the reed wind sound is generated by the distribution of the sound components of the entire range of the audible frequency band which is cool in a wide space, and is transmitted continuously. As such, the reed-wind sound was analyzed as a result of being able to comfort the listener because it was not irritating to maintain a stable sound while receiving a cool feeling. The body change characteristics of the reed-wind sound showed the effect of lowering the blood pressure to those who showed normal hypertension, and helped maintain the normal blood pressure in those who showed hypotension. In the case of pulse rate, if the pulse rate is fast, it is lowered. If it is slow, it helps to find the normal pulse rate. In the results of the MOS test of reed winds and the interviews, it was the opinion that the feeling of stress disappears. There are also many opinions that it feels good to be whispered afterwards, and there are some opinions that weak and low wind sounds comfortable. On the other hand, there were some opinions that the sound of the reed wind was distracting and disturbing in the opinion of a small number, so that the mind was not concentrated and was careful. However, most people have concurred with previous research that they are better at concentrating in white noise. As the research results of the writing of the pencil writing among the ASMR sounds of the last time proved, the reed wind sounded positive for most people except for the sensitive person.

5. CONCLUSION

In this study, we analyzed and verified the reed wind sounds through various methods. Acoustic study, body change measurement, MOS test and interview were used as the research methods. In conclusion, there were many opinions that the reed wind sounded like a small, constantly repeated sound that gave a feeling of whispering, giving the listeners an affinity and comforting mind. The fact that ASMR sound has attracted a great deal of attention from modern people shows that it is stressful for people to take social life. However, using the ASMR sound appropriately for your own psychological state will be most effective. Also, if you rely too heavily on the ASMR sound, you may become addicted or seek a stronger sound and damage your hearing. As ASMR sound has been proven to affect the body and mind of the human body, it is necessary to research, verify, secure and systematically manage various ASMR sounds by commissioning to medical institutions and sound research institutes in national, government. We also hope to continue research that will help people's mental health and relieve their fatigue by discovering novel and effective ASMR sounds.

REFERENCE

[1] Seong-Geon Bae and Myung-Jin Bae, " A Study on Recovery in Voice Analysis through Vocal Changes before and After Specch Using Speech Signal Processing," *IJAER*, Vol. 12(2017), pp.5299-5303, 2017.

[2] Hyun Bin Kang, "Life noise" ASMR "I feel good". *National Broadcasting*. Confirmed on January 9, 2016.

[3] Smith, S. D., Fredborg, B., and Kornelsen, J. (2016). An examination of the default mode network in individuals with autonomous sensory meridian responses (ASMR). Soc. Neurosci. 1–5. doi: 10.1080/17470919.2016.1188851. Available online at: http://www.tandfonline.com/doi/pdf/10.1080/17470919.2016.1188851

[4] S.G. Bae, M.S. Kim, and M.J. Bae, "On Enhancement Signal Using Non-uniform Sampling in Clipped Signals for LTE Smart Phones," *2013, IEEE ICCE-berlin*, pp.125-126, ICCE-berlin 2013

[5] Autonomous Sensory Meridian Response (ASMR): a flow-like mental state EL Barratt, NJ Davis - PeerJ, 2015 – peerj.com

[6] Now you've got the shiveries: Affect, intimacy, and the ASMR whisper community J Andersen - Television & New Media, 2015 – journals.sagepub.com

[7] An examination of the default mode network in individuals with autonomous sensory meridian response (ASMR), SD Smith, B Katherine Fredborg… - Social …, 2017 - Taylor & Francis

[8] Autonomous sensory meridian response (ASMR) and frisson: Mindfully induced sensory phenomena that promote happiness, MA del Campo, TJ Kehle - International Journal of School & …, 2016 - Taylor & Francis

[9] Interaction of humoral agents and regulation of airway smooth muscle responses (ASMR), JS Douglas, A BOUHUYS… - Federation …, 1972 - FEDERATION AMER SOC EXP

[10] J Young, ASMR, I Blansert - 2015 – books.google.com

[11] An examination of personality traits associated with autonomous sensory meridian response (ASMR), B Fredborg, J Clark, SD Smith - Frontiers in psychology, 2017 – frontiersin.org

[12] Eliciting Euphoria Online: The Aesthetics of'ASMR'Video Culture, R Gallagher - Film Criticism, 2016 – quod.lib.umich.edu

[13] An examination of personality traits associated with autonomous sensory meridian response (ASMR), B Fredborg, J Clark, SD Smith - Frontiers in psychology, 2017 – frontiersin.org

[14] Ik-Soo Ahn, Seong-Geon Bae, Myung-Jin Bae, "A Study on Warning Sound for Drowsiness Driving Prevention System", *International Journal of Applied Engineering Research ISSN 0973-4562* Volume 12, Number 24 (2017) pp. 14088-14094, 2014.

[15] Ik-Soo Ahn, Seong-Geon Bae, Myung-Jin Bae, "A Study on the Possibility of Retaliatory Driving against Car Klaxon's Sounds", *International Journal of Applied Engineering Research ISSN 0973-4562* Volume 13, Number 3 (2018) pp. 1578-1585, 2018.

[16] Ik-Soo Ahn, Seong-Geon Bae, Myung-Jin Bae, "A Study on the Necessity of Driving Sound and Driving Sound for Electric Power Simple Transportation System", *Journal of Engineering and Applied Sciences* Volume 13, Number 5, pp. 1298-1303, 2018.

[17] Barratt, E. L., and Davis, N. J. (2015). Autonomous Sensory Meridian Response (ASMR): a flow-like mental state. PeerJ. 3:e851. doi: 10.7717/peerj.851

[18] del Campo, M. A., and Kehle, T. J. (2016). Autonomous sensory meridian response (ASMR) and frisson: mindfully induced sensory phenomena that promote happiness. Int. J. School Educ. Psychol. 4, 99–105. doi: 10.1080/21683603.2016.1130582

[19] Grewe, O., Nagel, F., Kopiez, R., and Altenmüller, E. (2007). Listening to music as a re-creative process: physiological, psychological, and psychoacoustical correlates of chills and strong emotions. Music Percept. 24, 297–314. doi: 10.1525/mp.2007.24.3.297

[20] Raichle, M. E. (2015). The brain's default mode network. Annu. Rev. Neurosci. 38, 433–447. doi: 10.1146/annurev-neuro-071013-014030