

Scientific Evidence Proves its Effect on Human Mind and Body Is Music that Uses the Solfeggio Frequency Effective for Emotional Induction? Experiment by Presenting Music and How to Create with “Image Fantasy Performance” Using “Kyoko Takemoto’s Imaginative Music Playing Method”

Kyoko TAKEMOTO¹, Yasuhiro ITO^{2,3}, Tadayuki IIDA⁴, Shin ISIHARA²,
Kaoru KAWAI⁵ and Go HASHIMOTO¹

¹*Department of Music Education, Aichi University of Education, Kariya 448-8542, Japan*

²*Department of Community Medicine, ⁵Department of Comprehensive Life Sciences, Fujita Health University, Toyoake 470-1192, Japan*

³*Department of Medical Technology, Yokkaichi Nursing and Medical Care University, Yokkaichi 512-8045, Japan*

⁴*Faculty of Health and Welfare, Prefectural University of Hiroshima, Mihara 723-0053, Japan*

Abstract

We presented how to create the “Kyoko Takemoto’s Imaginative Music Playing Method”. “Enveloped in the Light Full of Love” composed by Hashimoto was screened by the “Image Fantasy” performance using “Kyoko Takemoto’s Imaginative Music Playing Method” and the influence on mind and body of indicator was investigated. “Enveloped in the Light Full of Love” was composed using the Solfeggio scale. Some of the subjects were blindfolded during the experiment (auditory group). In the emotional score immediately after the performance, “anger” and “anxiety” were significantly lower in the auditory group. This was evidence that the visual causes negative emotions. There was no difference in amylase activity, cortisol concentration, and serotonin concentration between the audiovisual group and the auditory group. From these results, it was considered that the Music of the Solfeggio scale induced positive emotions in the mind and body of the experimental participants, along with the emotional performances of the new Music that were unfamiliar to the ears.

Keywords: Kyoko Takemoto’s Imaginative Music Playing Method, Solfeggio frequency, emotional induction

I. Introduction

The COVID-19 disaster that began in 2020 has changed people’s lives and drastically changed the environment of people involved in music. The concerts that were previously taken for granted were all canceled, and afterward many changes were required such as reducing the number of seats. People seeking music have changed their behavior to enjoy music distribution on YouTube and other media. Many musical works can be listened to for free on smartphones, and the number of people in an environment where music is playing in their daily lives is increasing. As many as 90% of college students answered that they continued to play music despite restrictions ¹⁾.

In the field of music education, face-to-face lessons were usually used for music; however, after the pandemic, distance lessons have become more common. Therefore, we

were able to obtain a lot of feedback from passive students who normally listen to lectures. It was reaffirmed that music is always part of their lives. There are various types of music that they listen to, but since the melody and rhythm of the music save their hearts, we found that many people put their music aside while projecting their lives onto the lyrics of the music ¹⁾.

What’s happening to your body that makes you feel excited when you listen to music? Why is music soothing and encouraging? Since 2017, the authors have been conducting joint research on the effects of music on the mind and body in collaboration with the field of medicine in order to find scientific evidence for the power of music. Using scientific evidence, we found that music was effective in controlling negative emotions, such as anger or sadness, and in addition, increased the feeling of resilience ²⁾³⁾. In this paper, “Enveloped in the Light Full of Love” composed by

Hashimoto was presented as by the “Image Fantasy Performance” using “Kyoko Takemoto’s Imaginative Music Playing Method” and its influence on the audience was investigated.

II. What is the “Kyoko Takemoto’s Imaginative Music Playing Method”

1. Purpose

Hereinafter called as “Kyoko Takemoto’s Imaginative Music Playing Method” is a creative piano playing method and teaching method that makes it possible to express the emotions hidden in the score by concretely expressing the music, which is abstract, with words, colors, or images. The first author, Kyoko Takemoto, introduced “Image Fantasy Performance” using “Kyoko Takemoto’s Imaginative Music Playing Method”, mainly at universities to improve the students’ understanding of music and expressiveness (Fig. 1).



Fig. 1. “Image Fantasy Performance” using “Kyoko Takemoto’s Imaginative Music Playing Method”

Its introduction changed the interpretation of the music department students’ works, demonstrating that it has an educational effect⁴⁾⁵⁾. The method concretely expressed the “Visualized Music = image diagram” associated with the music, combined the “Image Diagram” with the performance, and was shared with all other students. This led to a deeper understanding of music by the students. “Kyoko Takemoto’s Imaginative Music Playing Method” can embody and visualize musical works, accurately convey the content of music not only to performers but also to viewers, and guide them to specific emotions. As a result, it is expected that emotion-inducing effects, such as stress relief and stress tolerance, can be obtained at a higher level than simply listening to a recorded sound source (Fig. 2). Hence, after understanding the background of the musical work, analyzing tonality, speed, melody, harmony, musical symbols, and other elements, the composer’s thoughts, assertions, and emotions are effectively expressed.

Specifically, in “Image playing”, the composer’s feelings are visualized using “Words” and “Colors” to form the world that he wants to express as music. Since it is a subjectivity that arises from the “Unconsciousness of the mind and deep memory” of the performer who creates using the “Kyoko Takemoto’s Imaginative Music Playing Method”, we are trying to make it universal and objective by incorporating the opinions of multiple performers.

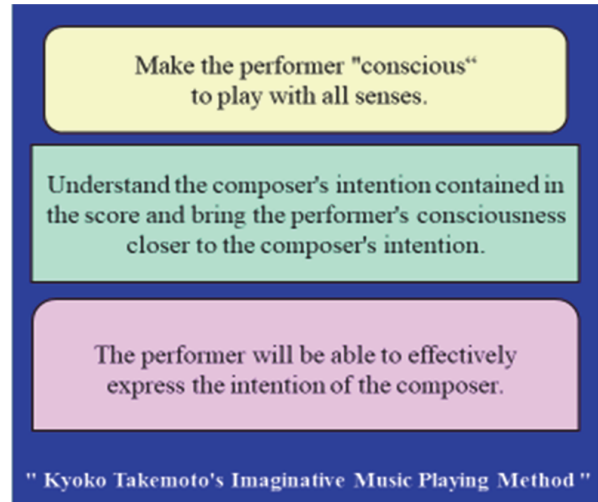


Fig. 2 Purpose of “Kyoko Takemoto’s Imaginative Music playing Method”

III. How to create using the “Kyoko Takemoto’s Imaginative Music playing Method” imaged from the score?

1. How to express music in language: Awareness of the performer’s emotions by verbalizing the score

Expressing music in language has two meanings. The first is that if it is a musical score of Western music, musicians who have learned Western music can recognize it as a common language even if they use a different language. In the field of brain science, it has been reported that Broca’s area is activated because a musical score is comparable to Pavlov’s second language system, and induces memory and conditioned reflexes⁶⁾. Musicians are dynamically conscious of the music by looking at the musical score, something that is challenging for non-musicians.

The second is verbalization by “Image word” (Fig. 3) for playing using “Kyoko Takemoto’s Imaginative Music playing Method”, which is the subject of this paper. By going through this process, even if you are not a musician or cannot read the score, you can express your consciousness by reading the words. The composer’s intention is included in the structure and format of the musical work; therefore, we analyze their situation and emotions at the time of composition and write the words that create images as “Image Words” by making full use of the performer’s own

memory and imagination. Next, after graphing the temporal transition of the “Image Words”, the story of the entire Music is created. By this method, we understand the flow of music is changing the listener’s emotions, and construct a playing method.

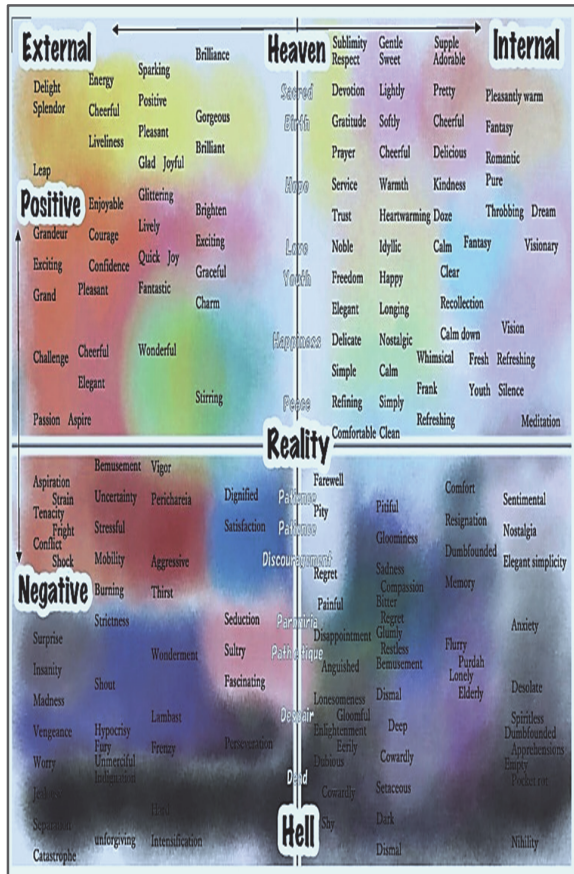


Fig. 3 “Image words” colored according to the written meaning.

2. Method for visualization: Color expression to clarify the purpose of performance

If the performer draws a three-dimensional space associated with the sound as an “Expression Curve” and paints it (Fig. 4), they can recognize the sensations and emotions inherent in the musical work, and begin to notice the unconscious emotions that sleep deep inside the heart. As a result, the performer does not just feel the music, but by clarifying their own consciousness of the music, the purpose of the performance becomes clear. Color and language have a synergistic effect with a three-dimensional space created by sound and breathing during the performance, and the whole sensory area functions to induce emotions. In psychology, it is said that color affects unconscious emotions and affects the psychology of performers and viewers. Finally, the whole brain is mobilized to determine the specific playing method so that the image can be reproduced according to the “Musical Image Score”, which is a visual

representation of the performance ^{4) 5) 7) 8)}.

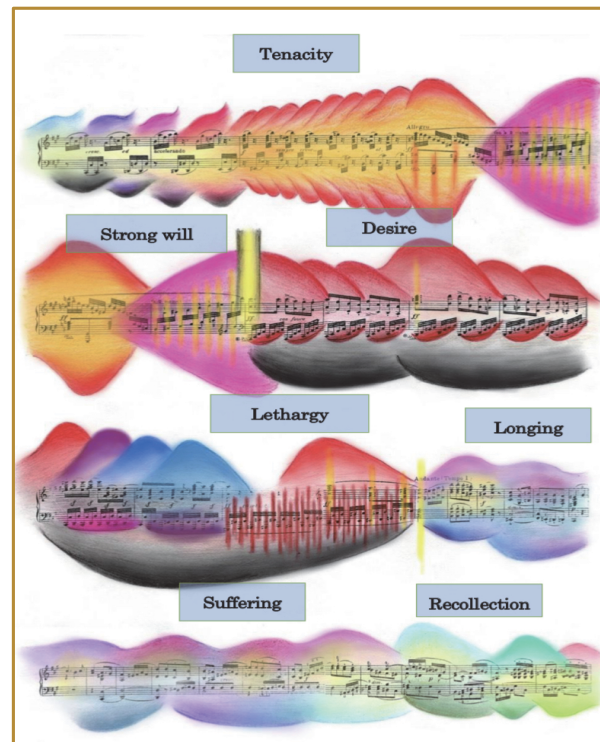


Fig. 4 “Expression curves” added to the score ^{7) 8)}.

IV. A music composition using solfeggio scale

1. Purpose of the composition of the piano piece “Enveloped in the Light Full of Love” using the solfeggio frequency

The purpose of composing this piano piece does not end with creating work which is so-called “Healing music” that makes one feel better just listening to it. It is common with Healing music that it is an aim to invite a listener to a safe and stable mental condition. However, in the process of getting there, it is different from healing music in that it levies some ordeals on the unconsciousness of the listener. If the emotions that form the basis of a person’s mind are awakened both positively and negatively by listening to this music, it is also natural that negative emotions are aroused. The ordeal means that a mental state of security and stability cannot be obtained without the tolerance of accepting negative emotions. Therefore, we aimed at the making of music that vitality to tomorrow and relief are provided after having passed through re-recognition of oneself and forgiveness. In addition, the main purpose of this work is to provide logistical support for the “Kyoko Takemoto’s Imaginative Music playing Method” with the skill of composition. It is also aimed at exploring the significance of musical intervention in the social environment that influences human health.

2. How to compose the piano piece “Enveloped in the Light Full of Love”

One of the motives for starting composition was to pay attention to the existence of the Solfeggio scale, which is a musical scale that collects sounds with frequencies that give good influence on nature and the human body, and to consider whether the scale can be applied in music. The constituent notes of the Solfeggio scale have corresponding organs and limbs, and these are said to have the effect that promotes their functional recovery and calming or activating mental state. However, there are many uncertainties about the influence on the human mind and body. In addition, the mainstream method for composing healing music using the conventional Solfeggio scale is to provide a gentle tune from beginning to end while playing one of the constituent sounds of the scale arbitrary as a background over a long period time. Besides, many of the timbre used in Healing music is refined with a synthesizer. It means that Healing music is continuing high dependence on “synthesized sound artificially” rather than a musical tune. In our research, to spread it to many performers in the future, we firmly planned to compose it for the piano that is an acoustic instrument, without depending on timbre of the synthesizer. On such a premise, we aimed to form melody by integrating constituent sounds of the Solfeggio scale which are often treated one by one (Fig. 5). If this musical work has a positive effect on the mind and body, it may help prove the effectiveness of the Solfeggio scale.

3. Interest in the Zodiac constellations (Fig. 6)

For this research, the transition of human emotions must be reflected to the tune, and while searching for a way to express it, we focused on “fortune-telling”. From this, the idea was born that each of the “Zodiac constellation” could be assigned to the 12 semitones that make up an octave and symbolized. The allocation method we used was to set Aries, which is a symbol of the beginning, to C while obeying the regularity of “Circle of fifth”. By following the same procedure, we could set Taurus to G, Gemini to D, and so on,

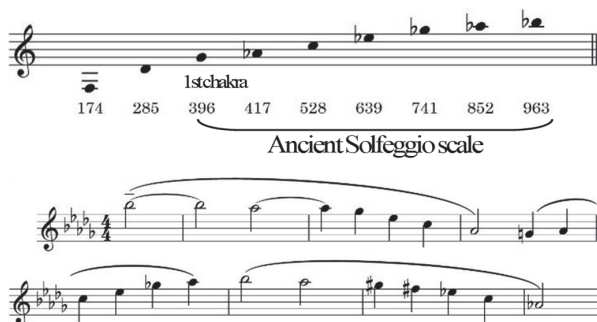


Fig. 5 Main theme obtained from the same scale as the Solfeggio scale (numerical unit is Hz)

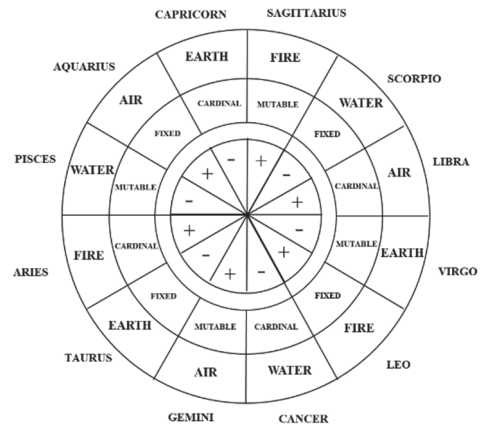


Fig. 6 The key of each constellation set based on the tonic assigned on the horoscope.

until Pisces to F. As a result, all the constellations had different key-tone, and individuality of each constellation emerged. Therefore, a key with the assigned unique tone as the tonic could be the key that is peculiar to each constellation. According to Western astrology, the 12 constellations can be classified into 3 groups: active, immobile, and flexible, or classified into the 4 elements: fire, earth, air (wind), and water. Since these items are evenly spaced on the array, the following chords are obtained when those constituent notes of each group are aggregated. The activity/immobility/flexibility which constitutes “3 groups” became a diminished seventh chord, and the fire/earth/air/water which constitutes “4 elements” became an augmented triad (Fig. 7), from these, it was confirmed that the obtained chords have a homogeneous relationship in the group or element.

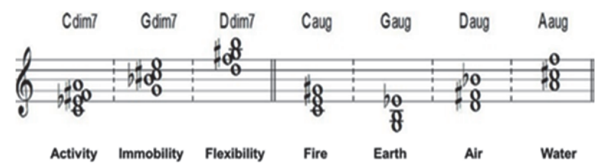


Fig. 7 List of chords extracted for each category

4. About the fundamental key

The fundamental key of the music was set to D flat major, which was chosen for two main reasons. Firstly, when playing the theme using the Solfeggio scale, it was closest to D flat major. 396 Hz (G), which is not included originally in the major scale of D flat major, can be processed as a non-harmonic tone (appoggiatura or auxiliary tone), and sometimes can be regarded as the 4th tone of the Lydian mode. However, it is difficult to handle 285 Hz (D), and it was necessary to devise a measure, such as hiding D to the inner part, when composing. The result that coordinated the formation of melody in consideration of the above are 2 types of themes: the main theme that symbolizes light (measures 16-34, 134-151) and the secondary theme that

reminds us of a mother's lullaby (measures 35-42, 182-186). Another reason is the compositional intention to make the fundamental key inconsistent with any keys assigned to the 12 constellations. Accordingly, D flat major was assigned to fundamental key as symbol of "Existence to integrate the order of the heavens". To express the gentle light such as the embrace, it was necessary to select D flat major, which contains a lot of b . In addition, this key is said to have some image of colors that is warmer more softly.

For example, there are the following scenes; Leo and Sagittarius, which were originally positioned as feelings of anger, were transposed to D flat major, and as a result, they roar the blessing (measures 152-159). This description expresses those feelings of their anger were settled down by having been enveloped by a gentle light. In addition, People can see Taurus, Capricorn, and Aries on the horoscope appearing and disappearing. This scene was inspired by the ceiling painting⁹⁾ of the Farnese Palace (Rome, Italy), which depicts the innumerable constellations including the 12 constellations rushing vividly and moving vigorously.

The contents of the story described in this music are to convey from parents to children "the desire for happiness that they have gained through facing one's destiny, through despair and destruction for the regeneration of their hearts, and through forgiveness". As a result, the only way to portray such a magnificent flow was to put D flat major as the fundamental key. Based on the world view built up in this way, the main theme was created with the Solfeggio scale. When it reaches the listener through the expression by the performer, it is possible to use science to verify the effect and influence on the mind and body.

V. Experimental method

1. Experiment participants

The participants in the experiment were 25 female student volunteers from Universities A and F. The average age was adjusted to 20.4 ± 1.2 years so that the difference in sensation depending on age was reduced. Prior to the experiment, specific explanations were given about the experiment, and informed consent was obtained in writing.

2. Experimental method

The experiment was carried out by presenting the piano solo song "Enveloped in the Light Full of Love" composed by Hashimoto, with images and language added to the "Kyoko Takemoto's Imaginative Music Playing Method" (items 2 and 3 named "Image Fantasy"), on an acoustic reflector behind the stage. An eye mask was attached to some of the participants in the experiment so that only the piano performance was heard. The group that listened to the

performance while watching the video and language was called the "audiovisual group", and the group that listened only to the performance with the eye mask on was called the "auditory group". The playing time was about 17 minutes. Saliva was collected by Salivette (Sarstedt AG & Co. Germany) before the start of the experiment and immediately after the end of the performance. At the same time, the condition anxiety score was obtained using the questionnaire State-Trait Anxiety Inventory (STAI) Form-X (Sankyobo, Kyoto). Emotions were scored using the Face Scale, which allows intuitive evaluation of emotions (a method of expressing emotions with facial expressions; a smile is a high score, a crying face is a low score). Another question was the impression received from the song immediately after the performance. The participants scored using a five-point scale on the four items of anger, anxiety, friendship, and vigor. Saliva was ice-cooled immediately after collection, centrifuged, and stored in a deep freezer at -80°C until measurement. The measurement items were amylase activity value, cortisol concentration, and serotonin concentration. Amylase activity value was measured with a saliva amylase monitor (NIPRO, Tokyo).

The measurement principle of amylase is a colorimetric method that applies the endpoint method. 2-chloro-4-nitrophenyl-4-O- β -D-galactopyranosylmaltoside, which is a substrate of α -amylase, is hydrolyzed by amylase, and the color tone of yellow that develops according to its activity value is measured. We used an expanded range high-sensitivity salivary cortisol EIA kit (Salimetrics, USA) to measure cortisol, and the All-species Serotonin ELISA Kit (LSBio, USA) to measure serotonin.

3. Research ethics

This study was approved by the Research Ethics Committee of Aichi University of Education (approval number AUE2017040HUM). The experiment adhered to the Declaration of Helsinki, which is the ethical principle of medical research on humans.

4. Results

The reaction results of the experimental participants to "Image Fantasy" using the piano solo music "Enveloped in the Light Full of Love" are shown in Table 1. The audiovisual and auditory responses of the participants were compared.

4-1. Impressions of music: The impressions of music by the 5-point evaluation method were examined in 4 items at the psychological level. Table 1 shows the results of the audiovisual group and the auditory group. There was no significant difference between the two groups.

4-2. State anxiety score: The state anxiety score before an experiment and immediately after a performance decreased after an experiment in the audiovisual group. In the auditory group, there was no significant difference before and after an experiment.

4-3. Face Scale score: The scores before the experiment and immediately after the performance increased significantly in the audiovisual group after the performance. However, in the auditory group, there was no difference between the two groups. In addition, when comparing the two groups after the performance, the auditory group scored significantly lower.

4-4. Amylase activity value: The amylase activity value before the experiment and immediately after the performance increased significantly in the audiovisual group. In the auditory group, there was a significant increase in after an experiment. In addition, there was no significant difference between the two groups before and after.

4-5. Cortisol concentration: The cortisol concentrations before and immediately after the experiment were no difference before and after the experiment in the audiovisual and audio groups. In addition, no significant difference was observed between the two groups before and after the experiment.

Table 1. The experimental results of “Enveloped in the Light Full of Love” is shown

State / part	Item	Unit	Audiovisual group		
			Before an experiment (B)	Immediately after a performance (A)	B vs A p value
Sense of music "Emotion"	anger			2.6 ± 0.7	
	anxiety			3.4 ± 0.7	
	friendship			4.9 ± 0.4	
	vigor			5.0 ± 0.0	
Emotions (happy / sad)	Face Scale		6.0 ± 1.3	8.9 ± 1.1	0.004*
Feeling	State anxiety score		38 ± 8	30 ± 8	0.054 ^{NS}
Sympathetic activity	Amylase activity	KU/L ^b	30 ± 17	48 ± 23	0.001*
HPA axis ^a	Cortisol concentration	µg/dL ^c	0.15 ± 0.11	0.16 ± 0.09	0.883 ^{NS}
Brain-Gut axis	Serotonin concentration	ng/mL ^d	1.88 ± 0.76	2.39 ± 0.61	0.026*

Item	Auditory group		B vs A p value	Comparison of Audiovisual and Auditory groups p value
	Before an experiment (B)	Immediately after a performance (A)		
anger		1.8 ± 0.4		0.0298*
anxiety		2.0 ± 0.7		0.0086*
friendship		4.2 ± 0.8		0.1489 NS
vigor		4.2 ± 0.8		0.0993 NS
Face Scale	6.4 ± 2.3	7.0 ± 1.6	0.634 ^{NS}	B: 0.733, A: 0.045*
State anxiety score	40 ± 9	36 ± 11	0.376 ^{NS}	B: 0.689, A: 0.314
Amylase activity	26 ± 13	46 ± 21	0.049*	B: 0.638, A: 0.884
Cortisol concentration	0.18 ± 0.07	0.21 ± 0.15	0.755 ^{NS}	B: 0.491, A: 0.510
Serotonin concentration	1.54 ± 0.97	2.37 ± 0.61	0.009*	B: 0.514, A: 0.955

Note: Data means average ± standard deviation. The p value is the significance level of the risk rate of the test result, and p <0.05 or less is considered to be significant. * Indicates that there is a statistically significant difference. NS (not significant) indicates no significant difference. B: before an experiment, and A: immediately after a performance.

a: Hypothalamic-pituitary-adrenal gland axis. b: One unit of amylase activity is defined as the amount of enzyme (international standard) that can change 1 µmol of substrate per minute under optimal conditions. c: µg is 1 / 100,000 grams, dL: deciliter, d: ng is 1 billionth of a gram, mL: milliliter

4-6. Serotonin concentration: The serotonin concentration before the experiment and immediately after the performance was significantly increased in the audiovisual group and audio group. On the other hand, there was no significant difference between these two groups before and after the experiment.

5. Discussion of experimental results

In this experiment, there were no physiological indicators that made a significant difference between the audiovisual group and the auditory group wearing the eye mask. However, the scores of the negative sensations “anger” and “anxiety” were significantly lower in the auditory group.

On the other hand, there was no difference between the positive impressions of “friendship” and “vigor”. Thus, the image induced negative emotions. However, on the Face Scale, the auditory group scored lower, and the score was not higher (smile score) than before the performance. It was considered that this was influenced by the darkened visual field of the auditory group. Both the impression survey of the tune by the 5-step evaluation method and the Face Scale were answered intuitively, which was useful for emotional evaluation.

On the other hand, in a questionnaire, such as the STAI, the subjects must express their feelings in their own words, which is a score of their mood. Hence, the STAI is a method of scoring state anxiety and characteristic anxiety; thus, their negative mood hardly changed. What we can see from these results is that emotions are easily guided by images. There was no significant difference in amylase activity (sympathetic nerve activity index)¹⁰, cortisol concentration (Hypothalamic- pituitary-adrenal axis [HPA] axis stress index)¹¹, and serotonin concentration (cerebral-intestinal correlation index)³ with or without vision. In addition to the emotional evaluation score in the music that was heard for the first time, vision may induce a negative “impression” of the music.

The following pathways are currently known for their response in the central nervous system (in the brain) to music that is listened to for the first time. It is a spatial cognitive coordinate path that starts from the posterior of the cerebellum, passes through the lateral thalamic nucleus group, posterior commissure area, prefrontal cortex, and anterior basal ganglia to the thalamus. Especially, it is a system that works to recognize the rhythm, which is a stimulation loop that responds to new music. As the listener becomes accustomed to the music, it shifts from the spatial cognitive coordinate path to the motion coordinate path¹².

The music that a person listens to several times is stored in the unconscious area, and the next time its music is

listened to, the memory at that time is revived along with the melody and rhythm¹³.

Since the amylase activity value increased in both the audiovisual group and the auditory group, there was a sympathetic nerve reaction to the music heard for the first time. Amylase transmits the load received in the hypothalamus via the sympathetic nerve; thus, the listener was conscious of the unknown song. Previous studies using the “image playing method” found that it was difficult to induce amylase activity value in known songs³.

On the other hand, cortisol increases due to hypothalamic stimulation and decreases when listening to music in a seat without stimulation. In our previous experiments, listening to a piano performance decreased cortisol levels; however, it did not decrease when the images were presented at the same time²⁾³. In this experiment, cortisol did not decrease even in the auditory group, so, probably, the music was consciously listened to, as was found in the previous studies that investigated amylase levels.

Serotonin acts as a gastrointestinal and vasoactive autacoid (hormone-like action) in the periphery and was increased in both the audiovisual and auditory groups. The relationship between emotions and serotonin in the central nervous system is an old and new challenge. One explanation for the increase in serotonin due to emotional changes induced by external stimuli comes from the analysis of narcolepsy patients. External stimuli that cause an emotional response increase amygdala activity.

Excessive activity of the amygdala causes cataplexy, so the orexin nerve increases the activity of the serotonin nerve in the dorsal raphe nucleus, increasing the release of serotonin in the amygdala and weakening the activity of the amygdala¹⁴.

The rate of increase was $135 \pm 59\%$ in the audiovisual group and $213 \pm 119\%$ in the auditory group, with no significant difference. The spatial cognitive coordinate path works for music that you listen to for the first time to recognize the music using a wide range of central nervous system functions¹². Since no significant difference was observed between the two, it was considered that the influence of visual input was small, as was the case with the HPA axis and sympathetic nervous system.

In addition, the increase in peripheral serotonin, which was released from the intestinal tract via the cerebral intestinal axis because of the activity of reward-expecting neurons by auditory stimulation of the midbrain dopamine system, was induced by music¹⁵.

Furthermore, since auditory memory neurons in the striatum also intervene in this system, it is presumed that the cerebral intestinal axis is affected by the feeling put into the

performance and playing done with a sense of rhythm.

6. Research limitations

A new Music utilizing the Solfeggio scale was provided to the experimental participants using the “Kyoko Takemoto’s Imaginative Music Playing Method”. There was a significant difference in intuitive emotional evaluation between the audiovisual group and the auditory group. However, since it was the first experience for all the experimental subjects with this piece of music, it was not possible to confirm whether it was due to the effect of the Solfeggio scale or because it was novel.

VI. Summary of this article:

Relationship to the Mind and Body of Music

The emotions when feeling the music shown in the above section may be accompanied by changes in behavior as well as consciousness. The purpose of music includes music therapy, work efficiency, muscle strengthening during exercise, maintenance of tension, and making viewers happy. The effects of music on the mind and body are diverse, including changes in the sense of smell, sight, hearing, and equilibrium^{16) 17)}. It is the effect of taste, smell, and music that reminds us of “forgotten memories” and is called the Proust effect after the third volume of Marcel Proust’s novel, “The Guermites Way”¹⁸⁾.

Music was used in the French Revolution and the American Revolutionary War for its social impact¹⁹⁾. There are various hypotheses about the manifestation of the effects of music, but they cannot be systematically proved. In addition, it is usually difficult to manipulate humans with music, and conclusions are drawn by making inferences by comparing them with verification results and behavioral evidence. Music may have the effect of providing disciplined control over human behavior, as riots in spectators can occur in soccer games but are less likely to occur in music festivals. It is thought that the signal input to the limbic system, which originated in Brodmann areas 41 and 42 of the temporal lobe, regulates the output to the prefrontal cortex²⁰⁾.

Fig. 8 shows a schematic diagram of the cerebrum centered on the amygdala when listening to music and being immersed in a feeling of happiness. Although no pleasant feelings occur from around the amygdala, it is thought that the dopamine nervous system acts on the reward system and contributes to the sensation of happiness²¹⁾. The serotonin nervous system does not produce a feeling of well-being but acts on the stabilization of the central nervous system. Cholinergic nerves regulate GABAergic nerves and have an inhibitory effect on the amygdala. The expression of the

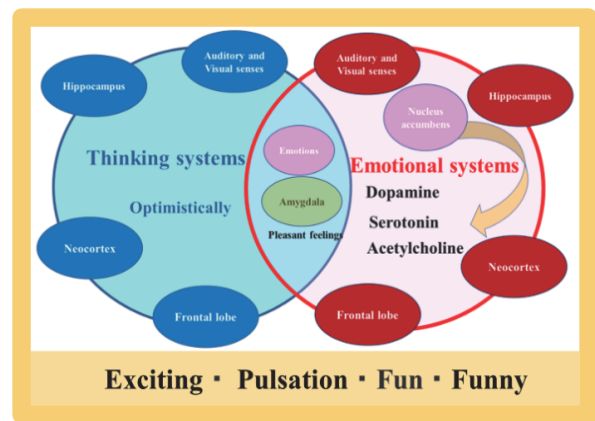


Fig. 8 Amygdala circumference when listen in to Music and feeling happy Information input to the side

emotional system resulting from these is a stable “pleasant feeling” and is likely to cause a good mood²²⁾. In the research, we conducted so far on “Kyoko Takemoto’s Imaginative Music Playing Method”.

We obtained results similar to the synergistic effect of music and image. In the experiment in which the same music used in “Kyoko Takemoto’s Imaginative Music Playing Method” was played in the same order without using visual images, there was no change in the state anxiety score, serotonin, and cortisol.

On the other hand, when the “Visualized Music” image created for “Image Playing” was projected in a silent state, the state anxiety score and serotonin increased or decreased²³⁾. From these results, it was shown that the viewer demands an image suitable for the music and that an image with emotions induces a feeling of sympathy even if there is no music. Why do tears naturally come out when we listen to music that echoes in our hearts?

Many people have such an experience. The exact reason for this is still unknown in modern brain science. However, from the accumulation of research so far, it is considered that the emotions induced by such music strongly stimulate the sympathetic nervous system, and the parasympathetic nervous system that antagonizes this is activated to cause tears. In addition, the number of tears secreted into the eyelids increases and decreases depending on various emotions, so if the emotions are strong, tears overflow^{24) 25)}.

Not only music but also movies, photographs, paintings, plays, and literary works that resonate with the heart, smells, tastes, and even the feeling of touching an animal may cause this response. Humans become overwhelmed because many “unconscious areas” are mobilized from the specific non-declarative memory that forms each individual’s senses²⁶⁾. A previous study by Selye found that various information inputs from the outside world induced non-specific reactions (similar reactions) in the living body in all emotions, and

these non-specific reactions enrich human life²⁷⁾. In short, it is believed that the same result will be achieved if the trigger resonates with the mind.

VII. Funding

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VIII. Competing Interests

Author(s) disclose no potential conflict of interest.

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