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A Basic Study of the Physiological and Psychological Effects of Museum Bathing (1):

A Case Study of Junior and Senior High School Students

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Abstract: Surveys by the Ministry of Health, Labor and Welfare and the Japanese Red Cross Society produced the extremely worrying finding that junior and senior high school students suffered from lethargy and loneliness during the COVID-19 crisis. Despite the fact that they had few ways to relieve their stress, the use of museums, art galleries, or other centers of culture or art was never suggested. In this study, we conducted an empirical trial of "museum bathing" (an activity that utilizes the healing effects of museums to promote health and prevent disease, through guided museum tours) by junior and senior high school students at four museums (Fukuoka Asian Art Museum, Fukuoka City Museum, Kyushu National Museum, and Fukuoka Art Museum), to evaluate the relaxing effect of this therapy both psychologically and physiologically. The psychological and physiological data showed that museum bathing significantly enhanced the level of relaxation at all four museums. This finding suggests that museum bathing can be advocated as a stress-relief method for junior and senior high school students.

Keywords: Museum bathing, relaxation effect, physiological measurement, psychological measurement, junior high school students, senior high school students

1. Introduction

The Japanese Red Cross Society conducted an online survey of 100 high school and university students from around Japan, titled "Changes in State of Mind During the State of Emergency, from April 2020 to September 2021." [1]

To a question on "Changes in feelings due to the COVID-19 crisis," common responses were "I don't feel like doing anything anymore, lethargy" (43% of HS students/49% of UNI students), and "I feel lonely and anxious about being alone (28% of HS students/35% of UNI students). These results showed that over 30% of students suffered from lethargy and loneliness.

Another worrying finding was the large number of students with low self-esteem, as evidenced by the response "I don't feel good about myself, I'm not needed by others" (27% of HS students/20% of UNI students).

To a question about "Anxiety about the effect of the COVID-19 crisis on higher education and job-hunting prospects," a common response was "I will struggle with entrance exams and job hunting" (42% of HS students/33% of UNI students).

[1] Japanese Red Cross Society, *Shingata koronaka to wakamono no shōrai fuan ni kansuru chōsa* [Survey on the COVID-19 crisis and young people's anxiety about the future] (2021), retrieved from https://www.jrc.or.jp/press/2022/0106_022802.html/
https://www.jiji.com/jc/article?k=000000097.000033257&g=prt

To a question about "Anxiety about the effect of the COVID-19 crisis on personal growth and experiences," common responses were "It's difficult to build new interpersonal relationships" (30% of HS students/33% of UNI students) and "I can't develop interpersonal communication skills" (30% of HS students/27% of UNI students).

On the basis of these findings, the Japanese Red Cross Society concluded that high school and university students felt that "Living through the COVID-19 crisis has already impacted their future and is likely to continue impacting it," and were anxious about "The impact of lifestyle restrictions and remote learning on their social and interpersonal skills (which they would have probably developed easily under normal circumstances) and the resulting effects on their personality development."

Lastly, to the question, "Methods for dealing with changes in feelings caused by the COVID-19 crisis," common responses were "I tried to be as optimistic as possible, thinking 'things will work out somehow,'" (24.6% of HS students/30.9% of UNI students), "I tried to see it as a learning opportunity, thinking 'this is a valuable experience'" (10.5% of HS students/22.1% of UNI students), "Rather than comparing myself with others, I focused on what I can do" (15.8% of HS students/20.6% of UNI students), and "I tried to accept the change, thinking 'what has happened is not going to change'" (19.3% of HS students/19.1% of UNI students). These responses reveal a strong tendency for students to try and resolve problems on their own.

In contrast, the figures for the response "I discussed it with my parents" (15.8% of HS students/23.5% of UNI students) and "I discussed it with my teachers" (15.8% of HS students/11.8% of UNI students)" suggests that most students do not have the opportunity to talk about or express their private thoughts. If they cannot find someone to speak with and strive to solve their problems alone, they are unlikely to get a chance to express themselves. As a result, they will certainly accumulate a considerable amount of stress.

The Ministry of Health, Labour and Welfare (MHLW) also conducted an online survey, from September 11 (Friday) to 14 (Monday), 2020, to "gage the psychological impact of the COVID-19 pandemic on citizens."[2] A total of 10,981 responses (sample size) were collected from people aged 15 and over.

The results (from Feb. to Sept. of 2020) showed that approximately 55% of respondents felt some degree of anxiety (e.g., "I felt nervous," "I felt restless and troubled," or "I felt depressed and unwell, no matter what happened").

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[2] Ministry of Health, Labour and Welfare, Social Welfare and War Victims' Relief Bureau, Department of Health and Welfare for Persons with Disabilities, Mental Health and Disability Health Division, *Shingata korona-uirusu kansenshō ni kakawaru mentaruherusu ni kansuru chōsa kekka gaiyō ni tsuite* [Summary of survey results on mental health related to COVID-19 infection], retrieved from https://www.mhlw.go.jp/content/12200000/syousai.pdf

Of the respondents who took some kind of action to dispel these feelings, 46.3% answered affirmatively to the question "Were you able to relieve your stress?" (Yes + Somewhat). Specific actions included (1) Preventive measures such as washing hands and wearing a mask (73.5%), (2) Searching for information using a smartphone or Internet connection (35.7%), (3) Speaking with family or friends (21.0%), and (4) Exercising or moving the body (20.3%).

On the other hand, however, 20.7% answered negatively to the question "Were you able to relieve your stress?" (No + Not much), which means that one out of five people were living with anxiety and stress.

On the topic of changes in daily life, about 40% of respondents reported "decreased physical activity" and about 20% reported "increased gaming time."

The three pillars of health are said to be "exercise," "nutrition," and "sociality."

Thus, there are fears that if the current "living with COVID" situation continues, the balance between the three pillars of health will be disturbed, leading to significant secondary health problems.

In light of this situation, the ministry (MHLW) is recommending a variety of stress reduction methods for daily life, including "exercise stretching," "breathing yoga," "developing a regular daily rhythm," "talking with friends and family," "trying to write down one's current feelings," "listening to music," and "laughing."[3]

However, most of these stress reduction methods are solitary activities initiated by oneself. Yet, there are also many social resources available in the communities where high school and university students live. For the coming years, it will be necessary to propose stress reduction methods that utilize and operate through these community resources. I believe that proposing a variety of methods can broaden the range of choices for stress reduction methods, making it easier for people to find the appropriate method at any particular time.

2. Proposing "museum bathing" to young people as a new stress relief method

With grants-in-aid for scientific research, I have conducted two research projects, "Policy Research Utilizing University Museums for Curator Training Course Education," and "Online-based University Curator Training Course Programs and Continuing Education for Qualified Curators." Through these studies, I learned that in the process of acquiring the "skill of protecting" (conservation and restoration)," the "skill of examining (investigation and research), the "skill of showing" (exhibition), and the "skill of communicating" (education and dissemination) materials and artworks,

[3] Ministry of Health, Labour and Welfare, *Shingata korona ryūkō-chū no kokoro no kenkō iji ni tsuite* [Maintaining mental health during the COVID-19 pandemic], retrieved from https://www.mhlw.go.jp/content/000723599.pdf

students in curator training courses also cultivate the "ability to take initiative," the "ability to think things through," and the "ability to work in a team," which are described as the "basic skills of working adults." Furthermore, in many cases curators who became acquainted with each other through research activities worked in multidimensional ways as "drivers in solving problems in the local community," maintaining strong ties to local people.

However, according to the Ministry of Education, Culture, Sports, Science and Technology's Social Education Survey of 2018,[4] Japanese citizens used museums only 1.2 times a year on average. Although there are more than 5,700 museums (museums, museum-equivalent facilities, and museum-like facilities) in Japan, their utilization rate is very low.

What kind of image of museums do local people have?

Most typically, they see museums as "a place to increase knowledge," "a place of new discoveries," "a place to confront oneself," "a place of healing," "a place that is hard to enter," and as "as a difficult place."

In its "Basic Plan on the Promotion of Culture and the Arts (Term 1) (Report)" of 2018,[5] the Council for Cultural Affairs stated that "museums, art galleries, libraries, etc. are required to serve not only as centers for the preservation, transmission, creation, exchange, and dissemination of culture and art… but also as places for addressing a variety of social challenges in partnership with educational, welfare, medical care and other related organizations."

As well as generating new value for museums, such a move is expected to enable curators to develop a new skill, of "supporting technology (health), i.e., creating a place to support the health of citizens." It is fair to say that this innovation raises questions the value of museums in local communities.

Looking abroad, in October 2018, the Canadian Medical Association (CMA) launched an initiative to "write prescriptions" for museum visits as part of healthcare treatment to help patients recover their health. The CMA partnered with the Montreal Museum of Fine Arts to allow patients suffering from various physical and mental health issues, as well as their families, to visit museums free of charge to enjoy the health benefits of art and culture.[6] A similar initiative is being trialed in Belgium from September 2021.[7]

Angela Clow of the University of Westminster, UK, conducted cortisol tests on London workers before and after they made brief visits to art galleries during their lunch break. The results showed

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[4] Ministry of Health, Labour and Welfare, *Shakai kyōiku chōsa - Heisei 30-nendo kekka no gaiyō* [Social education survey—summary of FY2018 results], retrieved from https://www.mext.go.jp/content/20200313-mxt_chousa01-100014642_3-3.pdf

[5] *Bunka geijutsu suishin kihon keikaku (dai 1-ki)* [Basic Plan on the Promotion of Culture and the Arts (Term 1), (Cabinet decision on March 6, 2018), retrieved from https://www.bunka.go.jp/seisaku/bunka_gyosei/hoshin/pdf/r1389480_01.pdf

[6] Daniel Grant(2018) :Can Going to a Museum Help Your Heart Condition? In a New Trial, Doctors Are Prescribing Art., retrieved from https://observer.com/2018/11/doctors-prescribe-art-montreal- heart- condition-asthma-cancer/

[7] Retrieved from https://ideasforgood.jp/2021/10/04/brussels-art-prescription/

that the cortisol level of workers was quite high before viewing art, but that it returned to normal at the end of the visit. Clow demonstrated that even a short lunchtime visit to an art gallery can reduce stress.[8]

Modern society is said to be a stressful society.

The surveys mentioned above, by the Japanese Red Cross Society and the MHLW, also revealed that many young people are facing various kinds of stress in their daily lives as a consequence of the COVID-19 crisis.

Using museums, which are community social resources, as a setting, I am pursuing research on the relaxing effects of "museum bathing" (an activity that utilizes the healing effects of museums to promote health and prevent disease, through guided museum tours) on local residents, in collaboration with medical and welfare institutions.

More specifically, I determine the relaxing effects by conducting psychological measurements (POMS2 Japanese version, VAS) and physiological measurements (blood pressure, pulse, amylase) before and after test subjects view artworks in a museum or art gallery.

Whereas self-report data such as "I feel calm when I come to the museum" or "I feel good when I look at this painting" are subjective assessments, collecting scientific data from psychological and physiological measurements makes it possible to evaluate the relaxing effects of museums objectively.

This study, focused on junior and senior high school students, was conducted at four venues (Fukuoka Asian Art Museum, Fukuoka City Museum, Kyushu National Museum, and Fukuoka Art Museum) with the aim of shedding light on the relaxing effects of "museum bathing."

This empirical trial was funded by a Grant-in-Aid for Publication of Scientific Research Results (HIRAMEKI ☆ TOKIMEKI SCIENCE)[9] (a program aimed at giving fifth and sixth-year elementary school students and junior and senior high school students the opportunity to experience the fun of science by directly seeing, hearing, and touching the cutting-edge findings of research conducted at universities and research institutions and funded by Grants-in-Aid for Scientific Research (KAKENHI).

Approval for this empirical trial was obtained from the Kyushu Sangyo University Ethics Committee on Research Involving Human Subjects. The consent of the test subjects was obtained after explaining the details of the program to them, both orally and in writing.

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[8] Angela Clow with Catherine Fredhoi (2006)：Normalisation of salivary cortisol levels and self-report stress by a brief lunchtime visit to an art gallery by London City workers, *Journal of Holistic* Vol. 3 Issue 2 May.

[9] Japan Society for the Promotion of Science, HIRAMEKI ☆ TOKIMEKI SCIENCE, retrieved from https://www.jsps.go.jp/hirameki/

3. Points to keep in mind in conducting an empirical trial on the relaxing effects of "museum bathing"

In conducting this empirical trial, I paid careful attention to the following points.

3.1. Instruments for psychological and physiological measurements and the items and contents of objective evaluation

(1) Psychological measurement/Profile of Mood States (POMS) test

To evaluate mood and emotion, I used the POMS2 Japanese version (shortened version for adults) of Kanekoshobo. It consists of an A4 sheet with 35 questions. With only around half as many questions as the complete version (65 items), this version puts less burden on the test subjects. The measurements are made on six scales: Anger-Hostility, Confusion-Bewilderment, Depression-Dejection, Fatigue-Inertia, Tension-Anxiety, and Vigor-Activity. The response time was about 5 minutes.

(2) Physiological measurement: Wrist sphygmomanometer and pulsimeter

The maximum blood pressure (systolic), minimum blood pressure (diastolic), and pulse rate, which all serve as indicators of autonomic nervous activity, were measured using the OMRON HEM-6121 Wrist Blood Pressure Monitor. Blood pressure and pulse rate measurements are the simplest methods of gaging autonomic nervous activity.

Essentially, when the human organism is in a relaxed state, blood pressure and pulse rate decrease; when the organism is stressed, they increase. In other words, a drop in pressure and rate indicates a predominance of parasympathetic nervous activity and a state of relaxation. Conversely, a rise in pressure and rate indicates excitation of the sympathetic nervous system and a state of tension.

3.2. Common issues for unifying research methods and experimental procedures based on psychological and physiological measurements

I have previously published two papers, "A Study on the Relaxation Effect of Museums in Aging Society: Toward a New Role for Museums in a Super-Aging Society, "[10] and "Prospects for Furthering the Study of Museum Bathing: A Review of the International Research Literature Based on a Scoping Review by Law et al.[11]

In the first study, objective data was collected by conducting physiological and psychological measurements in museums of history, art, archaeology, folklore, and other kinds of museums, based on empirical studies on "forest bathing."

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[10] Ogata I. (2021), *Journal of Collaborative Regional Development* Vol.6, 55-72, retrieved from http://repository.kyusan-u.ac.jp/dspace/bitstream/11178/8117/1/chiikivol.6_04.pdf

[11] Ogata I. (2021), *Journal of Collaborative Regional Development* Vol.7, 35-52, retrieved from http://54.64.211.208/dspace/bitstream/11178/8122/1/chiiki%20vol.7_03.pdf

In the second study, I presented significant research papers from around the world featuring analysis of empirical methods in museum bathing research, to identify common issues for unifying research methods and experimental procedures based on psychological and physiological measurements.

In this paper, I concluded that, "with regard to the limitations of studies identified in the various papers (including the evaluation of the sense of well-being brought about by the setting and content of artwork in different types of museum, experiments on the length of time spent for viewing artworks, research on individual differences, methods for setting experimental and control groups, and continuous experiments involving the same group in different museum types), it will be necessary to continue to elaborate and refine research methods by conducting a series of field experiments to accumulate scientific data."

Therefore, in conducting this empirical trial, I have not only paid attention to all these items, but also emphasized responses to the following six questions set forth by Law et al. [12]

(1) What populations and settings were studied?
(2) What study methodologies were used?
(3) What stress outcomes were measured?
(4) What type and content of artworks were viewed?
(5) What was the duration of the artwork viewing and how many artworks were viewed?
(6) Did the studies show changes in the stress outcomes?

4. Essential points of "museum bathing" empirical trials at four museums/art museums

4.1. Empirical trial at Fukuoka Asian Art Museum

(1) **Venue**: Fukuoka Asian Art Museum[13] (opened in 1999) is located in the heart of Fukuoka City in a building complex that is directly accessible from Nakasu-Kawabata Station on the Fukuoka City Subway (Riverain Center Building, 7F & 8F, 3-1 Shimokawabata-machi, Hakata-ku, Fukuoka City).

https://faam.city.fukuoka.lg.jp

(2) **Test subjects**: High school students who are resident in Fukuoka Prefecture; a total of 13 participants (4 junior HS students: 1 boy and 3 girls; 9 senior HS students: 1 boy and 8 girls). In addition to the test subjects, 7 university undergraduates and 3 faculty members participated.

(3) **Meeting and measurement place?**: Yes, AJIBI Hall on 8F.

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[12] Mikaela Law, Nikita Karulkar, Elizabeth Broadbent (2021), Evidence for the effects of viewing visual artworks on stress outcomes: a scoping review, *BMJ Open*.

[13] Fukuoka Asian Art Museum website: https://faam.city.fukuoka.lg.jp

(4) **Art viewing method**: Permanent collection exhibitions, “Modern and Contemporary Asian Art” (60 pieces), “FAAM Collection X: Era of Monsters” (2 pieces) and “Bug Catching in Asian Art!” (30 pieces) (Jun. 24 to Sep. 21, 2021), were being held in the Asia Gallery on the 7F. The test subjects, divided into five groups, moved around the venue to view the exhibits.

(5) **Quantity and type of works viewed**: A total of 92 works of modern and contemporary Asian art.

(6) **Details of works**: Main exhibits of the three permanent collection exhibitions.

● “Modern and Contemporary Asian Art” (60 pieces)

[Main exhibits] Name of artist (country): Title of work (year of creation, type of work, materials/techniques)

(i) Kim Whanki (South Korea): 20-V-1974 #330 (1974, oil on canvas)

(ii) Haji Marsidi bin Haji Akip (Brunei): Symphony No. 22 (Kite Season No. 14) (1986, oil on canvas)

(iii) Mohammad Eunus (Bangladesh): Step by Step (1989, oil on canvas)

(iv) Khien Yimsiri (Thailand): Vanity (1959, bronze)

(v) Chen Shun-Chu (Taiwan): Conference: Family Parade - House II (1995, photograph)

(vi) Vasudeo H. Pandya (India): Vishnu (first half of 20th century, oleograph on paper)

(vii) Wang Keping (China): Long Live! (1978, wood, vinyl plastic)

(viii)Aisha Khalid (Pakistan): Conversation (2002, 2 channel video (120 min. each))

● “FAAM Collection X: Era of Monsters” (2 pieces)

[Main exhibits] Name of artist (country): Title of work (year of creation, type of work, materials/techniques)

(i) Dadang Christanto (Indonesia): Bureaucracy (1991-92, acrylic, pencil, crayon, ink on plywood, wood, and buffalo horn)

(ii) Panya Vijinthanasarn (Thailand): The Cold War (1979, tempera on paper)

● “Bug Catching in Asian Art!” (30 pieces)

[Main exhibits] Name of artist (country): Title of work (year of creation, type of work, materials/techniques)

(i) Ni Gusti Ayu Natih Arimini (Indonesia): Cremation (1985, watercolor on cloth)

(ii) Thawan Duchanee (Thailand): Future (1989, oil, enamel and gold leaf on canvas)

(iii) Tran Luong (Vietnam): Under the Water (1994, oil on canvas)

(iv) Anoli Perera (Sri Lanka): In the Entangled Web I (2001, wire mesh, paper, cloth, lace, thread, acrylic paint, iron frame, etc.)

(v) John Frank Sabado (Philippines): Mediator (2001, ink on paper)

(vi) Wah Nu (Myanmar): Tea Time in Spring (2003-04, video (12 min.))

(vii) Takamasa Sumi (Japan): Armored Cross: Mantis (2002-03, FRP)

(7) **Program for the day:**

09:00 Meeting of staff

09:30 Start of registration

10:00 Opening ceremony, self-introduction, consent for measurement

10:20 Measurement #1 (blood pressure, pulse, and POMS after Kraepelin test)

10:45 Movement

10:50 Individual viewing (view permanent collection exhibitions alone, find favorite pieces)

11:20 Movement, toilet break

11:35 Measurement #2 (blood pressure, pulse, POMS)

11:55 Explanation of Grants-in-Aid for Scientific Research and "museum bathing" research

12:00 Lunch

12:45 Meeting, movement

12:50 "How to become a qualified curator" by OGATA Izumi, Professor, Kyushu Sangyo University

"A day in the life of a curator: how to create an exhibition" by NAKAGOME Jun, Chief Curator, Museum of Kyushu Sangyo University

"Music and stress relief" by INOUE Koichi, Assoc. Professor, Fukuoka Women's Junior College

13:20 Movement

13:25 Group viewing (each group views the permanent collection exhibitions together and speaks about their favorite pieces to the group based on explanations by Faculty of Art and Design undergraduates)

13:55 Movement

14:00 Break

14:10 Measurement #3 (blood pressure, pulse, POMS)

14:35 Movement

14:40 Snack time

15:00 Movement

15:05 Brief review

15:20 Completion ceremony, awarding of "Future PhD"

15:30 Closing ceremony, end, cleanup

(8) **Duration of viewing**: Average time spent by test subjects in permanent exhibition galleries on 7F was 30 minutes.

(9) **Instructions for viewing**: "Find your two favorite pieces."

(10) **Measurement methods**: Physiological (blood pressure, pulse) and psychological (POMS)

● Physiological measurement: Each participant was given an OMRON HEM-6121 Wrist Blood Pressure Monitor to measure their blood pressure and pulse. Two measurements were made each time and after these results were entered the average of the two values was calculated.

● Psychological measurement: After the Kraepelin test and after viewing, the participants were asked to fill out a POMS sheet (which was distributed to them).

Measurement #1: After Kraepelin test

Measurement #2: After 30 minutes of viewing in permanent exhibition galleries on 7F (individual viewing: test subjects looked for their favorite pieces without talking to anyone else)

Measurement #3: After lunch, after 30 minutes of viewing in permanent exhibition galleries on 7F (group viewing: each test subject spoke about their favorite pieces to the group).

(11) **Measurement results**: POMS results showed reduced Tension-Anxiety and increased Vigor-Activity. Maximum and minimum blood pressure and pulse rate values decreased. Details are explained in Chapter 5.

(12) **Study limitations**: A total of three measurements were performed for this study. The first one was made after imposing a temporary burden with the Kraepelin test. In applying this burden on the test subjects, we also aimed at unifying the conditions of the test subjects, who had come to the museum from different environments. However, the first measurement, conducted after explaining the details of the measurements, had to be performed before the Kraepelin test, in order to ascertain the current condition of the test subjects. In other words, a total of four measurements were needed.

4.2. Empirical trial at Fukuoka City Museum

(1) **Venue**: Fukuoka City Museum[14] (opened in 1990) is located west of the city center, an approximately 15-minute walk from Nishijin Station on the Fukuoka City Subway (3-1-1 Momochihama, Sawara-ku, Fukuoka City).

(2) **Test subjects**: High school students who are resident in Fukuoka Prefecture; a total of 9 participants (9 senior HS students: 2 boys and 7 girls). In addition to the test subjects, 2 university undergraduates and 2 faculty members participated.

(3) **Meeting and measurement place?**: Yes, Lecture Room 1 on 1F.

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[14] Fukuoka City Museum website: http://museum.city.fukuoka.jp

(4) **Art viewing method**: The 33rd Annual Exhibition of New Acquisitions (Nov. 16, 2021 to Jan. 30, 2022) was being held in four rooms (Feature Exhibition Rooms 1, 2, 3, and 4). The participants, divided into four groups, moved between the rooms to view the exhibition.

(5) **Quantity and type of works viewed**: A total of approximately 100 works that are part of the newly curated "History and Life of Fukuoka" collection.

(6) **Details of works**: Titles and main exhibits from the four Feature Exhibition Rooms.

● Feature Exhibition Room 1: (1) Culture of the Fukuoka Domain

[Main exhibits] *Shachihoko-gawara* (ornate ridge-end tiles); Statue of NOBUKUNI Yoshimasa; Wakizashi (short sword) Signed Omi No Kami Hojoji Tachibana Masahiro; "*Ichigyosho* (one-line writing) by KAMEI Nanmei; Landscape Painting by OGATA Tokoku Mibuchi

● Feature Exhibition Room 2: (2) "Memories of the City"

[Main exhibits] A Bird's-eye View of Fukuoka-Hakata, Great Fukuoka-Guide to Fukuoka Companies and Stores; Tenjin Underground Shopping Mall Map; Hakata Gion Yamakasa Water *Happi* (Kojiyamachi); Tie-dyed Kimono Cloth with Ginkgo Design

● Feature Exhibition Room 3: (3)-1 "Daily Life"

[Main exhibits] Tamaseseri ("Ball-Catching") Festival at Hakozaki Shrine (8-mm film); Navy Type Zero Reconnaissance Seaplane (model); Small Typewriter for Japanese Text; Railway Travel Guide; *Zori* Sandals

● Feature Exhibition Room 4: (3)-2 "Daily Life"

[Main exhibits] Hinomaru Flag; *Gaze Yurimon*; "Seoibashigo" ("back-mounted ladder"); Ship License; Wood-core Dry Lacquer Buddhist Sculpture; Susanoo-no-mikoto Killing Eight-Headed Serpent (votive horse tablet)

(7) **Program for the day**:

09:00 Meeting of staff

09:30 Start of registration

10:00 Opening ceremony, self-introduction, consent for measurement

10:19 Measurement #1 (blood pressure, pulse, and POMS)

10:40 Move to the Feature Exhibition Rooms on 2F

10:50 Individual viewing (view the Exhibition of New Acquisitions alone, find favorite pieces)

11:10 Move to Lecture Room 1 on 1F and take toilet break

11:28 Measurement #2 (blood pressure, pulse, POMS)

11:55 Explanation of Grants-in-Aid for Scientific Research and "museum bathing" research

12:25 Lunch

13:15 Meet, then move to the Feature Exhibition Rooms on 2F

13:20 Explanation of “Exhibition of New Acquisitions” by NOJIMA Yoshitaka (Curator, Fukuoka City Museum)

13:40 Group viewing (each group visits the Exhibition of New Acquisitions and members speak to their group about their favorite pieces based on explanations)

14:00 Move to Lecture Room 1 on 1F

14:07 Measurement #3 (blood pressure, pulse, POMS)

14:25 Break

14:40 Snack time

Explanations on “The Work of Curator” and “Motivations of a Curator” by YOSHIDA Kimiko (Assoc. Professor, Museum of Kyushu Sangyo University), MATSUMURA Toshiki (Chief Curator, Fukuoka City Museum), and curator NOJIMA Yoshitaka.

15:20 Upcoming developments in “museum bathing” research (OGATA Izumi)

15:35 Brief review

15:55 Completion ceremony, awarding of “Future PhD”

16:00 Closing ceremony, end, cleanup

(8) **Duration of viewing**: The average viewing time of participants was 20 minutes.

(9) **Instructions for viewing**: “Find your favorite pieces.”

(10) **Measurement methods**: Physiological (blood pressure, pulse) and psychological (POMS)

● Physiological measurement: Each participant was given an OMRON HEM-6121 Wrist Blood Pressure Monitor to measure their blood pressure and pulse. Two measurements were conducted at each of the three times (once before viewing and two times after viewing). After the two measurement results were entered, the average of the two values was calculated.

● Psychological measurement: Measurements were conducted a total of three times; once before viewing and two times after viewing. The participants were asked to fill out a POMS sheet (which was distributed to them).

Measurement #1: After opening ceremony, at 10:19.

Measurement #2: After 20 minutes of viewing in the Feature Exhibition Rooms on 2F (individual viewing: test subjects looked for their favorite pieces without talking to anyone else), at 11:28.

Measurement #3: After 20 minutes of viewing in the Feature Exhibition Rooms on 2F (group viewing: participants spoke to their group about their favorite pieces), at 14:05.

(11) **Measurement results**: POMS values for confusion, depression, fatigue, and tension all decreased. Values for vigor increased. Maximum and minimum blood pressure values decreased. Pulse rate increased in the third measurement after group viewing. Details are explained in Chapter 5.

(12) **Study limitations**: Between the individual and group viewing sessions, some time was dedicated to allow curators to offer explanations about exhibition. Since these explanations were not included in the tests conducted at Fukuoka Asian Art Museum, Kyushu National Museum, and Fukuoka Art Museum, they may impact comparisons of the results at different museums. In any future empirical trials, we will need to unify the tests by deciding whether to include explanations about exhibits by curators.

4.3. Empirical trial at Kyushu National Museum

(1) **Venue**: Kyushu National Museum[15] (opened in 2005) is located south of the center of Fukuoka City, an approximately 10-minute walk from Nishitetsu Dazaifu Station (4-7-2 Ishizaka, Dazaifu City, Fukuoka Prefecture).

(2) **Test subjects**: High school students who are resident in Fukuoka Prefecture; a total of 10 participants (10 senior HS students: 1 boy and 9 girls). In addition to the test subjects, 5 university undergraduates and 3 faculty members participated.

(3) **Meeting and measurement place?**: Yes, Seminar Rooms A and B on 1F.

(4) **Art viewing method**: The Cultural Exchange Exhibition Hall on 4F is divided into five themes covering the span of history from the Paleolithic Age to the Edo Period. Due to time constraints, viewing was limited to Theme 1 “Jomon Culture: Ocean Bound” (42 pieces in the main exhibition hall), Theme 2 “Political Power: Cultivating Rice” (75 pieces in the main exhibition hall, 59 pieces in Room 3, and 15 pieces in Room 4), Theme 3 “Nation Building: The Age of the Envoys” (21 pieces in the main exhibition hall, 10 pieces in Room 6), and Room 2 “KANEKO Kazushige Memorial Gallery: Asian Ethnoforms” (23 pieces). The participants, divided into five groups, moved between these spaces to view the exhibits.

(5) **Quantity and type of works viewed**: 245 pieces ranging from the Paleolithic Age to the 11th century.

(6) **Details of works**: We presented five pieces per section from the list of works provided by the Kyushu National Museum.

● Theme 1: “Jomon Culture: Ocean Bound” (main exhibition hall)

[Main exhibits] Name of piece (place of excavation, quality, shape, period, etc.)

(i) Honjo Village Buried Tree (90,000 year-old tree from Inbi, Honjo-mura, Minamiamabe-gun, Oita Prefecture; in present-day Saiki City)

(ii) Shallow Bowl-shaped Earthenware with Stand (from Ebikawa, Gonohe-machi, Sannohe-gun, Aomori Prefecture; late Jomon period)

[15] Kyushu National Museum website: https://www.kyuhaku.jp/exhibition/exhibition_info01.html

(iii) Earthenware with Spout (from Okuki, Kiriyanai, Gonohe-machi, Sannohe-gun, Aomori Prefecture; late Jomon period)

(iv) Jar-shaped Earthenware (from Shinanoki, Tanabu, Mutsu-shi, Aomori Prefecture; late Jomon period)

(v) Clay Figure (from Kamegaoka, Kizukuri, Tsugaru-shi, Aomori Prefecture; late Jomon period)

● Theme 2: "Political Power: Cultivating Rice" (main exhibition hall)

[Main exhibits] Name of piece (place of excavation, quality, shape, period, etc.)

(i) Mold Used to Cast Bronze Halberds (from Tatara-Omuta, Fukuoka City; Yayoi period; Important Cultural Property)

(ii) Three-pronged Hoe (from Sasai, Fukuoka City)

(iii) Large Sue Ware Jar (from Okinoshima Site No. 5, Fukuoka Prefecture; National Treasure)

(iv) Red *Maken* Earthenware Jar (from Kurita, Fukuoka Prefecture; Important Cultural Property)

(v) Iron Sword (from Higashi-Oda-mine site, Fukuoka Prefecture; Important Cultural Property)

● Theme 2: "Political Power: Cultivating Rice" (Room 3)

[Main exhibits] Name of piece (place of excavation, quality, shape, period, etc.)

(i) Horse-shaped *Haniwa* (terracotta clay figure) (from Manabe burial mound, Tsuchiura City, Ibaraki Prefecture; Kofun period)

(ii) Gilt-bronze Headdress (from Daegu City, South Korea; Three Kingdoms period)

(iii) Small *Dotaku* (bell-shaped bronze vessel) (Itazuke ruins, Fukuoka City)

(iv) *Dotaku* with *Kesa* (patched robe) Design (unknown provenance; late Yayoi period)

(v) Clay Flute (from Kaba ruins, Fukuoka Prefecture)

● Theme 2: "Political Power: Cultivating Rice" (Room 4)

[Main exhibits] Name of piece (place of excavation, quality, shape, period, etc.)

(i) House-shaped *Haniwa* (terracotta clay figure) (Okubo kiln site, Shimotobaru, Kogemachi, Fukuoka Prefecture)

(ii) Cylindrical Coffin *Haniwa* (terracotta clay figure) (Oninomakura burial mound, Asakura City, Fukuoka Prefecture)

(iii) Stone Ornamental Human Figure (Iwatoyama burial mound, Yame City, Fukuoka Prefecture; Important Art Object)

(iv) Stone Coffin (Ishibitsuyama burial mound, Omuta City, Fukuoka Prefecture)

(v) Wall Painting (back wall) from Chibusan Tumulus (original: Jo, Yamaga City, Kumamoto Prefecture, by KUSAKA Hakko)

● Theme 3: “Nation Building: The Age of the Envoys” (main exhibition hall)

[Main exhibits] Name of piece (place of excavation, quality, shape, period, etc.)

(i) *Onigawara* (ridge-end tiles) (from Dazaifu Government Office Ruins, Dazaifu City, Fukuoka Prefecture; Nara period; Important Cultural Property)

(ii) *Eiga Monogatari* (ink on paper; Kamakura period; National Treasure)

(iii) Gilt-bronze Headdress (Miyajidake burial mound, Fukutsu City, Fukuoka Prefecture; National Treasure)

(iv) Nara Tri-color Glazed Jar (from Shiga Prefecture; Nara period; Important Cultural Property)

(v) Stone Pagoda of Many Treasures and a Thousand Buddhas (from Liao dynasty China, 1084; Important Cultural Property)

● Theme 3: “Nation Building: The Age of the Envoys” (Room 6)

[Main exhibits] Name of piece (place of excavation, quality, shape, period, etc.)

(i) Head of Bodhisattva (Yungang Grottoes, Shanxi Province, China)

(ii) Standing Shakyamuni Bodhisattva (Gandhara, Pakistan, 2nd to 3rd century)

(iii) Standing Guanyin Bodhisattva (Northern Qi dynasties period, China, 576)

(iv) Niche of a Buddha Triad (from Baoqing Temple, Xi’an, China, Tang dynasty, 8th century; Important Cultural Property)

(v) Seated Amitabha Tathagata (lacquer and gold leaf on wood, Heian period, 10th century)

● KANEKO Kazushige Memorial Gallery: Asian Ethnoforms (Room 2)

[Main exhibits] Name of piece (place of excavation, quality, shape, period, etc.)

(i) Large Cymbal (Bangkok, Thailand)

(ii) Silver Bowl (Luang Prabang, Laos)

(iii) Brass Pot (Punjab, India)

(iv) Metal Headdress (Karachi, Pakistan)

(v) Silver Horn, Silver Headdress and Silver Necklace (Miao people, Leishan County, Guizhou Province, China)

(7) **Program for the day**:

09:30 University student staff meeting, preparation of reception and venue

10:00 Confirmation of guided tour routes in museum, confirmation of items to be viewed in the Cultural Exchange Exhibition Hall on 4F

11:30 Lunch

13:30 Start of registration

13:50 Opening ceremony, self-introduction, consent for measurement

14:04 Measurement #1 (blood pressure, pulse, and POMS)

14:25 Movement

14:30 Individual viewing (view the Cultural Exchange Exhibition Hall alone to find favorite pieces)

15:00 Movement, toilet break

15:05 Measurement #2 (blood pressure, pulse, POMS)

15:15 Explanation of Grants-in-Aid for Scientific Research and "museum bathing" research

15:30 Snack time

Explanations about a variety of work of the Kyushu National Museum by TANAKA Atsushi (Head, Cultural Exchange Division, Kyushu National Museum) and UENO Mitsuhiro (Senior Researcher, Cultural Exchange Division, Kyushu National Museum)

15:45 Movement

15:55 Group viewing (each group visits the Cultural Exchange Exhibition Hall and members speak to their group about their favorite pieces)

16:25 Move

16:31 Measurement #3 (blood pressure, pulse, POMS)

16:35 Brief review

16:55 Completion ceremony, awarding of "Future PhD"

17:00 Closing ceremony, end, cleanup

(8) **Duration of viewing**: Average viewing time of participants was 30 minutes.

(9) **Instructions for viewing**: "Find your favorite pieces."

(10) **Measurement methods**: Physiological (blood pressure, pulse) and psychological (POMS)

● Physiological measurement: Each participant was given an OMRON HEM-6121 Wrist Blood Pressure Monitor to measure their blood pressure and pulse. Measurements were conducted a total of three times; once before viewing and two times after viewing. Two measurements were made each time and after these results were entered, the average of the two values was calculated.

● Psychological measurement: Measurements were conducted a total of three times; once before viewing and two times after viewing. The participants were asked to fill out a POMS sheet (which was distributed to them).

Measurement #1: After opening ceremony, at 14:11.

Measurement #2: After 30 minutes of viewing in the permanent exhibition rooms on 4F (individual viewing: test subjects looked for their favorite pieces without talking to anyone else), at 15:10.

Measurement #3: After 30 minutes of viewing in the permanent exhibition rooms on 4F (group viewing: participants spoke to their group about their favorite pieces), at 16:35.

(11) **Measurement results**: POMS results showed reduced values for confusion, depression, fatigue, and tension. The value for vigor increased. Maximum and minimum blood pressure and pulse values all decreased. Details are explained in Chapter 5.

(12) **Study limitations**: The Cultural Exchange Exhibition Hall on 4F of the Kyushu National Museum is divided into spaces dedicated to five themes, extending chronologically from the Paleolithic Age to the Edo Period. Due to time constraints, viewing was limited to Theme 1 "Jomon Culture: Ocean Bound" (42 pieces in the main exhibition hall), Theme 2 "Political Power: Cultivating Rice" (75 pieces in the main exhibition hall, 59 pieces in Room 3, and 15 pieces in Room 4), Theme 3 "Nation Building: The Age of the Envoys" (21 pieces in the main exhibition hall, 10 pieces in Room 6), and Room 2 "KANEKO Kazushige Memorial Gallery: Asian Ethnoforms" (23 pieces), amounting to a total of 245 pieces for an average viewing time of 30 minutes per viewing. The question of how differences in the number of viewed exhibits impact the relaxation effect will be addressed in a further study.

4.4. Empirical trial at Fukuoka Art Museum

(1) **Venue**: Fukuoka Art Museum[16] (opened in 1979) is located slightly west of the city center, an approximately 10-minute walk from Ohorikoen Station on the Fukuoka City Subway (1-6 Ohori Koen, Chuo-ku, Fukuoka City).

(2) **Test subjects**: High school students who are resident in Fukuoka Prefecture; a total of 10 participants (8 junior HS students: 2 boys and 6 girls; 2 senior HS students: 2 girls). In addition to the test subjects, 6 university undergraduates and 2 faculty members participated.

(3) **Meeting and measurement place?**: Yes, the Art Studio on 1F.

(4) **Art viewing method**: Three sets of exhibits were prepared: Set A, Set B, and Set C. Participants were divided into 6 groups and given 2 viewing opportunities.

Groups 1 and 2 viewed Set A (first session) and Set C (second session); Groups 3 and 4 viewed Set B (first session) and Set A (second session), and Groups 5 and 6 viewed Set C (first session) and Set B (second session).

- Set A collections: "Becoming a Sengai Expert" (21 pieces) and "Brilliant Raden and Sparkling Makie" (21 pieces) (Nov. 16, 2021 to Jan. 16, 2022) in the Japanese and Other Asian Art room on 1F, and "Buddhist Art from Tokoin Temple" (12 pieces) (Apr. 1, 2021 to Mar. 31, 2022) in the Tokoin Temple Buddhist Art room on 1F.

[16] Fukuoka Art Museum website: https://www.fukuoka-art-museum.jp/exhibition/

- Set B collections: “I Can’t Give Up Hope: The Art of Tabe Mitsuko” (64 pieces) (Jan. 5 to Mar. 21, 2022) in the Collection Galleries (Modern and Contemporary Art A and B) on 2F.
- Set C collections in Collection Galleries (Modern and Contemporary Art A and C) on 2F: Collection Highlights I: From “The Fine Artworks Both Foreign and Domestic Which Show the Currents of Modern Art” (8 pieces); Collection Highlights II-1: “Rethinking the Gender Balance in the Acquisitions and Presentations” (10 pieces); Collection Highlights II-2: “Post-war Art Movement and Women Artists” (13 pieces); Collection Highlights II-3: “Various Creations in Painting” (5 pieces); and Collection Highlights II-4: “Artworks, Society and Us” (8 pieces) (May 21, 2021 to May 29, 2022).

(5) **Quantity and type of works viewed**: Set A (54 pieces/Antique art), Set B (64 pieces/Contemporary art), Set C (44 pieces/Modern and contemporary art).

(6) **Details of works**: (We present five pieces in each viewed collection from the list provided by Fukuoka Art Museum)

- Set A (Antique art)

* “Becoming a Sengai Expert”

[Main exhibits] Name of piece (period, quality): Name of artist (year of birth and death)

(i) Portrait of Sengai Gibon (Edo period, color on silk): by SAITO Shuho (1769-1861), inscription by Sengai Gibon (1750-1837)

(ii) Circle (Edo period, ink on silk): by Sengai Gibon (1750-1837)

(iii) Ebisu, god of fortune (Edo period, ink on silk): by Sengai Gibon (1750-1837)

(iv) Hotei, god of fortune (Edo period, ink on silk): by Sengai Gibon (1750-1837)

(v)Tiger (Edo period, ink on silk): by Sengai Gibon (1750-1837)

* “Brilliant Raden and Sparkling Makie”

[Main exhibits] Name of piece (period, quality)

(i) Writing paper box, decorated in mother-of-pearl inlay with design of paired dragons and sacred jewel (Edo period (Ryukyu kingdom), 18th-19th century; lacquered wood)

(ii) Covered utensil with flower-and-bird design in mother-of-pearl inlay and gold lacquer (Yuan dynasty China, 14th century; lacquered wood)

(iii) Peach shaped food box, decorated in mother-of-pearl inlay with design of hermits (Ming dynasty China, 16th century; lacquered wood)

(iv) Saddle decorated in mother-of-pearl inlay with wave design (Kamakura period, 13th century; lacquered wood) Important Cultural Property

(v) Box, decorated in *makie* lacquer with landscape design (Edo period, 17th century; lacquered wood)

* Buddhist Art from Tokoin Temple

[Main exhibits] Name of piece (period, material/technique): Name of artist (year of birth and death)

(i) Standing Yakushi-nyorai (Bhaisajyaguru) (Heian period, 12th century; wood) Important Cultural Property

(ii) Seated Dainichi-nyorai (Mahavairocana) (Edo period, 17th century; lacquered wood with gold leaf)

(iii) Twelve generals attending to Yakushi-nyorai (Bhaisajyaguru): Protector of the Monkey direction (Edo period, 1667; wood): by SADA Matashiro Cho-o (birth year unknown-1713)

(iv) Standing Amida-nyorai (Amitabha) (Kamakura period, 13th century; lacquered wood with gold leaf and color) Important Cultural Property

(v) Pair of Kongo-rikishi (Vajradhara) (open-mouthed) (Northern and Southern dynasties period, 1367; wood): by Soei (birth and death years unknown)

● Set B (Contemporary Art)

* "I Can't Give Up Hope: The Art of Tabe Mitsuko"

[Main exhibits] Name of piece (year of creation, technique, and material): Artist: TABE Mitsuko (1933-)

(i) *Yamato Takeru no Mikoto* (1950s, oil, asphalt on board)

(ii) Looking for One and Only Existence (1963; oil, plaster, sticker, printed matter, plexiglas on board)

(iii) Flower of *Marubeni* (1976; oil on canvas)

(iv) Gone with the Wind (1995; printed matter on paper, paint on plexiglas)

(v) Evolution is so Creative (2017; oil, gold leaf, brass on canvas)

● Set C (Modern and Contemporary Art)

* **Collection Highlights I**: From "The Fine Artworks Both Foreign and Domestic Which Show the Currents of Modern Art"

[Main exhibits] Name of piece (year of creation, technique): Name of artist

(i) The Flying Sleigh (1945; oil on canvas): Marc Chagall

(ii) Nude Lying (1931; oil on canvas): Leonard Foujita (FUJITA Tsuguharu)

(iii) Dancer Hearing an Organ in a Gothic Cathedral (1945; oil on canvas): Joan Miró

(iv) The Madonna of Port Lligat (1950; oil on canvas): Salvador Dali

(v) Abstract Basketry (1964; oil on canvas): FUJINO Kazutomo

*** Collection Highlights II-1**: “Rethinking the Gender Balance in the Acquisitions and Presentations”

[Main exhibits] Name of piece (year of creation, technique): Name of artist

(i) Piled Up (1951; oil on canvas): KATSURA Yuki

(ii) Infinity-Nets A.H.T. 1960 (1979, acrylic on canvas): KUSAMA Yayoi

(iii) With Myself 7 (1970; etching on paper): Sonia Delaunay

(iv) Souvenirs of Egypt (1909; watercolor on paper): YOSHIDA Fujio

(v) Flower Garden (1955; oil on board): AKABOSHI Nobuko

*** Collection Highlights II-2**: “Post-war Art Movement and Women Artists”

[Main exhibits] Name of piece (year of creation, technique): Name of artist

(i) Title Unknown (1993, watercolor/acrylic and pencil on paper): OGURO Aiko

(ii) Red (1965, oil on canvas): SHIRAGA Kazuo

(iii) Anthropometry (ANT 157) (1961; oil on paper, mounted on canvas): Yves Klein

(iv) Rain Forest Column VIII (1959; sculpture/painted wood and metal): Louise Nevelson

(v)Elvis (1963; silkscreen ink and spray paint on canvas): Andy Warhol

*** Collection Highlights II-3**: “Various Creations in Painting”

[Main exhibits] Name of piece (year of creation, technique): Name of artist

(i) Barely Touching (1989; oil on canvas): Elizabeth Murray

(ii) Untitled 97-3 (1997; oil on canvas): TATSUNO Toeko

(iii) Total Loss Room (2000; oil on cotton, mounted on board): MATSUO Fujiyo

(iv) From the Space of Trees IV (1998; pigment on paper): HIDAKA Rieko

(v) Floating 2 (2002; acrylic, watercolor and color pencil on cotton): OURA Kokoro

*** Collection Highlights II-4**: “Artworks, Society and Us”

[Main exhibits] Name of piece (year of creation, technique): Name of artist

(i) Melancholia (1989; lead, plexiglass, sand and wood): Anselm Kiefer

(ii) Eternal City I (1998, direct print): YANAGI Miwa

(iii) Love Train (1998; aluminum can, cardboard, wood and photography): Sarah Lucas

(iv) Certainty/Entropy (Japan 2-2) (2016; unraveled fabric designed by the artist with colored warp threads): TEZUKA Aiko

(v) Woman Shooting Cherry Blossoms (2019; mannequin, Dutch wax-printed cotton, globe, steel, brass, Zamak, wood, resin and silk): Yinka Shonibare CBE

(7) **Program for the day**:

09:00 Meeting of staff

09:30 Start of registration

10:00 Opening ceremony, self-introduction, consent for measurement

10:27 Measurement #1 (blood pressure, pulse, and POMS)

10:55 Movement

11:00 Individual viewing (participants are divided into three groups—A: Antique art, B: Contemporary art, C: Modern and contemporary art—and asked to find their favorite pieces)

11:30 Movement, toilet break

11:34 Measurement #2 (blood pressure, pulse, POMS)

11:45 Explanation of Grants-in-Aid for Scientific Research and "museum bathing" research

12:00 Lunch

12:55 "What do curators do?" A talk by ONIMOTO Kayoko (Senior Educator, Museum Education, Fukuoka Art Museum)

13:25 Movement

13:30 Individual viewing (the three groups—A: Antique art, B: Contemporary art, and C: Modern and contemporary art— view their second set of exhibits (different to the morning). Note that group viewing was originally planned, but the decision was made to stick with individual viewing in order to limit the risk of COVID-19 infection.)

14:00 Movement

14:03 Measurement #3 (blood pressure, pulse, POMS)

14:30 Rest, toilet break

14:40 Snack time

YOSHIDA Kimiko (Assoc. Professor, Museum of Kyushu Sangyo University) and senior educator ONIMOTO Kayoko talk about the motivation for becoming a curator.

15:20 Upcoming developments in "museum bathing" research (OGATA Izumi)

15:30 Brief review

15:55 Completion ceremony, awarding of "Future PhD"

16:00 Closing ceremony, end, cleanup

(8) **Duration of viewing**: Average viewing time of participants was 30 minutes.

(9) **Instructions for viewing**: "Find your favorite pieces."

(10) **Measurement methods**: Physiological (blood pressure, pulse) and psychological (POMS)

● Physiological measurement: Each participant was given an OMRON HEM-6121 Wrist Blood Pressure Monitor to measure their blood pressure and pulse. Measurements were conducted a total

of three times; once before viewing and two times after viewing. Two measurements were made each time and after these results were entered, the average of the two values was calculated.

● Psychological measurement: Measurements were conducted a total of three times; once before viewing and two times after viewing. The participants were asked to fill out a POMS sheet (which was distributed to them).

Measurement #1: After opening ceremony, at 10:27.

Measurement #2: After 30 minutes of viewing in the exhibition rooms by each of the three groups (individual viewing: test subjects looked for their favorite pieces without talking to anyone else), at 11:34.

Measurement #3: After 30 minutes of viewing in the exhibition rooms by each of the three groups (individual viewing: test subjects looked for their favorite pieces without talking to anyone else), at 14:03.

(11) **Measurement results**: POMS results showed reduced values for confusion, depression, fatigue, and tension. The values for vigor increased. The maximum and minimum blood pressures fluctuated. Pulse values decreased. Details are explained in Chapter 5.

(12) **Study limitations**: There were only 10 test subjects (8 junior HS students: 2 boys and 6 girls; and 2 senior HS students: 2 girls). Considering that the test subjects were divided into three groups (Antique art, Contemporary art, and Modern/Contemporary art), the number of test subjects was low. We hope to redo this trial with a higher number of participants to see how the results are affected.

5. Results and discussion of "museum bathing" empirical trials at four museums/art museums

5.1. Results and discussion of "museum bathing" empirical trial at Fukuoka Asian Art Museum

5.1.1. Comparison of psychological measurements (POMS)

As shown in Fig. 1, the mean values of Anger-Hostility, Confusion-Bewilderment, and Depression-Dejection were lower after museum viewings. From this we can infer that museum bathing affected the negative mood states of the trial participants by reducing their psychological stress.

Note that a statistically significant difference was only observed for Confusion-Bewilderment after Viewing 1.

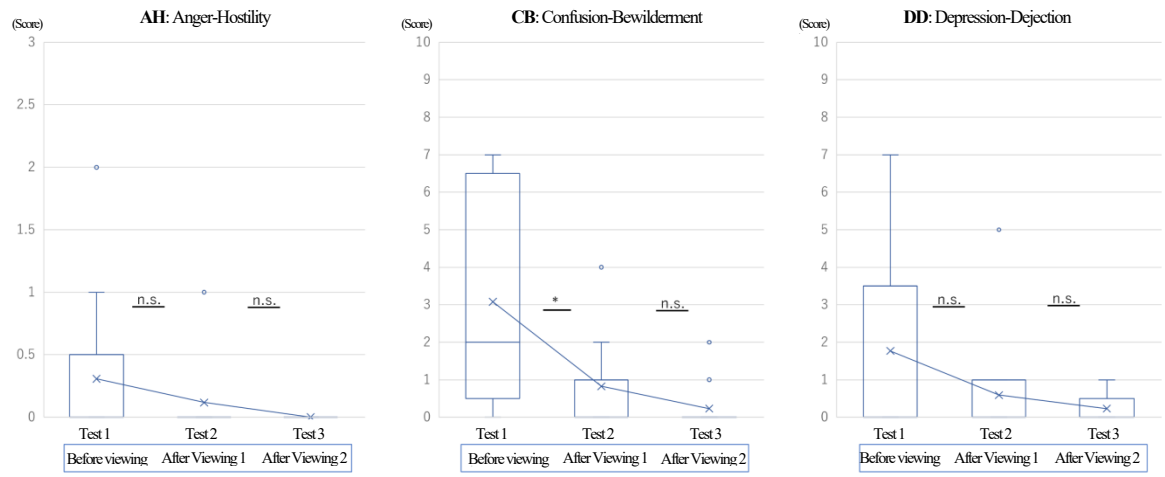

Fig. 1 Comparison of POMS at Fukuoka Asian Art Museum (1) *: $p<0.05$

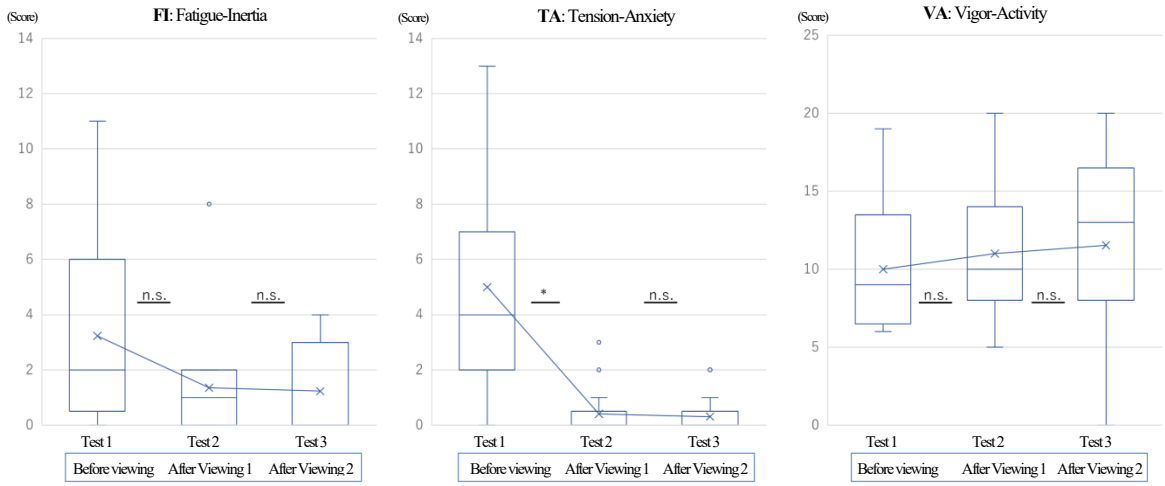

Fig. 2 Comparison of POMS at Fukuoka Asian Art Museum (2) *: $p<0.05$

As shown in Fig. 2, the mean values of Fatigue-Inertia and Tension-Anxiety were lower after the viewings. From this we can infer that museum bathing affected the negative mood states of the participants by reducing their psychological stress. At the same time, the mean value of Vigor-Activity increased after viewing. This suggests that museum bathing affected the positive mood states of the participants.

Note that a statistically significant difference was only observed for Tension-Anxiety after Viewing 1.

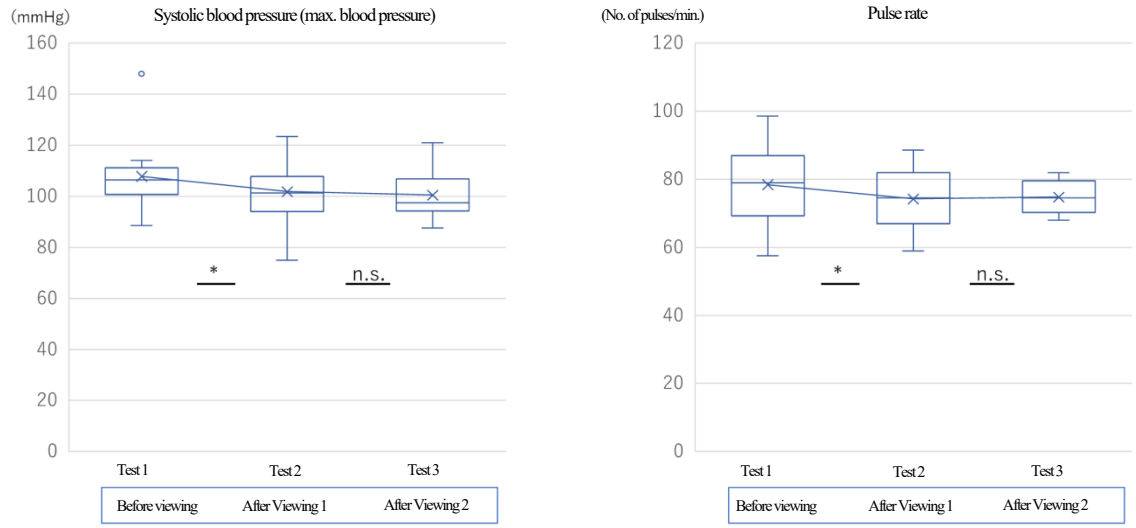

Fig. 3 Comparison of VAS, systolic blood pressure (max. blood pressure) and pulse rate at Fukuoka Asian Art Museum *: $p<0.05$

5.1.2. Comparison of physiological measurements (systolic blood pressure (max. blood pressure) and pulse rate)

As shown in Fig. 3, the mean values of systolic blood pressure (max. blood pressure) and pulse rate were lower after viewing. Note that for both parameters, a statistically significant difference was observed after Viewing 1.

5.2. Results and discussion of "museum bathing" empirical trial at Fukuoka City Museum

5.2.1. Comparison of psychological measurements (POMS)

As shown in Fig. 4, the mean values of Anger-Hostility, Confusion-Bewilderment, and Depression-Dejection were lower after viewings. From this we can infer that museum bathing affected the negative mood states of the trial participants by reducing their psychological stress.

Note that statistically significant differences were observed for Confusion-Bewilderment after Viewings 1 and 2, and for Depression-Dejection only after Viewing 1.

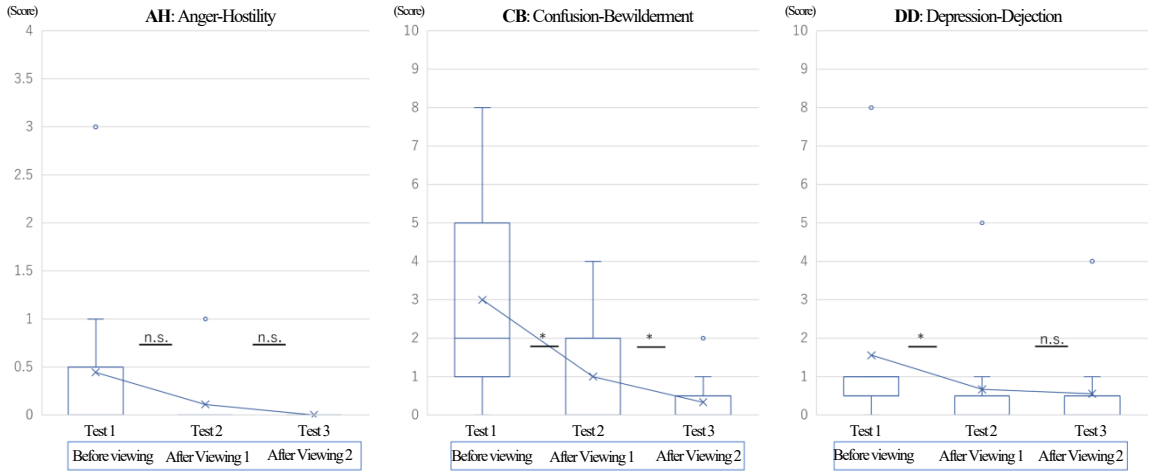

Fig. 4 Comparison of POMS at Fukuoka City Museum (1) *: $p<0.05$

As shown in Fig. 5, the mean values of Fatigue-Inertia and Tension-Anxiety were lower after the viewings. From this we can infer that museum bathing affected the negative mood states of the participants by reducing their psychological stress. At the same time, the mean value of Vigor-Activity increased after viewing. This suggests that museum bathing impacted the positive mood states of the participants.

Note that a statistically significant difference was only observed for Tension-Anxiety after Viewing 1.

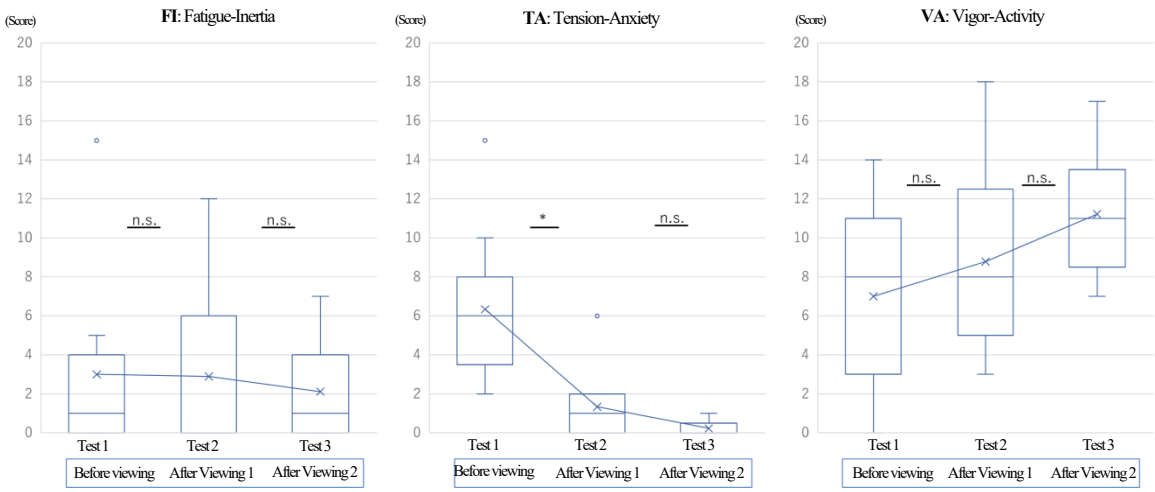

Fig. 5 Comparison of POMS at Fukuoka City Museum (2) *: $p<0.05$

5.2.2. Comparison of physiological measurements (systolic blood pressure (max. blood pressure) and pulse rate)

As shown in Fig. 6, the mean values of systolic blood pressure (max. blood pressure) and pulse rate were lower after viewing. However, a comparison of pulse rate after Viewing 1 and after Viewing 2 reveals that pulse rate increased. The cause of this increase is unclear, but the fact that

the participants had to rush from the exhibition space to the measurement room to strictly observe the scheduled measurement starting time after viewing may have been a factor. This is an issue for further investigation.

Note that a statistically significant difference was observed for pulse rate after Viewings 1 and 2.

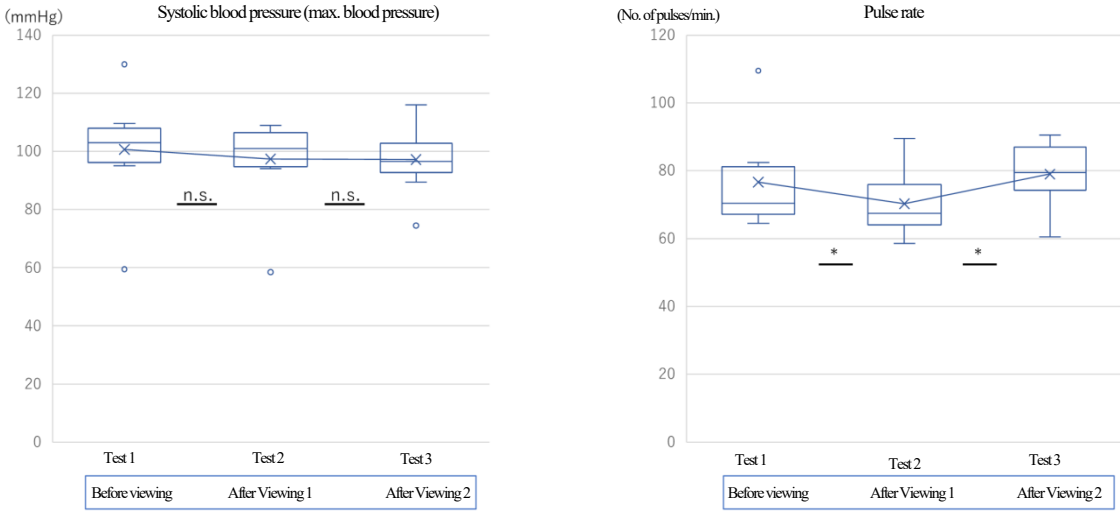

Fig. 6 Comparison of systolic blood pressure (max. blood pressure) and pulse rate at Fukuoka City Museum *: $p<0.05$

5.3. Results and discussion of "museum bathing" empirical trial at Kyushu National Museum

5.3.1. Comparison of psychological measurements (POMS)

As shown in Fig. 7, the mean values of Anger-Hostility, Confusion-Bewilderment, and Depression-Dejection were lower after the viewings. From this we can infer that museum bathing affected the negative mood states of the trial participants by reducing their psychological stress.

Note that the only statistically significant differences were observed for Confusion-Bewilderment and Depression-Dejection after Viewing 1.

As shown in Fig. 8, the mean values of Fatigue-Inertia and Tension-Anxiety were lower after the viewings. From this we can infer that museum bathing affected the negative mood states of the participants by reducing their psychological stress. At the same time, the mean value of Vigor-Activity increased after viewing. This suggests that museum bathing impacted the positive mood states of the participants.

Note that a statistically significant difference was only observed for Tension-Anxiety after Viewing 1.

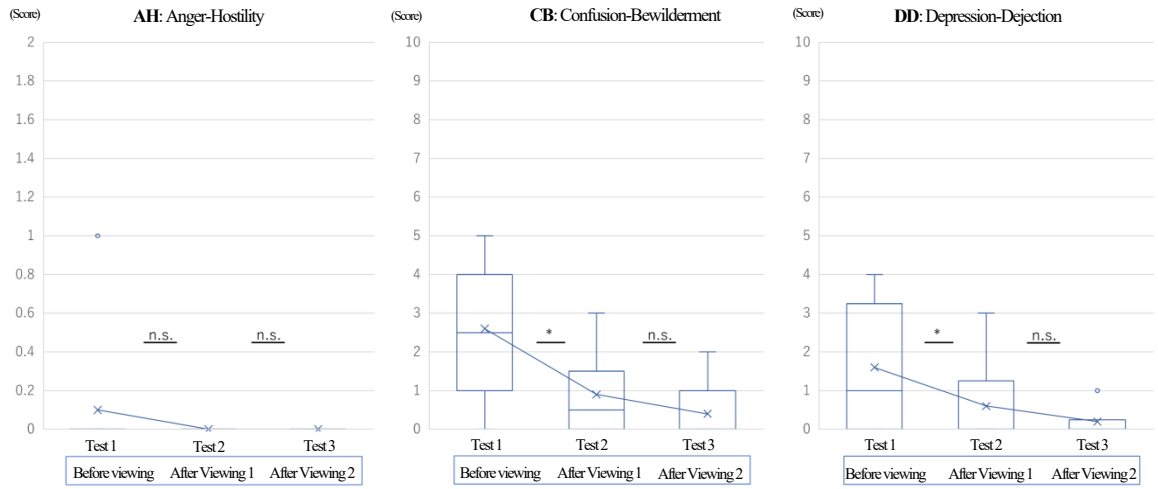

Fig. 7 Comparison of POMS at Kyushu National Museum (1) *: $p<0.05$

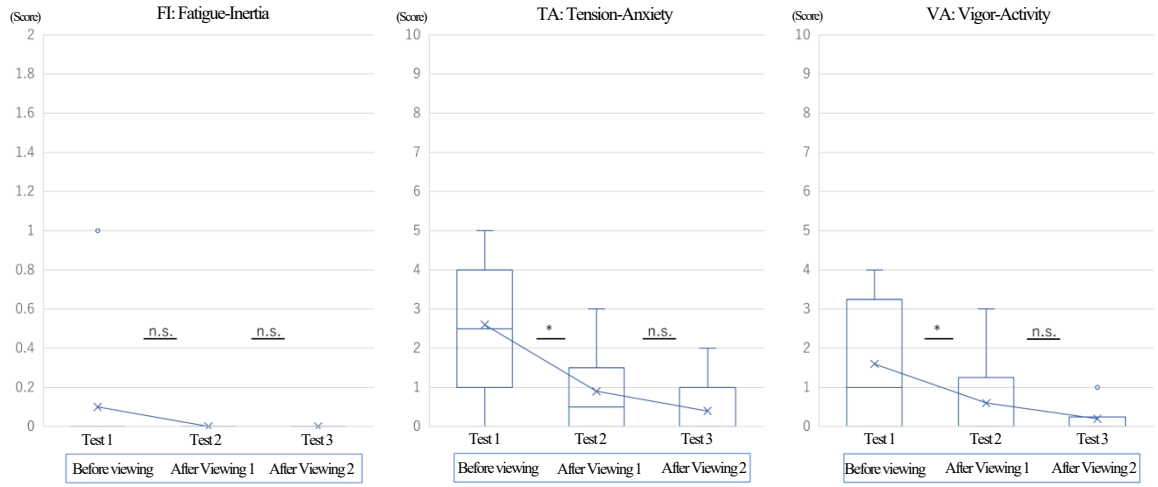

Fig. 8 Comparison of POMS at Kyushu National Museum (2) *: $p<0.05$

5.3.2. Comparison of physiological measurements (systolic blood pressure (max. blood pressure) and pulse rate)

As shown in Fig. 9, the mean values of systolic blood pressure (max. blood pressure) and pulse rate were lower after viewing. However, a comparison of systolic blood pressure (max. blood pressure) after Viewing 1 and after Viewing 2 reveals a slight increase in blood pressure. The cause is unclear. This is a question for further investigation.

Note that statistically significant differences were observed for systolic blood pressure (max. blood pressure) after Viewing 1 and for pulse rate after both Viewing 1 and Viewing 2.

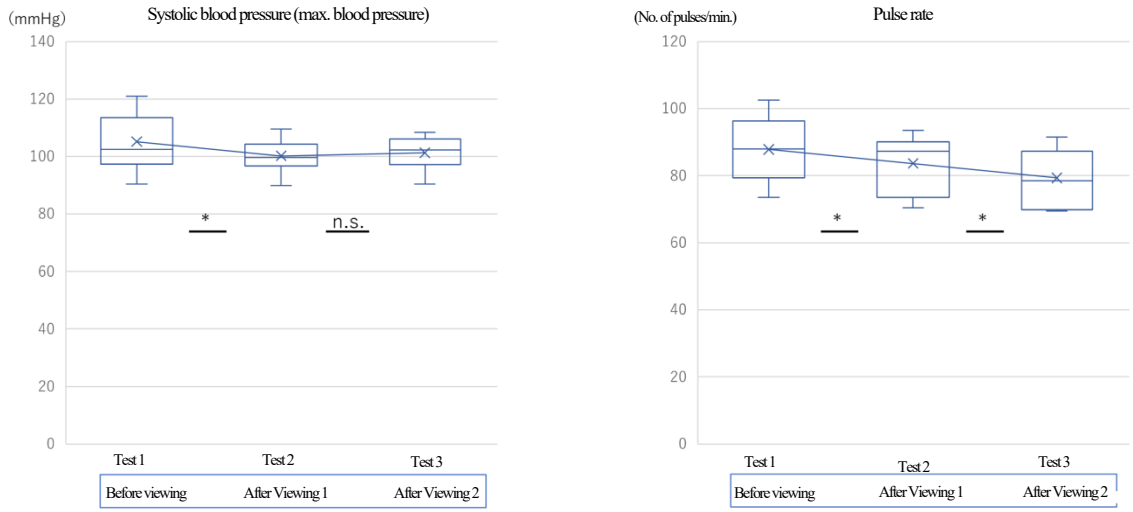

Fig. 9 Comparison of systolic blood pressure (max. blood pressure) and pulse rate at Kyushu National Museum *: $p<0.05$

5.4. Results and discussion of "museum bathing" empirical trial at Fukuoka Art Museum

At Fukuoka Art Museum, the trial participants and exhibits to be viewed were organized in a different way to the previous three museums. The participants were divided into six groups and the exhibits were divided into three sets: Set A (Antique art) on 1F, Set B (Contemporary art) on 2F, and Set C (Modern and contemporary art) on 2F, with each group assigned two viewings. Groups 1 and 2 were assigned to view Set A (Viewing 1) and Set C (Viewing 2), Groups 3 and 4 were assigned to view Set B (Viewing 1) and Set A (Viewing 2), and Groups 5 and 6 were assigned to view Set C (Viewing 1) and Set B (Viewing 2).

5.4.1. Comparison of psychological measurements (POMS) when viewing three different sets of art

● Anger-Hostility (A-H)

As shown in Fig. 10, the mean values of Anger-Hostility (A-H) were lower after viewing sets A→C and sets B→A. From this we can infer that museum bathing affected the negative mood states of the participants in these cases by reducing their psychological stress. However, the mean value of A-H for sets C→B increased after Viewing 1 (C) but decreased after Viewing 2 (B). The reason for this is unclear, but it may be that the exhibits of Set C—a mix of modern and contemporary figurative, abstract, and three-dimensional works—increased the psychological stress of the test subjects.

Note that no statistically significant differences were observed in any of the cases.

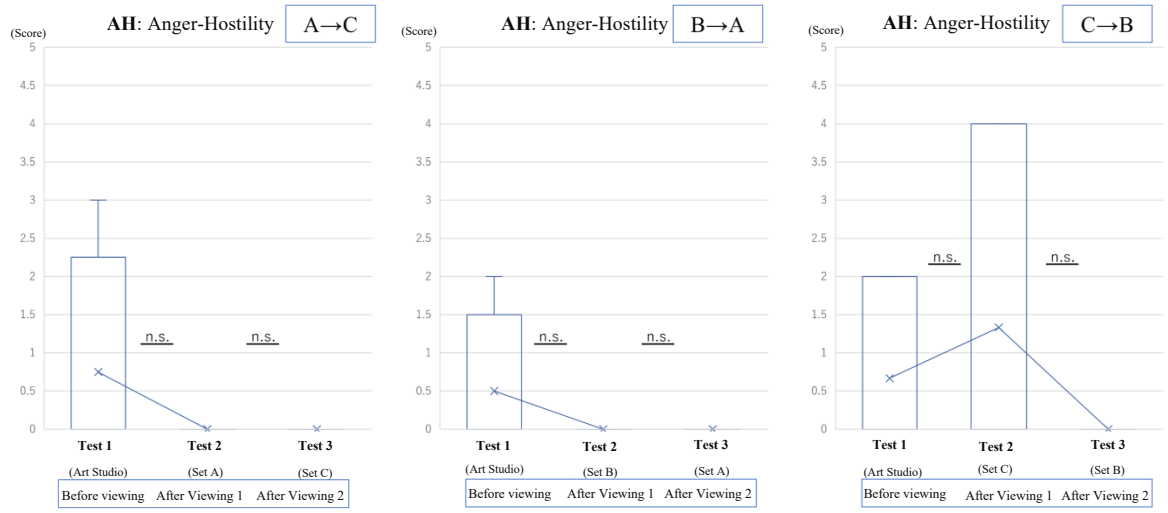

Fig. 10 Comparison of POMS when viewing three different sets of art: "Anger-Hostility" *: $p<0.05$

● Confusion-Bewilderment (C-B)

As shown in Fig. 11, the mean values of Confusion-Bewilderment (C-B) were lower after viewing in all cases. From this we can infer that museum bathing affected the negative mood states of the participants by reducing their psychological stress. However, the mean value of C-B in the case of B→A increased slightly after Viewing 2 (A). The reason is unclear, but it is possible that a stark contrast between the lighting conditions in exhibition spaces of Set B and Set A impacted the psychological stress of the test subjects.

Note that the only statistically significant difference was observed for A→C after Viewing 1 (A).

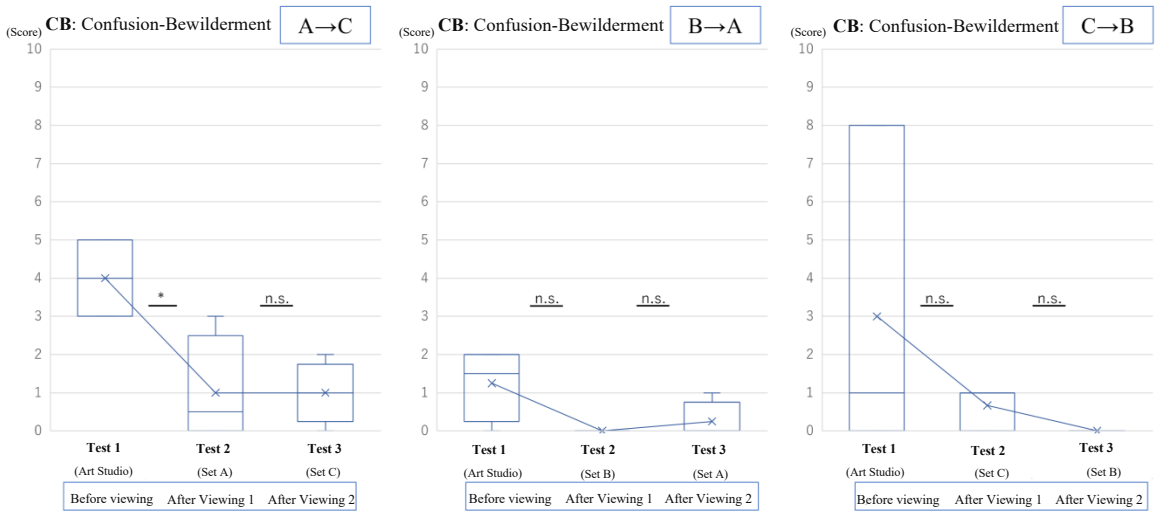

Fig. 11 Comparison of POMS when viewing three different sets of art: "Confusion-Bewilderment" *: $p<0.05$

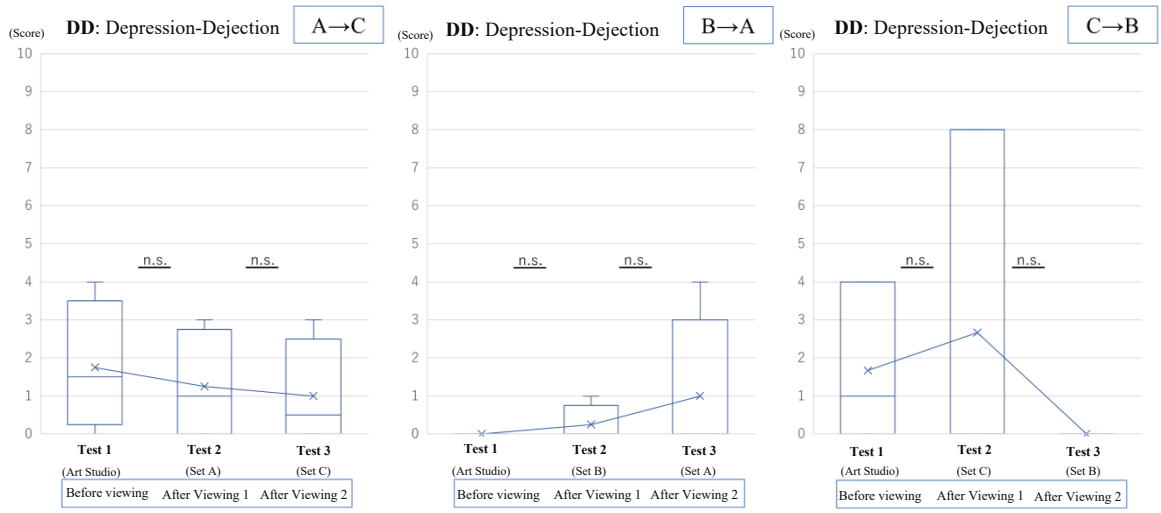

Fig. 12 Comparison of POMS when viewing three different sets of art: "Depression-Dejection" *: $p<0.05$

● Depression-Dejection (D-D)

As shown in Fig. 12, the mean value of Depression-Dejection (D-D) was lower after viewing only in the case of A→C. From this we can infer that museum bathing affected the negative mood states of the participants by reducing their psychological stress in this case. However, in the case of B→A, the mean value of D-D increased after viewing. In the case of C→B, the mean value increased after Viewing 1 (C) but decreased after Viewing 2 (B). The reasons are unclear, but the fact that Set B and Set C consisted of modern and contemporary artworks that were unfamiliar to the participants may have impacted their psychological stress in some way.

Note that no statistically significant differences were observed in any case.

● Fatigue-Inertia (F-I)

As shown in Fig. 13, both in the case of A→C and B→A the mean values of "Fatigue-Inertia" decreased after Viewing 1 but increased after Viewing 2, whereas in the case of C→B the mean value increased after Viewing 1 (C) but decreased after Viewing 2 (B). This pattern with C→B, of the mean value increasing after Viewing 1 (C) and then decreasing after Viewing 2 (B), was also observed with the mood states of Anger-Hostility and Depression-Dejection. Although the reason for this pattern is unclear, it is likely that the exhibits in Set C affected the psychological stress of the test subjects in some way.

Note that no statistically significant differences were observed in any of the cases.

● Tension-Anxiety (T-A)

As shown in Fig. 14, the mean values of Tension-Anxiety (T-A) decreased after Viewing 1 in all cases. From this we can infer that museum bathing affected the negative mood states of the trial participants by reducing their psychological stress. However, both in the case of A→C and B→A,

the mean values of T-A increased slightly after Viewing 2. The reason for this is unclear, but one possibility is that the psychological stress of the test subjects was affected by the fact that their eyesight was forced to adapt to an intense change in lighting intensity when moving into the exhibition spaces of Set A and Set C.

Note that the only observed statistically significant difference was in the case of A→C after Viewing 1 (A).

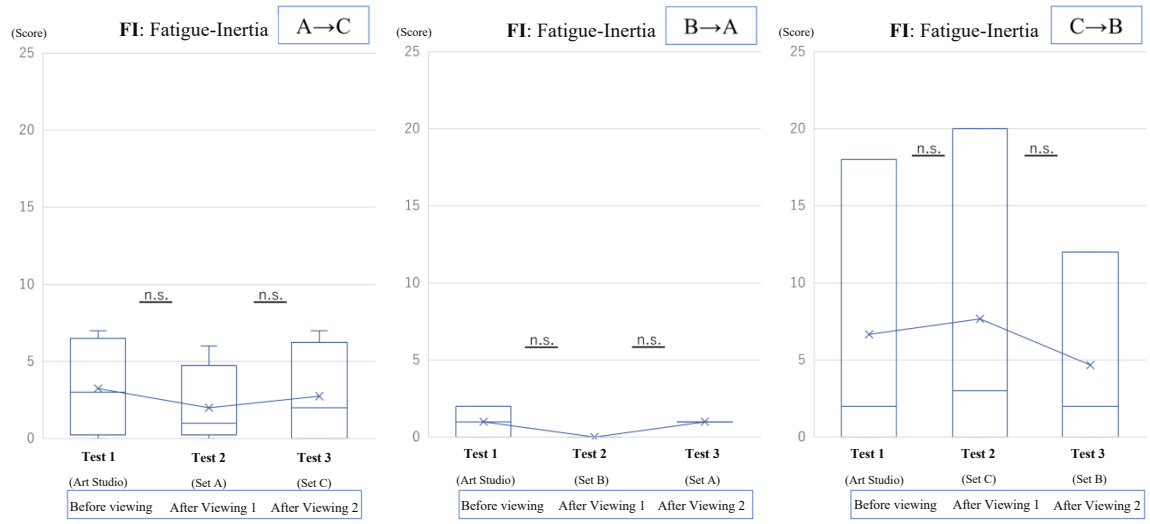

Fig. 13 Comparison of POMS when viewing three different sets of art: "Fatigue-Inertia" *: $p<0.05$

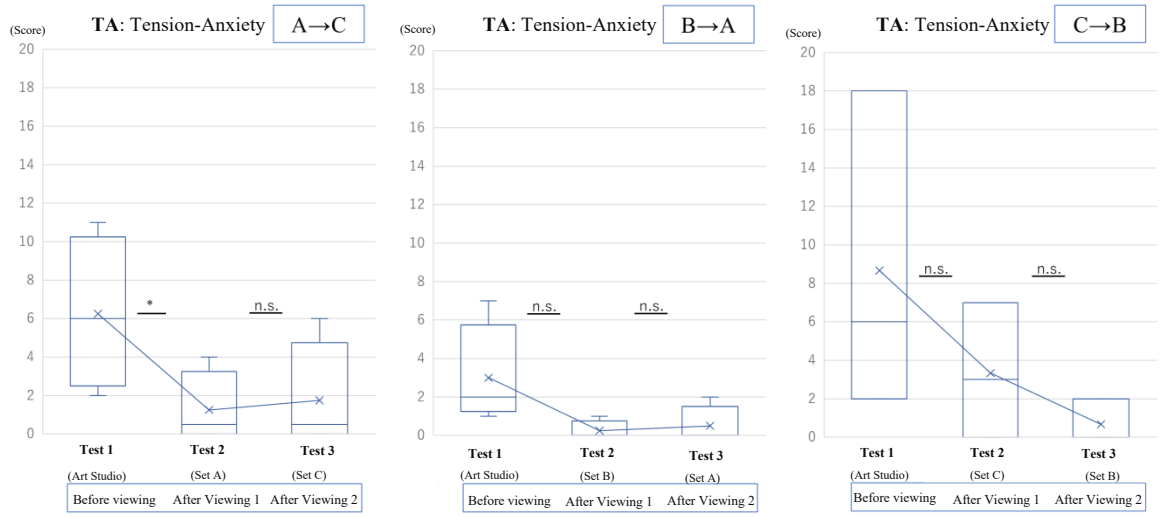

Fig. 14 Comparison of POMS when viewing three different sets of art: "Tension-Anxiety" *: $p<0.05$

● Vigor-Activity (V-A)

As shown in Fig. 15, the mean values of Vigor-Activity (V-A) increased in all cases after Viewing 1. However, both in cases A→C and B→A, the mean values of V-A decreased after Viewing 2, although in the case of C→B, the value increased. The reasons are unclear, but it is likely that the

characteristics of the exhibits of Sets A, B, and C influenced the psychological stress levels of the test subjects.

Note that statistically significant differences were only observed after Viewing 1 in the case of both A→C and B→A.

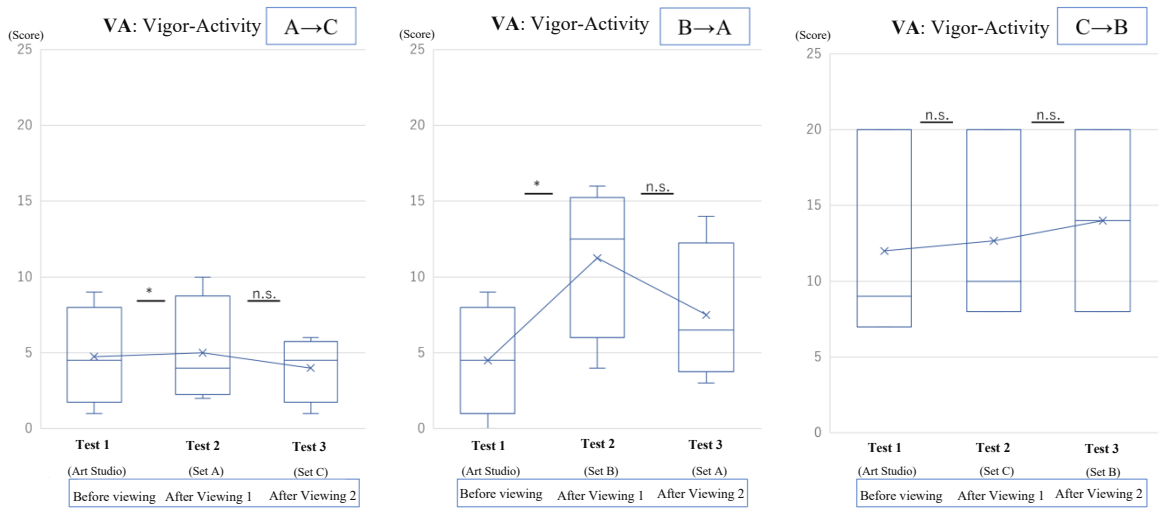

Fig. 15 Comparison of POMS when viewing three different sets of art: "Vigor-Activity" *: $p<0.05$

5.4.2. Comparison of physiological measurements (systolic blood pressure (max. blood pressure) and pulse rate) when viewing three different sets of art

As shown in Fig. 16, the mean systolic blood pressure (max. blood pressure) decreased after each viewing in both cases A→C and B→A. However, in the case of C→ B the mean systolic blood pressure fell after Viewing 1 (C) but rose after Viewing 2 (B). The reason for this is unclear, but it is likely that the characteristics of the exhibits of Sets A, B, and C influenced the psychological stress levels of the test subjects.

Note that the only statistically significant difference was observed in the case of C→ B after Viewing 1 (C).

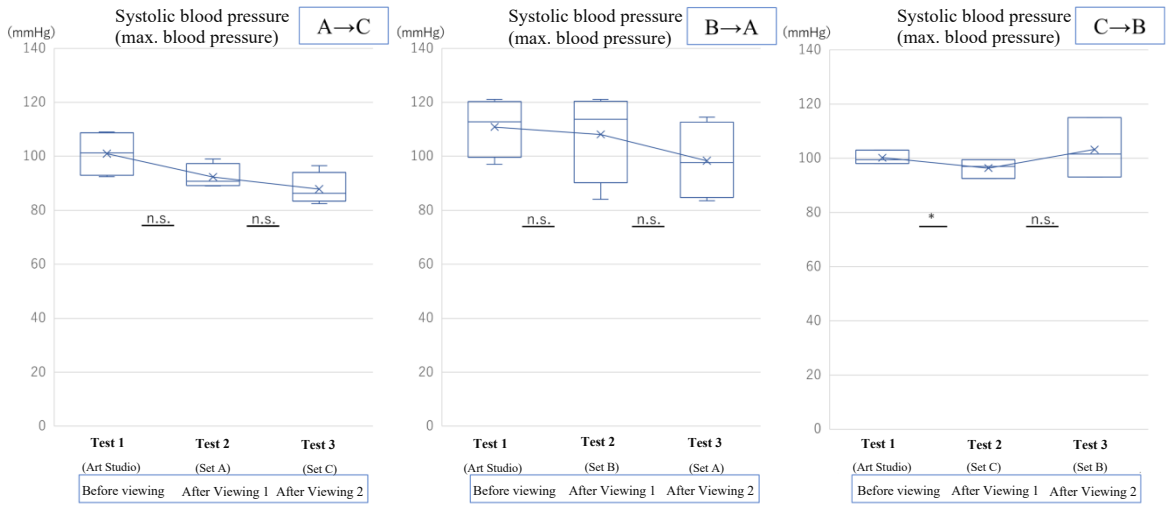

Fig. 16 Comparison of systolic blood pressure (max. blood pressure) when viewing three different sets of art *: $p<0.05$

As shown in Fig. 17, in the two cases A→C and B→A the mean values of pulse rate decreased after Viewing 1 but increased after Viewing 2. However, in the case of C→ B, the mean pulse rate moderately rose after both Viewing 1 (C) and Viewing 2 (B). The reason for this is unclear.

Note that no statistically significant differences were observed in any of the measurements.

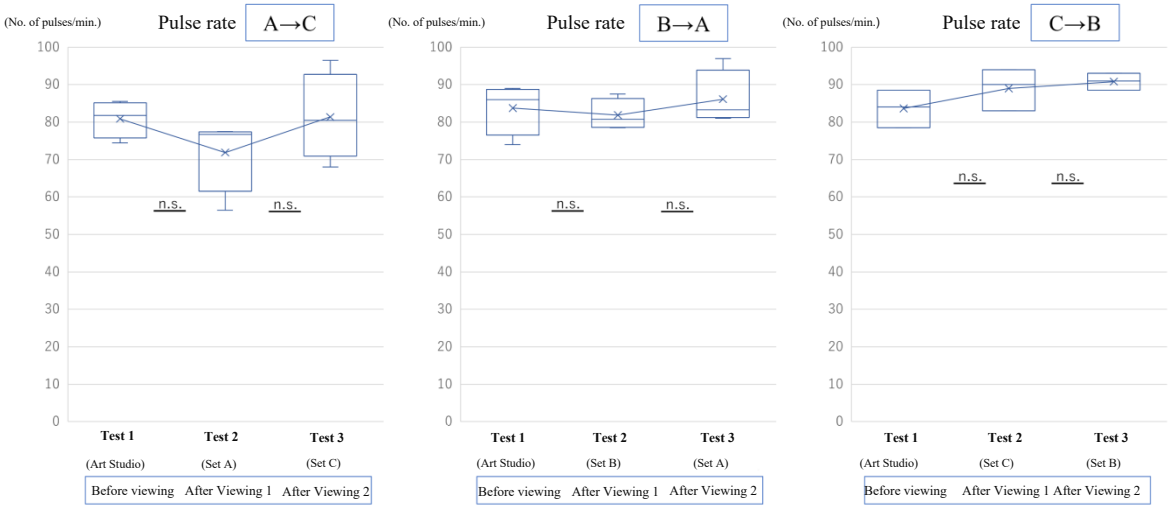

Fig. 17 Comparison of pulse rates when viewing three different sets of art *: $p<0.05$

5.5. Comparison of POMS TMD values (psychological measurements) at four museums

To measure the overall mood changes in the trial participants, we used TMD (Total Mood Disturbance) as a POMS indicator. POMS was developed based on the theory that mood, as a psychological stress response, can be classified into six types—Anger-Hostility, Confusion-Bewilderment, Depression-Dejection, Fatigue-Inertia, Tension-Anxiety, and Vigor-Activity. TMD was conceived as an overall indicator of mood disturbance, emotional or psychological distress,

and subjective well-being. It expresses the overall negative mood state of a person. It is calculated by summing up the raw scores for all six POMS factors, with a lower value indicating a better mood and emotional state.

At all four museums, the drop in mean TMD value occurred after Viewing 1, as shown in Fig. 18. From this, we can infer that museum bathing at four museums impacted the negative mood states of the trial participants, by reducing their psychological stress.

Note that statistically significant differences in TMD were observed after Viewing 1 at Fukuoka Asian Art Museum and Fukuoka Art Museum, and after both Viewing 1 and Viewing 2 at Fukuoka City Museum and Kyushu National Museum.

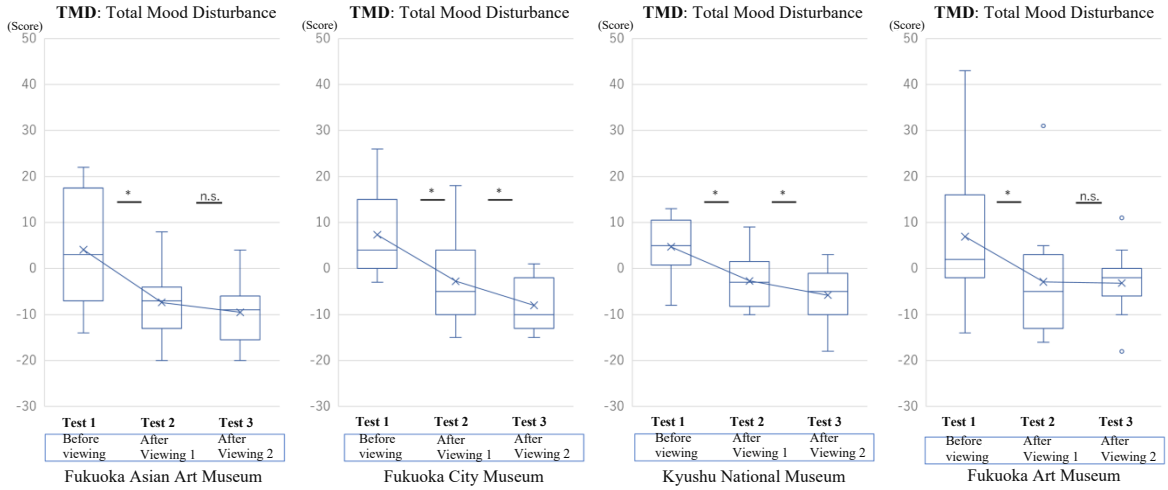

Fig. 18 Comparison of POMS TMD values (psychological measurements) at four museums

*: $p<0.05$

5.6. Comparison of physiological measurements (systolic blood pressure (max. blood pressure)) at four museums

Fig. 19 shows that at all four museums, the reduction in the mean value of systolic blood pressure (max. blood pressure) occurred after Viewing 1. From this we can infer that museum bathing had a relaxing effect on the trial participants at all four museums. Note that statistically significant differences in max. blood pressure were observed after Viewing 1 at Fukuoka Asian Art Museum, after Viewing 1 at Kyushu National Museum, and after Viewing 1 at Fukuoka Art Museum.

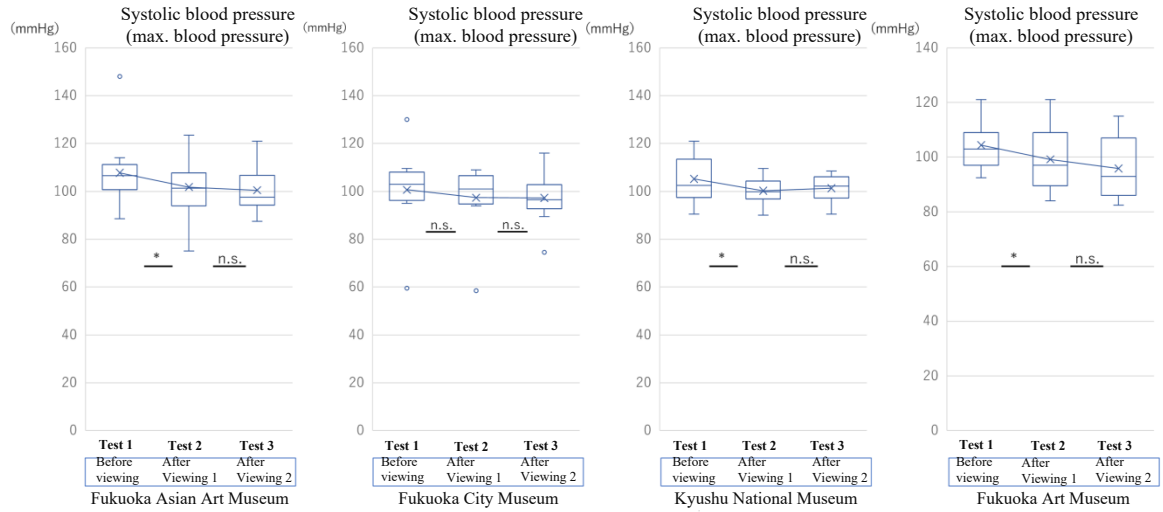

Fig.19 Comparison of systolic blood pressure (max. blood pressure) at four museums *: p<0.05

5.7. Comparison of physiological measurements (pulse rate) at four museums

As shown in Fig. 20, a comparison of pulse rates at the four museums reveals that the mean value of pulse rate decreased after Viewing 1. This suggests that museum bathing had a relaxing effect on the trial participants at all four museums.

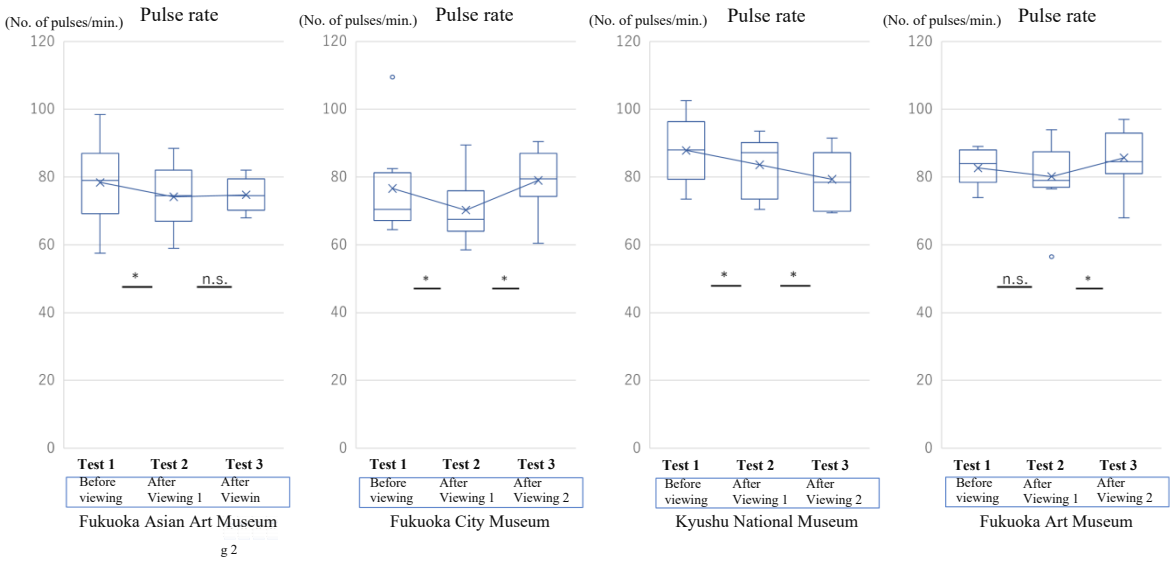

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Fig. 20 Comparison of pulse rates at four museums *: p<0.05

However, at Fukuoka Asian Art Museum, Fukuoka City Museum, and Fukuoka Art Museum, the mean pulse rate actually increased after Viewing 2. And even more strikingly, at Fukuoka City Museum and Fukuoka Art Museum, pulse rate was higher after Viewing 2 than before viewing. The reason for this result is unclear, but it may be related to the fact that the participants had to be rushed between the exhibition spaces and measurement room in order to strictly observe the scheduled measurement starting time after viewing. This is an issue for further investigation.

Note that statistically significant differences in pulse rate were observed after Viewing 1 at Fukuoka Asian Art Museum, after both Viewing 1 and Viewing 2 at Fukuoka City Museum and Kyushu National Museum, and after Viewing 2 at Fukuoka Art Museum.

5.8. Comparison of these findings with "limitations of studies" discussed in the international literature

Here, I would like to discuss the "limitations of studies" of the researchers covered in my previous study, "Prospects for Furthering the Study of Museum Bathing: A Review of the International Research Literature Based on a Scoping Review by Law et al.,"[17] with reference to some of the points I paid attention to in this study, as well as some explanation of comparison with the current findings.

(i) In the study by Francesca Ferroni et al., [18] only two artworks were viewed at an exhibition at the Castle of Rivoli's Contemporary Art Museum; a very small number. In this empirical trial, the participants viewed 92 pieces of modern and contemporary Asian art at Fukuoka Asian Art Museum; approximately 100 newly acquired pieces on the history and life of Fukuoka at Fukuoka City Museum; 245 pieces spanning the Paleolithic Age and the 11th century at Kyushu National Museum; and 54 antique art pieces, 64 contemporary art pieces, and 44 modern and contemporary art pieces at Fukuoka Art Museum. This means that the number of works viewed at each viewing ranged from around 50 to 250 pieces. As indicated by the POMS-based Total Mood Disturbance, there was a reduction in all the negative mood states, demonstrating that viewing had a relaxing effect. However, as the number of viewed artworks increases, concentration tends to decline and fatigue tends to rise. It will therefore be necessary to conduct further experiments to clarify a suitable limit for the number of artworks shown per viewing.

(ii) Luisa Krauss et al. [19] pointed out that the test subjects at the Schaulager (museum of the Laurenz Foundation) became interspersed with other visitors, making it impossible to guide the test subjects through the exhibition. In other words, the test subjects were unable to follow the prescribed order of viewing. In the present study, the test subjects were asked at all four museums to find their favorite works, but they were not forced to follow any particular viewing order; they were free to view the exhibits however they wanted. In future trials, I hope to explore the

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[17] See Note 11.

[18] Francesca Ferroni, Martina Ardizzi, Anna Kolesnikov, Vittorio Gallese (2018). Behavioral and autonomic responses to real and digital reproductions of works of art, *Progress in Brain Research*, January 2018

[19] Luisa Krauss, Celine Ott, Andrea Meyer, and Jens Gaab (2021). Impact of Contextualizing Information on Aesthetic Experience and Psychophysiological Responses to Art in a Museum: A Naturalistic Randomized Controlled Trial, *Psychology of Aesthetics, Creativity, and the Arts*, 15–3, 505–516

differences in relaxation effect between groups who are guided to view works in a fixed order and groups who are free to view works as they please.

(iii) In the study by Stefano Mastandrea et al.,[20] the test subjects were divided into three groups for viewing at the National Gallery of Modern Art in Rome (23 viewed figurative artworks, 23 viewed modern artworks, and 21 waited in the office), but the sample size was small. In the present study, the numbers of test subjects, all junior and senior high school students, were 13 at Fukuoka Asian Art Museum, 9 at Fukuoka City Museum, 10 at Kyushu National Museum, and 10 at Fukuoka Art Museum. My objective in studying museum bathing is to encourage people to feel open and free about visiting museums in their daily lives. One approach to this goal is to increase the sample size of individual trials to collect a large volume data, but I also like to conduct trials in an atmosphere that is as close as possible to daily life. For this reason, I plan to maintain a sample size of about 15 test subjects per trial as I increase the number of trials to accumulate more data.

(iv) Kristina Ter-Kazarian[21] pointed out that she did not set up a control group in her empirical trial at the Bellevue Arts Museum. One possible way to overcome this limitation in a future study is to use a group of people who remain at their workplaces during their lunch break as a control group. In the trial at Fukuoka Art Museum in the present study, I prepared three sets of art—antique art, contemporary art, and modern and contemporary art—to compare the effect of art content on relaxation. In future studies, as I continue to compare the effects of different content on relaxation, I will try to use "a group that does not view art" as a control group, as per Ter-Kazarian's suggestion.

5.9. Online post-questionnaire of junior and senior high school students (test subjects)

After each of the trials, I requested that the test subjects complete an online post-trial questionnaire. Below is a selection of their unedited responses.

(i) I never heard the term "museum bathing" before, but I really felt the relaxing effects of participating and I enjoyed myself very much. From now on, whenever I feel a bit down or worn out, I will try to do some "forest bathing" or "museum bathing."

(ii) It was interesting to see my blood pressure go down each time I did the three physiological measurements.

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[20] Stefano Mastandrea, Fridanna Maricchiolo, Giuseppe Carrya, Ilaria Giovannelli, Valentina Giuliani & Daniele Berardi (2019). Visits to figurative art museums may lower blood pressure and stress, *ARTS & HEALTH*, 11,123-132

[21] https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/45657/TerKazarian_washington_0250O_21485.pdf?sequence=2&isAllowed=y

(iii) I felt that the darkness of the museum, as well as the sound, made me feel calm. Since I will be studying cultural properties and museums at university, I was very interested in the subject of how museums can influence people. I am really looking forward to my future studies.
(iv) I usually only think about the artworks when I view art, but I felt that today's experience made me think about myself. I felt most comfortable viewing Set A, the antique art exhibits. Maybe because of how dark the lighting was. I also felt that this feeling was related to the quiet Japanese beauty of the old artworks. It occurred to me that when people from a different culture have a similar experience, the things that make them feel most relaxed probably depend on their culture. I guess that the art that people feel comfortable about depends on the environment too.
(v) I understood that viewing artworks in a museum or gallery is an effective way to reduce stress and relax.

The above responses clearly show that the participating junior and senior high school students were able to experience the relaxing effects of museum bathing. This can thus be considered an appropriate outcome of the HIRAMEKI ☆ TOKIMEKI SCIENCE program funded by a Grant-in-Aid for Publication of Scientific Research Results (KAKENHI). The responses also suggest new topics for further research, to investigate how the relaxation effect varies with differences in the brightness of exhibition spaces, sound, nationality, and cultural background.

6. Conclusion

For this study, I conducted trial experiments at four museums—Fukuoka Asian Art Museum, Fukuoka City Museum, Kyushu National Museum, and Fukuoka Art Museum—to verify the relaxation effect of "museum bathing" on test subjects made up of junior and senior high school students living in Fukuoka Prefecture.

The key findings of the study were:
(1) Psychological (POMS) and physiological (blood pressure and pulse rate) measurements at the four museums indicated that museum bathing may have a relaxing effect. This result suggests that museum bathing has the potential to serve as a useful method of stress reduction for junior and senior high school students.
(2) Evaluations of the POMS negative mood states of Anger-Hostility, Confusion-Bewilderment, Depression-Dejection, Fatigue-Inertia, and Tension-Anxiety indicated that the experience of museum bathing may reduce negative mood states.
(3) Evaluation of the POMS positive mood state of Vigor-Activity indicated that the experience of museum bathing may increase positive mood states.
(4) Evaluation of POMS-based Total Mood Disturbance (TMD) indicated that the experience of museum bathing may have a calming effect.

(5) Systolic blood pressure (max. blood pressure) measurements indicated that the experience of museum bathing may reduce blood pressure.
(6) Pulse measurements indicated that the experience of museum bathing may reduce pulse rate.
(7) The “limitations of studies” discussed in international literature on this subject can be addressed one by one, leading to measures to eliminate them.
(8) Responses to post-trial questionnaires suggested that museum bathing offered an opportunity to recognize anew the value and effectiveness of art as a mental health measure for junior and senior high school students in the face of the COVID-19 crisis.
(9) This study suggested that museum bathing can play a role not only in promoting health, but also in revitalizing communities by connecting people of all ages.

Thus, the present study was a series of empirical trials at four museums/art museums that succeeded in obtaining scientific evidence by quantitatively evaluating the relaxation effect of museum bathing. Furthermore, by addressing the “limitations of studies” addressed in previous overseas studies, I was able to establish a flow of empirical trials on the relaxing effects of museum bathing.

However, since the junior and senior high school students who participated in this experiment belonged to art, history, and science clubs, they already had some interest in museums and art galleries. Furthermore, the trials in this study were focused on the visual stimulation of artworks. For future studies, it will be important to use test subjects who have had little or no previous opportunity to visit museums or art galleries, and to examine the experience of art through a combination of senses, e.g., visual, tactile, and auditory stimuli. It will also be necessary to conduct empirical trials of museum bathing based on continuing participation, as opposed to one-off museum visits. Finally, with the cooperation of junior and senior high schools in Fukuoka Prefecture, it will be necessary to increase the number of trials, since the number of test subjects is still small.

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