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A Study on the Human Body Response to the Sound of Stepping on Fallen Leaves in ASMR

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Abstract *- ASMR sound is a sound that gives a sense of stability and comfort to people who are psychologically unstable or who want to receive comfort in any way. In this paper, the sound of stepping on fallen leaves among ASMR sounds was studied. It was confirmed that the sound of stepping on fallen leaves has the frequency characteristics of ASMR sound. The sound of stepping on fallen leaves shows sound components in which the entire audible frequency band is evenly distributed, and the low and high-frequency bands are balanced with each other. Body information such as blood pressure and pulse were tested, and interviews and questionnaires were conducted to confirm the effect of the sound of stepping on fallen leaves on the human body. As a result of the human body test, stepping on fallen leaves was found to be a healing sound that makes the mind and body feel good and induces a refreshing state. Even in the morse test results and interview results, the sound of stepping on fallen leaves felt refreshing and cool, so they expressed an opinion that it seemed to wash away the mischief and comfort the mind.*

Keywords — *Five senses, ASMR, sound healing method, the sound of stepping on fallen leaves, Healing sound*

I. INTRODUCTION

Modern people want to be healed and comforted in various ways. In the process, ASMR emerged, and ASMR ultimately aims to heal through five senses of satisfaction. Among them, ASMR, which focuses on sound, can be a self-help method through hearing. A variety of sounds are widely used in ASMR through sound, but in this paper, we will study the human body responds to the sound of stepping on fallen leaves among ASMR sounds to prove the effect of ASMR sound. To capture the sound of stepping on fallen leaves for the study, a dynamic directional microphone that can guarantee recording quality even outdoors was prepared with a cover that prevents wind resistance. The location for recording the sound of stepping on fallen leaves was set in Yeouido Park, Seoul. The recorded sound of stepping on fallen leaves was analyzed based on the sound's three elements using an acoustic analysis tool. In addition, brain waves were measured to examine the effect of stepping on fallen leaves directly on the human body, and a MOS test was performed on about 50 people.[1][2]

II. WHAT IS ASMR?

ASMR stands for Autonomous Sensory Meridian Response, a term that refers to sensory experiences such as psychological stability or pleasure that are difficult to describe that appear in response to visual, auditory, tactile, olfactory cognitive stimuli. It is recorded in advance. Among them, ASMR sound has been used worldwide for decades as a part of psychotherapy using sound. Among them, people who have a unique passion for ASMR sound develop new ASMR sounds, such as creating sounds similar to picking up the ears and recording those sounds from various angles with multiple microphones can feel them three-dimensionally. I'm working on posting these kinds of ASMR sound trigger videos to YouTube. Some ASMR sound trigger YouTube videos are evolving like a psychotherapy video using music or sound by setting various situations and creating a role-play form. ASMR's effect has not been scientifically proven, and there is a controversy as there are differences in the auditory response depending on the individual.[3][4][5]

III. A STUDY ON THE SOUND OF STEPPING ON FALLEN LEAVES DURING ASMR

ASMR sound is a regular and repetitively mixed sound of the entire frequency band. The ASMR sound is a soft whispering sound that can be received as comfortably as possible or a sound that feels a little strong but cool. The most common characteristic of ASMR sound can be judged as a small, repetitive, and fresh, stimulating sound. The sound of stepping on fallen leaves is a sound level that makes you feel cool, but it is a sound level that is repetitive and stimulates freshly. In this paper, we selected and studied the sound of stepping on fallen leaves among ASMR sounds. As a research method, we analyzed the acoustic characteristics of stepping on fallen leaves and investigated how it reacts to the human body. The components of the sound of stepping on fallen leaves were analyzed through acoustic analysis, and the human reaction was analyzed by measuring changes in blood pressure and pulse, analyzing brain waves, and MOS tests and interviews.[6][7]

A. Acoustic analysis of the sound of stepping on fallen leaves

The acoustic analysis of stepping on fallen leaves is based on the three elements of sound: time-domain analysis,

spectrogram analysis, and spectrum analysis. Time-domain analysis analyzes the sound's loudness and continuity, and the spectrogram analyzes each pitch's energy. Spectrum analyzes the characteristics of tone by frequency band. Adobe's audition program was used as a tool for the acoustic analysis of pencil writing. The loudness and continuity of the sound are analyzed as a time-domain waveform, the sound component and energy as a spectrogram, and the distribution of sound by the band and the overall frequency characteristics are analyzed as a spectrum. The analysis of these frequency components uses the concept of FFT to obtain the results.[8][9]

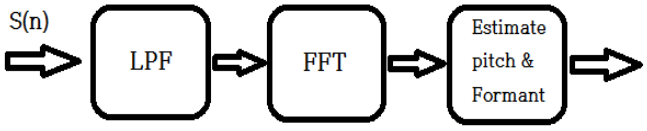

Fig. 1 FFT diagram for obtaining information on the sound of stepping on fallen leaves

Figure 1 above is a diagram of digitizing an analog sound signal with Fast Fourier Transform (FFT). As the first step in digitizing an analog signal, a low pass filter (LPF) is performed to filter out noise in high frequencies while passing low-frequency signals. Next, the sound signal is transformed to be easy to analyze by using high-speed pre-e transform. Through such a process, the foundation for analyzing the pitch and formant of acoustic frequencies is laid.[10][11][12][13]

Time-domain analysis

The time-domain analysis was used for acoustic analysis of the sound of stepping on fallen leaves. To understand the sound level and continuity of the sound of stepping on fallen leaves among ASMR sounds, a time-domain graph of the sound of stepping on fallen leaves was derived. In the time domain graph, the energy of the sound of stepping on fallen leaves was analyzed for each period, and the results were obtained by analyzing the persistence and continuity.[14][15]

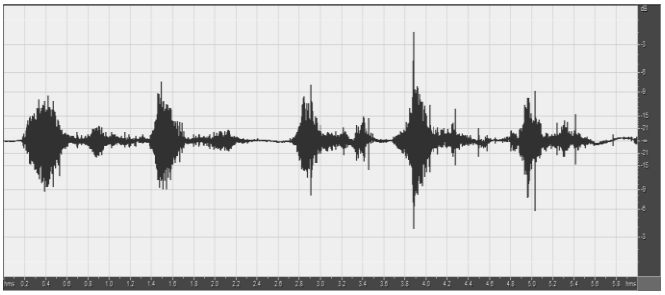

Fig. 2 Time domain graph of the sound of stepping on fallen leaves

Figure 2 is a time-domain graph of the sound of stepping on fallen leaves. If you look at the time domain graph of the sound of stepping on fallen leaves, you can see that the amplitudes of rough and thin are repeated. The sound of stepping on fallen leaves is repeatedly described with a rough and thin amplitude. A rough crackling sound occurs when stepping on fallen leaves, and the sound is generated when the pressed leaves are restored when the foot is released. In other words, the sound of stepping on fallen leaves is a sound that is continuously transmitted in a cool, whispering sound. In this way, the time-domain graph shows well the two repetitive sound characteristics of the sound of stepping on fallen leaves.

Spectrogram analysis

We analyzed the spectrogram graph to analyze the sound energy for the sound of stepping on fallen leaves.

Figure 3. When you look at the shape shown in the spectrogram graph of the sound of stepping on fallen leaves, you can see the shape formed by alternating parts of strong energy and parts of weak energy. The spectrogram of the sound of stepping on fallen leaves shows that the sound characteristics of stepping on fallen leaves are a sound that gives a cool and lingering effect expressed in strength and weakness. It can be seen that the sound component of stepping on fallen leaves is a sound that repeatedly touches a person's hearing while appropriately stimulating it.

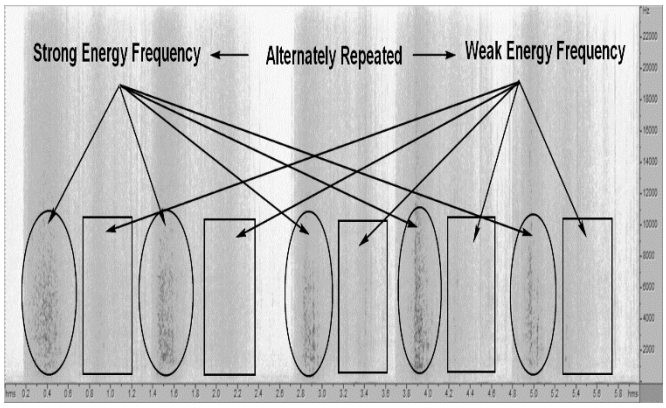

Fig. 3 Spectrogram graph of the sound of stepping on fallen leaves

Spectrum analysis

Through spectrum analysis of the sound of stepping on fallen leaves, the distribution of sound by frequency and sound components' characteristics were investigated. Through spectrum analysis, it is possible to find out what graphs are shown within the audible frequency band of the sound of stepping on fallen leaves and what types of frequency bands are distributed. Look at the spectrum graph showing the frequency distribution of the sound of stepping on fallen leaves in Fig. 4. You can see that the high-frequency region, the middle frequency region and the high-frequency region are evenly distributed. In general, sound in the low-frequency band covers the human body's entire skin at less than 200Hz and spreads deep inside the human body to deliver the sound feeling to the internal organs. The

middle frequency range is formed from 200Hz to 3,000Hz, and it is the area that uniquely expresses the main sound components. Besides, the high-frequency band's sound is formed from the 5,000Hz part and is a region that strongly appeals to the sound characteristics. Frequency sound is the advantage of sound made from the broadleaf tree.

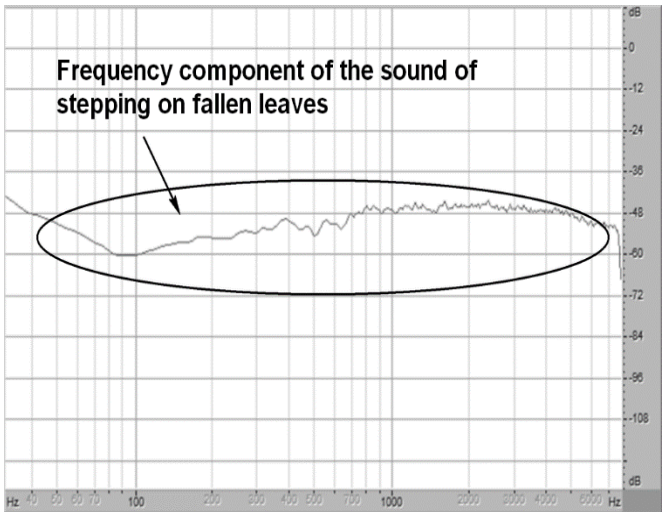

Fig. 4 Spectral graph of the sound of falling leaves

It can be seen that the frequency characteristics of the sound of stepping on fallen leaves shown in the spectrum graph of Figure 4 are distributed evenly from the low-frequency band to the high-frequency band and have a stabilizing effect on the body. This frequency characteristic shows that it has the sound characteristics required by ASMR sound.

B. Analysis of the human body responds to the sound of stepping on fallen leaves

To study the human body sensitization characteristics of stepping on fallen leaves, we analyzed the human body response through body change characteristics. As a method of analyzing the characteristics of body changes, changes in blood pressure, electrocardiogram, and pulse rate were measured before and during listening to the sound of stepping on fallen leaves... Blood pressure refers to the pressure exerted on the walls of blood vessels by blood flowing through them. Blood pressure is also a basic checkup to check a person's health. Blood pressure, electrocardiogram, and pulse rate analysis of the sound of stepping on fallen leaves allow you to see how your body reacts to the sound of stepping on fallen leaves. In general, a normal person's blood pressure is 120mmHg in the systolic phase, and the diastolic blood pressure is 80mmHg. However, if your systolic blood pressure is over 140mmHg and your diastolic blood pressure is over 90mmHg, you should suspect high blood pressure. Of course, it cannot be determined by measuring once, and you must measure it several times and judge by looking at the average measured value. In hypotension, systolic blood pressure is 90mmHg or less, and diastolic blood pressure is 60mmHg or less. High blood pressure is the cause of heart disease and can also lead to chronic kidney failure, also called kidney disease. Low blood pressure causes symptoms such as dizziness or general weakness due to anemia and headache. It causes dangerous complications such as diabetes mellitus for adults, so blood pressure management must be thoroughly maintained. Next, if your pulse is too fast or too slow, you need to detect something wrong with your body. The normal pulse rate for adults is 50-60 times per minute or less than 100 times. In the case of newborns, 120 to 140 times are twice as fast as adults. If your pulse rate is irregular, very fast, or very slow, you are more likely to have a heart attack, heart attack, or chronic heart disease. In this paper, blood pressure and pulse were measured to measure the sound of stepping on fallen leaves on body changes among ASMR sounds. To measure blood pressure and pulse simultaneously, it was performed in a quiet space using EX's EASY X 800 equipment. As a test subject, one of the people with normal hypertension, one from the normal blood pressure group, and one from the hypotension group were selected. The experiment method was first measured in a state where the subject did not hear the sound of stepping on fallen leaves. After rest for about 10 minutes, the body changes were measured using a blood pressure monitor and a pulse meter while listening to the sound of stepping on the leaves with headphones.[16][17][18]

Table. 1 Changes in the body after listening to the sound of stepping on fallen leaves

Checkpoint	Before listening			After listening		
Part	Systolic	diastolic	pulse rate	Systolic	diastolic	pulse rate
High	147	110	118	132	92	105
Nor	135	93	90	128	85	78
Low	83	58	42	115	75	62

However, the test subject in the normal blood pressure group decided to measure after working and leaving. The reason is to determine the extent to which blood pressure, which had increased somewhat while working even in the

normal blood pressure group, recovers again. Table-1 is a table comparing the results of measuring the subject's body change for the sound of stepping on fallen leaves among ASMR sounds, divided into systolic blood pressure, diastolic blood pressure, and pulse rate, with data before and after listening. As a result of measuring the body change of the sound of stepping on fallen leaves of the test subject for the physical response of the sound of stepping on fallen leaves, the test subject in the hypertensive group had a systolic blood pressure of 147 mmHg and diastolic blood pressure of 110 mmHg before hearing the sound of stepping on fallen leaves. This 132mmHg, diastolic blood pressure dropped to 92mmHg. Of course, it did not reach the normal blood pressure range, but in that the blood pressure fell after hearing the sound of stepping on fallen leaves, the results worthy of recommending steady listening to the sound of stepping on fallen leaves were derived. The test subjects in the normal blood pressure group also had a systolic blood pressure of 135 mmHg and diastolic blood pressure of 93 mmHg when their blood pressure was measured after performing busy tasks. This proved the ASMR effect of the sound of stepping on fallen leaves in that a sense of stability was found to be closer to the range of the diastolic blood pressure of 80 mmHg from the systolic blood pressure of 120 mmHg, which is a general normal blood pressure level. In the hypotensive subjects, the systolic blood pressure was 83mmHg, and the diastolic blood pressure was 58mmHg before hearing the sound of falling leaves. After listening to the sound of falling leaves, the systolic blood pressure was 115mmHg. The diastolic blood pressure increased to 75mmHg, which was adjusted to close to normal blood pressure. . Such an experiment shows the possibility that the sound of stepping on fallen leaves of ASMR may prevent the health of modern people caused by abnormal blood pressure. Next, we looked at the change in pulse rate. The pulse rate also fell from 118 bpm per minute to 105 bpm after hearing the sound of stepping on fallen leaves before the hypertensive group heard the sound of stepping on fallen leaves. In the normal blood pressure group, from 90 bpm per minute before hearing the sound of stepping on fallen leaves, it fell to 78 bpm after listening to the sound of stepping on fallen leaves. In the low blood pressure group, from 42 bpm per minute before hearing the sound of stepping on fallen leaves, it rose somewhat to 62 bpm after listening to the sound of stepping on fallen leaves. It can be said that the ASMR sound of the sound of stepping on fallen leaves was effective in that the pulse rate was flexible, but the high pulse rate was lowered, and the low pulse rate was activated within the normal range.

IV. MOS Test of the sound of stepping on fallen leaves

The MOS Test (Means Opinion Score Test) is an abbreviated questionnaire test mainly used for call quality testing. The MOS Test is an opinion verification test whose reliability has been verified by making it possible to present objective and sincere opinions, even if the number of people undergoing the experiment is small. Recently, it is used to research people's opinions in various fields.[19][20] Figure 5 below is a schematic diagram of the MOS test opinion of the sound of stepping on fallen leaves in Table-2. The MOS test for the sound of stepping on fallen leaves among the ASMR sounds was performed to collect opinions of listeners who responded to the sound of stepping on fallen leaves.

Table. 2 Changes in the body after listening to the sound of stepping on fallen leaves

Contents	Very Refresh	Refresh	Norm	Not refresh	Not very Refresh
Subject	13	20	10	4	3

For the MOS test, 50 listeners were surveyed to see how the sound of stepping on fallen leaves affects people. Also, after hearing the sound of stepping on fallen leaves, I interviewed what came to mind. As depicted in Figure 5, 33 people, more than half of the staff, felt refreshed and relieved of stress, and 10 people expressed that it was somewhat fresh and effective. Seven of them said that the sound of stepping on fallen leaves was harsh and repetitive, so it was stimulating, but most of the listeners responded positively. Interviews were conducted to hear opinions about the sound of stepping on fallen leaves among ASMR sounds. The interview was conducted so that 50 people who conducted the MOS test were freely asked for their opinions. The answer is, again, the sound of stepping on fallen leaves was a strong rustling sound when stepping on fallen leaves, and the weak sound of falling leaves when they took off their feet.

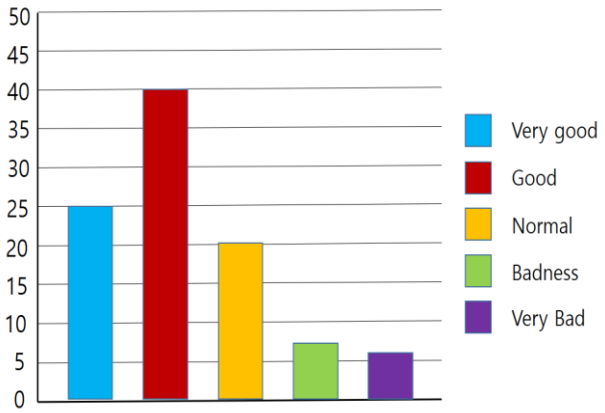

Fig. 5 MOS test opinion of the sound of stepping on fallen leaves

Ten people said that the second sound of stepping on fallen leaves seems to be effective as just ASMR. However, seven people gave negative opinions that the strong sound of the leaves breaking when stepping on the leaves was harsh and noisy, and distracting. These results are judged by the opinion that the sound of stepping on fallen leaves would be suitable as an ASMR sound if used well.

V. CONCLUSIONS

This study is a study to check whether the sound of stepping on fallen leaves is suitable for use as an ASMR sound, and the acoustic analysis, body change measurement, MOS test, and interview were conducted by that method. As a result of acoustic analysis, it was confirmed that the sound of stepping on fallen leaves has a cool and refreshing sound component. The sound of stepping on fallen leaves is generated by evenly distributing sound components in the entire audible frequency band in a large space. The sound of strong and weak is transmitted continuously. It was analyzed as a sound that gives a fresh stimulus by repeatedly generating a sound that gives a refreshing and cool feeling due to the harmony of the sound of falling leaves when stepping on the leaves and the lingering sound of the leaves when stepping on them. The characteristic of each frequency of the sound of stepping on fallen leaves shows a sound characteristic that maintains almost uniform dB in all bands from low to high-frequency bands. If we analyze in detail, the low-frequency band below 100Hz is formed more strongly, and it shows a graph that gradually rises to the middle frequency band and then becomes parallel in the high-frequency band for a while. This graph makes the listener feel cool by combining the high-frequency refreshment and the low-frequency comfortable stability. In the body change characteristics of the sound of stepping on fallen leaves, it showed the effect of lowering blood pressure in people who usually showed high blood pressure, and helped people with low blood pressure to maintain normal blood pressure. The pulse rate was also lowered when it was fast and helped to find a normal pulse rate when it was slow. In the MOS test results of the sound of stepping on fallen leaves and the contents of the interview, the most common opinion was that the stress disappeared with a refreshing and cool feeling.

On the other hand, a few opinions said that the sound of stepping on fallen leaves was harsh and noisy, so the mind couldn't concentrate and be anxious. However, most people have found that the entire band's sound component controls the strength and weakness and gives a refreshing and cool, appropriate stimulus to feel good. The fact that ASMR sound has become of great interest to modern people is to disprove that people's stress in social life is so great.

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