Tokyo Metropolitan Symphony Orchestra
Kazushi ONO, Music Director
55th Anniversary Since 1965

Roadmap and guidelines for the resumption of concerts by the Tokyo Metropolitan Symphony Orchestra (TMSO)

- reflecting the results of the “Trial performances in preparation for the resumption of concerts while impacted by COVID-19”

July 27, 2020
Tokyo Metropolitan Symphony Orchestra

(Revision History)

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-	2020/6/25	Japanese edition published.
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Roadmap and guidelines for the resumption of concerts by the Tokyo Metropolitan Symphony Orchestra (TMSO)

The Tokyo Metropolitan Symphony Orchestra (TMSO) has drawn up a roadmap and guidelines for the resumption of concerts, reflecting the results of the "Trial performances in preparation for the resumption of concerts while impacted by COVID-19" held on June 11 and 12, 2020, at Tokyo Bunka Kaikan, and advice from experts, and with reference to documents including Tokyo Metropolitan Government's roadmap and the guidelines formulated by the Council for the Management and Promotion of Classical Music Performances.

I. Roadmap

	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4
Target composition of orchestra	-	String strength of up to 12 first violins and double winds (~ around 55 performers)	String strength of up to 14 first violins and triple winds (~ around 75 performers)	String strength of up to 16 first violins and quadruple winds (~ around 90 performers)	With a chorus, etc.
Spacing of concerts	-	Leave a set period between concerts, and check the infection status of performers	Timetable concerts freely, according to the schedule (the usual spacing of concerts)		
In case of infection among orchestra members	-	After consulting with public health centers and external experts and responding accordingly, those who have been in close contact with infected persons are to remain at home, and the next concert is to take place without infected persons and those who have been in close contact with them.			
Transition between stages	-	Consider whether to move backwards or forwards a stage bearing in mind the infection status of the orchestra members and the spread of infection in society, and listening to the opinions of external experts. The decision to transition to the next stage is to be made by the orchestra after at least one month has elapsed.			The decision is to be made by the orchestra, taking into account the results of experiments into aerosol spray emitted by the chorus, etc.

II. Guidelines

Fundamental approach

The novel coronavirus (COVID-19) infection is transmitted by aerosol droplets emitted in the course of coughing, sneezing, or conversation, and through contact, by means of fingertips which have touched contaminated environments. Those infected are known to be infectious towards those around two days before the appearance of symptoms.

It is impossible to require zero risk of any social activity, let alone musical activities. Although the results of the trial performances show that the risk of infection from concerts can be considered to be relatively low, it is necessary to carry out periodic risk evaluations and put in place sufficient infection prevention measures.

When resuming concerts

The following measures will be implemented, based on this fundamental approach, and with reference to Tokyo Metropolitan Government's roadmap and the guidelines formulated by the Council for the Management and Promotion of Classical Music Performances.

1. Overall measures for performance activities

Concert planning (program selection) and on-stage measures

The results of measurement of the aerosol droplets emitted by wind instruments *(Cf: Technical Report from P.12)* show that, as long as these are played in the correct way by professional players, almost no aerosol can be detected from the instruments themselves. These results suggest that an arrangement of performers at almost the usual distance apart could be considered possible.

(1) Nevertheless, for the time being, we will begin with an arrangement which gives due consideration to ventilation on stage.
In concrete terms, we will start with a maximum instrumentation with a string strength of 12 first violins and double winds, an arrangement with relatively ample spacing between players. Hereafter, while continuing to observe the spread of COVID-19 closely, we will gradually progress to an instrumentation with 14 first violins and triple winds, 16 first violins and quadruple winds, and finally move to a large orchestra. Decisions about transitioning from one stage of the roadmap to the next will be made after at least one month has elapsed, paying attention to the spread of the infection in society and listening to the opinions of external experts.
(2) For the time being, we will select programs of around an hour in length with no interval, and limit audience numbers.
(3) A suitable distance will be maintained between the conductor and orchestra as necessary.
(4) The wearing of masks by performers is desirable in order to avoid exposing those around them to risk. However, where the wearing of a mask is an impediment to performance, performers shall not have to wear one, as long as they practice consideration for those around them.
(5) Care will be taken to avoid the sharing of instruments, scores, music stands, equipment

or tools of various kinds between multiple, unspecified people.

(6) Performances together with a chorus will be considered henceforth, with due attention to the reports of studies carried out by various organizations and institutions.

(7) If infections occur among orchestra members (staff), after consulting with public health centers and external experts and responding accordingly, those who have been in close contact with infected persons will remain at home, and the next concert will take place without infected persons and those who have been in close contact with them.

* "Those who have been in close contact with infected persons": those who have been in contact with a person confirmed to have been infected with the novel coronavirus at close distance or for a long period, and whose potential for infection is relatively high. Those who have been within arm's reach (around 1 meter or less) for at least 15 minutes are considered to have been in close contact with infected persons (taken from the Ministry of Health, Labour and Welfare's "Q & A on Coronavirus Disease 2019 (COVID-19)").

Measures in rehearsal venues, music rooms, etc.

(1) Care is needed to avoid close, crowded conditions in the same way as on stage. The orchestra will make a decision after taking the venue capacity and ventilation into consideration. Basically, playing in poorly-ventilated venues will be avoided.

(2) TMSO Studio (the large rehearsal room of the Tokyo Bunka Kaikan) is spacious with a high ceiling, and so the conditions are thought to be good; however, after checking the efficiency of the ventilation system and the passage of air through the room, any measures deemed necessary will be taken.

(3) Everyday infection prevention habits will be thoroughly enforced. These include temperature checks when entering the room, handwashing, hand sanitizing, the wearing of masks, and measures to deal with condensation on wind instruments.

(4) The conductor may use a microphone during rehearsals in order to prevent the spraying of aerosol droplets. In addition, the placing of an acrylic board between the conductor and the orchestra is a possibility.

(5) Care will be taken to avoid the sharing of instruments, scores, music stands, or tools of various kinds between multiple, unspecified people.

(6) In small spaces in which orchestra members gather, such as the lobby, music rooms, common rooms, and so on, care shall be taken to avoid close, crowded conditions through restrictions on the number of people using these spaces and the length of time for which they do so. Users will wear masks and maintain a distance between each other. When eating and drinking, in particular, they will take especial care that no risk of infection arises.

2. Measures to be taken by orchestra members and staff

Infection prevention measures by orchestra members

(1) Measures upon entering the venue

Orchestra members will:

① Take and record body temperature.

② Wear a mask and observe etiquette when coughing.

③ At the entrance to the music room, take body temperature with a

contactless thermometer, and sanitize their hands with an alcohol-based sanitizer.
④ Remain as far apart as possible in common rooms and music rooms.
⑤ Refrain from conversation wherever possible.

(2) Measures on stage
① Performers will wear masks as far as possible, and observe etiquette when coughing.
②Performers of wind instruments will remove the condensation which is produced when playing using the absorbent sheets designated for the purpose and, after the performance has ended, dispose of them in personin designated garbage bags.
③ Performers who feel that anything about their physical condition is unusual will report this to staff immediately.

(3) Measures during breaks, in common rooms and backstage
Orchestra members will:
① Wear masks in common rooms and music rooms.
② Remain as far apart as possible in common rooms and music rooms.
③ Not share food or drink with other orchestra members.
④ Bring their own water in order to stay hydrated.
⑤ If they feel that anything about their physical condition is unusual, report this to staff immediately.
⑥Refrain from conversation wherever possible.

Infection prevention measures by staff

(1) Measures upon entering the venue
Staff will:
①Take and record body temperature on the day in question.
② Wear a mask and observe etiquette when coughing.
③ Wash and sanitize their hands immediately after entering the venue.
④ Remain as far apart as possible in common rooms and music rooms.

(2) Setting up the stage
① As far as possible, a designated person will be responsible for setting up and clearing away chairs and music stands used on stage, avoiding contact by multiple, unspecified people.
② Staff will frequently disinfect chairs and music stands used on stage and chairs and desks in common rooms and music rooms.
③ While setting up the stage, staff will wear masks and gloves, and use an alcohol-based sanitizer frequently.
④ A librarian will handle the musical scores using gloves.

(3) Audience support
Staff engaged in audience support will:
① Wear masks, and use gloves, face shields, etc. where necessary.
② Take care to maintain social distancing with audience members, and avoid face-to-face conversations as far as possible.
③ Take care that masks, gloves, face shields, etc. do not come into direct

contact with the area around their faces when putting on and removing them.

(4) Measures after the end of a performance

Staff will:

① Dismantle and clear up rapidly.

② Disinfect with alcohol desks, chairs, etc. which have been used in common rooms and music rooms.

PCR testing

According to the opinion received from experts, “Although PCR testing of people without any symptoms can be considered depending on the situation, it involves a financial burden, and there is a possibility both that those who are positive may be judged negative (false negatives) and that those who are negative may be judged positive (false positives). Irrespective of whether or not testing takes place, it is important to implement reliable infection prevention measures.” The orchestra will continue to consider and make judgements about the various types of test, based on the latest information.

3. Measures to be taken by audience members

Requests to audience members

(1) Those buying tickets will be asked for their contact details at the point of sale.
(2) The following requests will be made in advance.

Requests to audience members

- Please wear a mask.
- Temperature monitoring of audience members will be carried out using methods such as thermography.
- Please wash and sanitize your hands frequently.
- Please maintain a distance between yourself and other audience members.
- Please refrain from talking in a loud voice and from eating or drinking inside the venue (with the exception of drinking water in order to stay hydrated).
- If any of the following apply, please refrain from coming to or entering the venue:

  ① If you have a temperature of 37.5 °C or above.

  ② If you have any of the following symptoms: cough, difficulty breathing, general weariness, sore throat, nasal discharge or congestion, impaired sense of taste or smell, sore or bloodshot eyes, headache, joint or muscle pain, diarrhea, nausea or vomiting.

  ③ If you have been in close contact with someone diagnosed as infected with the novel coronavirus.

  ④ If you have visited within the past two weeks a country or region from which entry restrictions apply or for which the government requires an observation period after entering Japan, or if you are in close contact with a resident of such a country or region.

- If cases of infection occur among audience members, names and contact details of audience members may be shared with official bodies such as public health centers.

(Additions or amendments to this content may be made depending on the content of each performance, the guidelines issued by the performance venue, etc.)

Measures at the venue

(1) Temperature monitoring will be carried out using methods such as thermography.
(2) Hand sanitizing will be carried out with alcohol-based sanitizer.

(3) Audience members will be asked to detach their own tickets from the ticket stubs at the entrance to the venue.
(4) Audience members will be instructed to avoid close contact.
(5) In principle, materials such as programmes will not be given out by hand; instead, audience members will be asked to pick them up themselves.

Measures related to the use of venue facilities

(1) A distance sufficient for infection prevention will be left between the performers on stage and the first row of seats.
(2) Necessary infection prevention measures will be put in place at the reception desk, such as the installation of a panel to prevent the spread of aerosol droplets.
(3) Autograph sessions etc. will not be held for the time being.
(4) Where audience members are provided with or sold food or drink, sufficient infection prevention measures will be implemented, in consultation with the facility.

Matters not covered in these guidelines shall be as stated in the "Guidelines for the prevention of infection by the novel coronavirus at classical music performances" drawn up by the Council for the Management and Promotion of Classical Music Performances.

These guidelines shall be revised as necessary, based on the spread of infection and the latest scientific evidence.

Experts contributing to the drawing up of this "Roadmap and guidelines for the resumption of concerts"

(In alphabetical order; titles omitted)

- Michiyo CHEETHAM (Tokyo Metropolitan Symphony Orchestra industrial physician/ Director, Soshigaya Michi Clinic)
- Hirokazu KAWASE (Professor, Department of Paediatric Surgery, St. Marianna University School of Medicine/ General Manager, Hospital Management Office)
- Hideki KOMATSUZAKI (Director, Komatsuzaki Clinic/ visiting lecturer, Sophia University)
- Hiroyuki KUNISHIMA (Professor, Department of Infectious Diseases, St. Marianna University School of Medicine)
- Kimihiko MASUDA (Community Medicine Coordination Manager/ Medical Director, Center for Pulmonary Diseases, National Hospital Organization Tokyo National Hospital)
- Tomoaki OKUDA (Professor, Department of Applied Chemistry Faculty of Science and Technology, Keio University)

Document 1

Overview of the “Trial performances in preparation for the resumption of concerts under the influence of COVID-19”

June 25, 2020
Tokyo Metropolitan Symphony Orchestra

“Trial performances in preparation for the resumption of concerts under the influence of COVID-19”

Date, time, and venue: Thursday, June 11 and Friday, June 12, 2020; Main Hall, Tokyo Bunka Kaikan
Organizers: Tokyo Metropolitan Symphony Orchestra/ Tokyo Metropolitan Foundation for History and Culture Tokyo Bunka Kaikan
Supporter: the Council for the Management and Promotion of Classical Music Performances

Aim

Carry out trial performances, with reference to the results of scientific studies and experiments carried out by orchestras and researchers overseas, and incorporating the opinions of the performers and the conductor. Further, in the presence of experts in aerosol measurement and infectious disease specialists, devise ways to enable both comprehensive verification of the performance situation and musical results. Open to the public (capacity of 100 people each day).

Content of activities carried out

- Wednesday, June 10: Preparations (marking a grid of 1 meter intervals and semicircles on the surface of the stage with vinyl tape, etc.)

- Thursday, June 11
  Kazushi ONO (Conductor/ Music Director, Tokyo Metropolitan Symphony Orchestra) Tokyo Metropolitan Symphony Orchestra (with the participation on the day of 40 orchestra members)
  - Strings only. The performance began with performers spaced at 2 meters intervals, which were progressively changed to 1.5 m, then to 1 m.
  - The final setting had performers spaced at 1 m intervals.
  - The conductor and performers wore masks. An acrylic panel was installed in front of the conductor (this was removed partway through).
  Program: from Grieg’s “Holberg Suite”; from Tchaikovsky’s “Serenade for Strings”.

- Friday, June 12
  Kazushi ONO (Conductor/ Music Director, Tokyo Metropolitan Symphony Orchestra) Tokyo Metropolitan Symphony Orchestra (with the participation on the day of 61 orchestra members)
  Megumi TANIHARA (Soprano) Hidekazu TSUMAYA (Bass)

  Hirokazu KAWASE (Professor, Department of Paediatric Surgery, St. Marianna University School of Medicine/ General Manager, Hospital Management Office)
  Hideki KOMATSUZAKI (Director, Komatsuzaki Clinic/ visiting lecturer, Sophia University)
  Hiroyuki KUNISHIMA (Professor, Department of Infectious Diseases, St. Marianna University School of Medicine)
  Kimihiko MASUDA (Community Medicine Coordination Manager/ Medical Director, Center for Pulmonary Diseases, National Hospital Organization Tokyo National Hospital)
  Tomoaki OKUDA (Professor, Department of Applied Chemistry,Faculty of Science and Technology, Keio University)

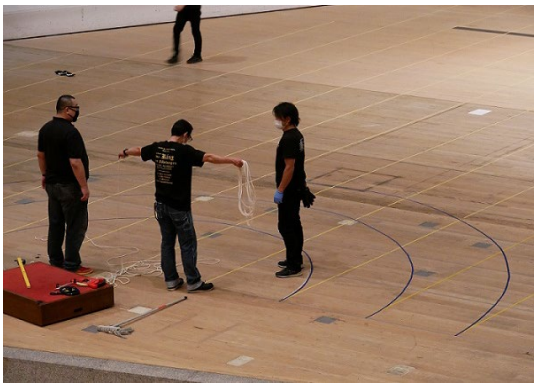
  (In alphabetical order; titles omitted)

- Aerosol measurement in a measurement chamber (set up in a music room). Wind instruments (piccolo, flute, oboe, clarinet, bass clarinet, bassoon, horn, trumpet, trombone, tuba), singers (soprano, bass). A music stand was placed in front of the performers.
- On-stage aerosol measurement of brass ensemble and woodwind ensemble.
- Orchestral music: wind and percussion instruments were positioned to match the settings for the string instruments established by the results from the first day.
- Spacing and positions were modified and adjusted during the performance with advice from experts.
- The final distances between performers were around 90 cm in each direction between the strings, around 1.3 m between the strings and the front row of the woodwind, around 1.7 m between the woodwind and the brass, and about 1 m on each side between the wind instruments.
- Professor Kunishima indicated that masks could be removed where they were an impediment to the performance.

Program: Mozart's 'Overture' to "The Marriage of Figaro"; from Mozart's Symphony No.41, "Jupiter"

- Singing and orchestral music: the singers stood in front of the orchestra, and aerosol measurement was conducted in the front row of the audience.
Program: from Verdi's 'From Flower to Flower' from "La Traviata"; Mozart's 'You Shall Go No More' from "The Marriage of Figaro".
- After the trial performances, Kazushi ONO, the group of experts, representatives from among the orchestra members, and office staff held a meeting. This included reporting of the results and the exchange of opinions.

State of Trial performance



Stage preparation June 10

Trial performance at spaced 2 m intervals June 11

Reception desk in the hall

Trial performance at spaced 2 m intervals June 11

Trial temperature measurement June 11

Trial performance at spaced 1.5 m intervals June 11

Trial performance at spaced 2 m intervals June 11

Trial performance at spaced 1 m intervals June 11

Photo ©Rikimaru Hotta (Except June 10)

State of measurement Trumpet　June 12

State of measurement Oboe　June 12

State of measurement Brass ensemble　June 12

State of measurement Wood wind ensemble　June 12

Orchestra ensemble　June 12

Ono and　Professor Kunishima

State of measurement Soprano solo　June 12

State of measurement Bass solo June 12

Photo　©Rikimaru Hotta (Except June 10)

Document 2

Technical Report:

Particle Measurement to Explore the Possibilities of Orchestral Playing post-Covid

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Department of Applied Chemistry
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Keio University, Japan
July 13th, 2020

Executive Summary

Particles (aerosols) or droplets (hereinafter referred to as “droplets”) emitted from orchestra performances were measured. Specifically, the droplets emitted from 10 wind instruments including the trumpet and flute, along with female and male singers were being tested. The clearest results were of the male singer (bass). However, the way in which the droplets were being emitted differed depending on the singing style; fewer emissions were being measured with German language, the vocal line from Beethoven’s Ninth Symphony (‘O Freunde, nicht diese Töne!), while more droplets were seen when the singer sang in Italian, which had many bursts on the consonants. Additionally, when the measuring instrument was placed 65 cm from the singer (height 190 cm), the aerosols were observed clearly. On the contrary, when it was placed 180 cm from the same singer, the particles could not be perceived clearly. Moreover, the number of droplets emitted from the female singer (soprano) was clearly fewer in comparison to the male singer. The droplets emitted from the 10 wind instruments (in order of measurement: oboe, trumpet, horn, tuba, trombone, flute, piccolo, bassoon, clarinet, and bass clarinet) were very minimal when measured in close proximity to the mouth or the instrument, and a measurable amount of aerosols were emitted when the mouthpiece was being blown and a flute was being played with some techniques such as the staccato and flutter. Still, none of the instruments emitted as many droplets as the male singer. In summary, amongst the 10 wind instruments being tested, it is difficult to conclude that “more droplets are being emitted than during daily conversations between people.” In other words, it is difficult to conclude that there is a higher risk during a performance held at a large hall (mid-performance) as opposed to the time before and after the performance (rehearsals, meals, conversations, celebration gatherings, and daily conversations).

1. Theoretical consideration of droplets emitted from singers and instruments

1-1. Sneezing

With regards to the types of droplets emitted from the human mouth, sneezing has the greatest number of spray droplets and the ability to reach long distances. According to previous research[1)], the initial velocity of a sneeze is 10 ~ 20 m per second (36 ~72 km/h), and after 0.2 seconds, almost all of the measured droplets reach a horizontal speed of zero. Note that oftentimes it is said that "the speed of a sneeze droplet is comparable to that of a bullet train (over 300 km/h)," however, at the time of writing this report (2020/6/23), Okuda has not found any scientific evidence to support that basis. With regards to the size of droplets emitted during coughs and sneezes, distributions from submicrons to millimeters have been reported[2,3)]; generally, it is observed that the peak is held around 0.1 mm and 0.5-0.7 mm. Suppose that a person with a height of 195 cm (assume the floor-to-mouth distance to be 170 cm) sneezes and a droplet with a diameter of 1 mm is released at an initial velocity of 20 m/s. The droplet emitted into the air with the initial velocity is subject to air resistance immediately after its release, and it comes to a halt. This air resistance is very strong; for example, a droplet with a diameter up to 0.2 mm loses its initial speed within 0.1 seconds. This is called the relaxation time. Assuming that the velocity of a droplet (with a diameter of 0.1 m having a relaxation time of 1 second) is linearly lost, thus the droplet released with an initial velocity of 20 m/s will reach a distance of 10 m (spray evaporation is not considered here). However, since droplets also have mass, they begin to drop vertically as soon as they are emitted. For a droplet with a diameter of 1 mm, the speed in which it drops (also called the terminal settling velocity) is 3.9 m/s. Thus, a droplet released from a height of 1.7 m will reach the ground within 0.5 seconds. **Therefore, a droplet with a diameter of 1 mm that is directly (from when it is released to when its velocity reaches zero) released from a sneeze will travel horizontally less than 5 m. Moreover, it is thought that during daily conversations, droplets emitted at an initial velocity from 1 ~ 5 m/s, thus it can be assumed that droplets emitted during daily conversations fall within 1 m distance from the speaker.**

1-2. Wind Instruments

Although this may seem obvious, when playing a wind instrument, people blow air to make a sound rather than to purposefully emit droplets and aerosols. Furthermore, **it is important to note that many instruments have a curved pipe. When the airflow is forced to curve, much of the droplets collide with the pipe wall.** Under these circumstances, when the JIS K0302 equation[4)] is applied at air velocity 10 L/min (similar to calm human breathing) with an instrument with a diameter of 1 cm (0.5 m/s wind speed assumed), as the wind passes by the 90° bend once, 50% of the 0.02 mm droplets collide

with the wall. Droplets with a larger diameter have a higher probability of colliding with the walls; by blowing into the instrument faster, more droplets will collide. In principle, the more curved the pipe of the instrument is, the more droplets stay trapped within the instrument. **Theoretically, it can be concluded that while assuming the majority of the air travels through the pipe, an increasingly curved instrument would release fewer droplets to the outside.** Therefore, regarding the main measurements, the plan was to pay close attention to instruments that has a potential of leaking air from the mouth such as the flute, and instruments that have a straight pipe, such as the clarinet.

2. Measurement results of droplets emitted from singers and instruments

2-1. Measuring equipment and their limitations

(a) Visualization device **(Photograph credits: Kato Koken Co., Ltd., all rights reserved)**

Laser Visualization: ParticleViewer PV2-II / CW Laser 2W light source

Can visualize particles approximately greater than 1 μm.

LED Visualization: ParticleViewer Light PV2-L / specialized LED light source

Can visualize relatively large droplets, approximately 10 μm or more.

(b) Particle measuring device

Light scattering particle counter (OPC, RION KE-01E) Flow rate 0.5 L/min, diameter 0.3-10 μm

Light scattering particle counter (OPS, TSI 3330) Flow rate 0.5 L/min, diameter 0.3-10 μm

Aerodynamic particle sizer (APS, TSI3321) Flow rate 5.0 L/min, diameter 0.5-20 μm

(c) Measurement problems and limitations present in this experiment

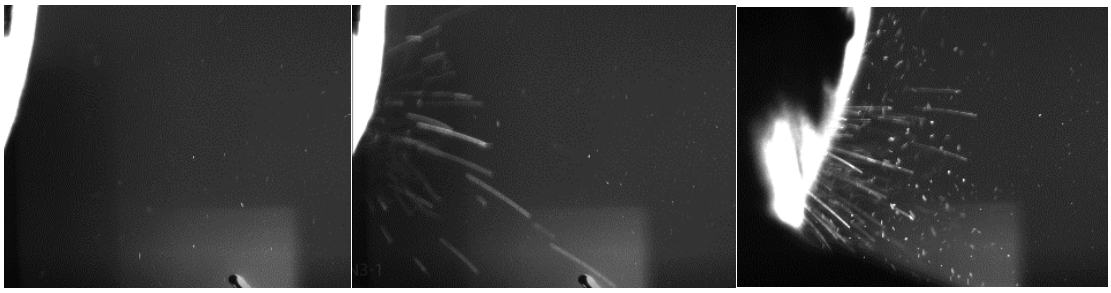
With regards to both the visualization equipment and the particle measurement equipment, an on-site measurement was done, therefore the background air is not cleaned. The measurement is performed while a considerable number of particles are already present in the air, therefore identifying the "new" particles emitted from the singers and instruments is somewhat difficult. In addition, the suction flow rate of the particle measurement device is relatively low at 0.5-5 L/min, and there is a probability that the particles generated by the singers and instruments were not properly introduced to the measurement device. Moreover, all the musical instrument players who have participated are professionals, therefore it is not certain that this result can be applied to amateurs. Furthermore, each instrument was performed by a single player for about 10 minutes, therefore reproducibility is not guaranteed.

2-2. Male Singer (bass)

a) Visualization device

German song total measurement time 49 seconds, confirmed droplets 8 times

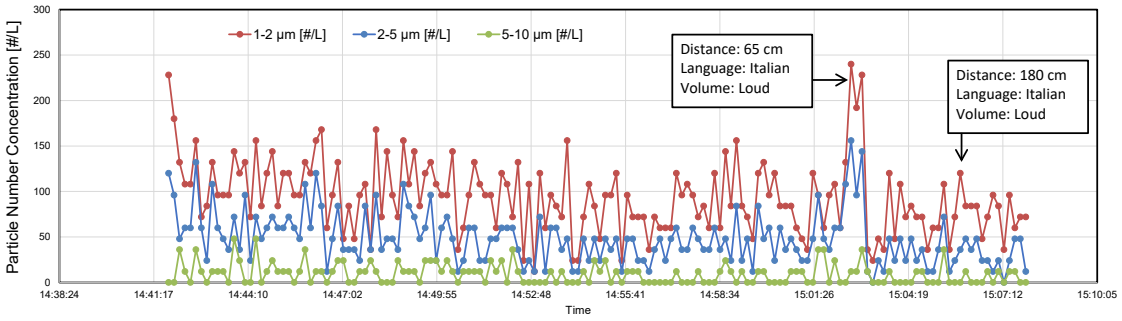
Italian song total measurement time 57 seconds, confirmed droplets 33 times



Had the highest number of droplets and frequency out of all the measurements done this time. The way in which the droplets were being emitted differed depending on the singing style; **fewer emissions were being measured with German language, the vocal line from Beethoven's Ninth Symphony ('O Freunde, nicht diese Töne!), while more droplets were seen when the singer sang in Italian, which had many bursts on the consonants.** While the larger particles almost directly fell below, there were also smaller particles that moved alongside the airflow which led to an observed increase in the particle concentration near the face. Additionally, **when vowels were being pronounced, almost no droplets were observed.**

(b) Particle measuring device

The measurement took place with the air suction port of the measuring instrument placed 65 cm away from a male singer (height 190 cm). **During the German song, no clear changes were observed with particles of any size. However, a clear increase in particle count was observed when the explosive Italian song was sung.** Specifically, there were about 100 of 1-2 μm particles per liter which increased to almost 200 particles per liter. Similarly, the 2-5 μm particles went from about 50 to 100 particles per liter. On the other hand, **when the distance between the singer and the measuring device was increased to 180 cm with the same song phrase, significant changes in particle count were not observed.**



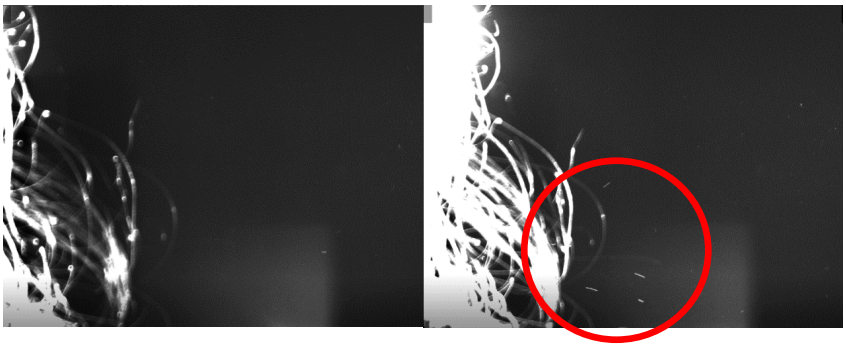
Graph: Changes in atmospheric particle count while singing (male singer)

2-3. Female Singer

(a) Visualization device

Of the total measurement time of 27 seconds, confirmed droplets were recorded 3 times

Not many droplets were seen during the German song, droplets were clearly seen when pronouncing the “t” sound in Japanese. Generally, the number and frequency of droplets emitted were fewer compared to the male singer.



(b) Particle measuring device

The measurement took place with the air suction port of a measuring instrument placed 50 cm away from the female singer, but no recognizable change was observed with the number of particles.

2-4. Oboe

(a) Visualization device

Of the total measurement time of 40 seconds, confirmed droplets were recorded 2 times

The droplet was observed slightly beyond the tip of the bell; the droplet was smaller than that emitted from the male singer.

(b) Particle measuring device

The measurement took place with the air suction port of a measuring instrument

placed 20 cm away from the bell, but no recognizable change was observed with the number of particles.

2-5. Trumpet

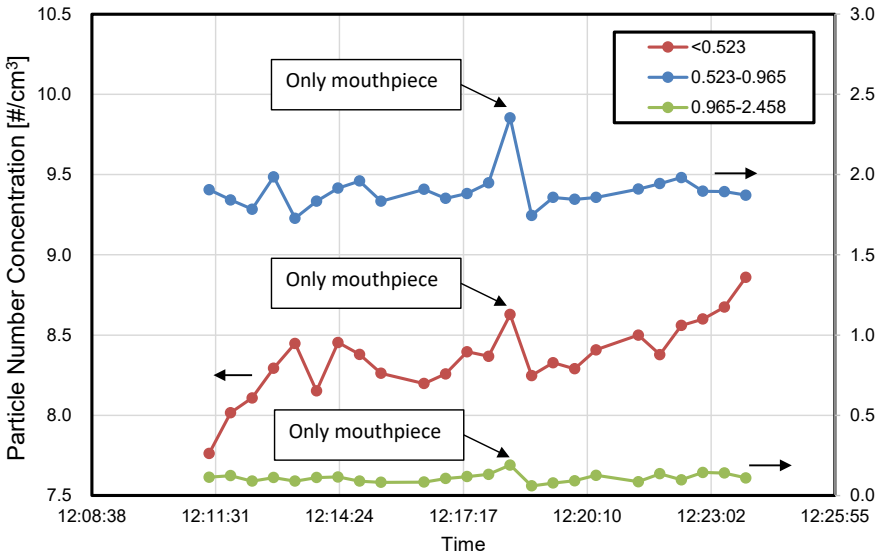
(a) Visualization device

Of the total measurement time of 40 seconds, confirmed droplets were recorded 2 times

Small number of droplets were identified at the tip of the bell; the droplet was smaller than that emitted from the male singer.

(b) Particle measuring device

The measurement took place with the air suction port of a measuring instrument placed 20 cm away from the bell, but no recognizable change was observed with the number of particles. However, **when the mouthpiece itself was blown into, and the air suction port of the particle measuring device was brought close to it, both the 0.5-1 μm and 1-2 μm particles slightly increased.**



Graph. Changes in atmospheric particle count while playing the trumpet

Red, blue and green plots represent different particle size

2-6. Horn

(a) Visualization device

Of the total measurement time of 38 seconds, 0 confirmed droplets were recorded.

(b) Particle measuring device: No recognizable change in the numerical values.

2-7. Tuba

(a) Visualization device

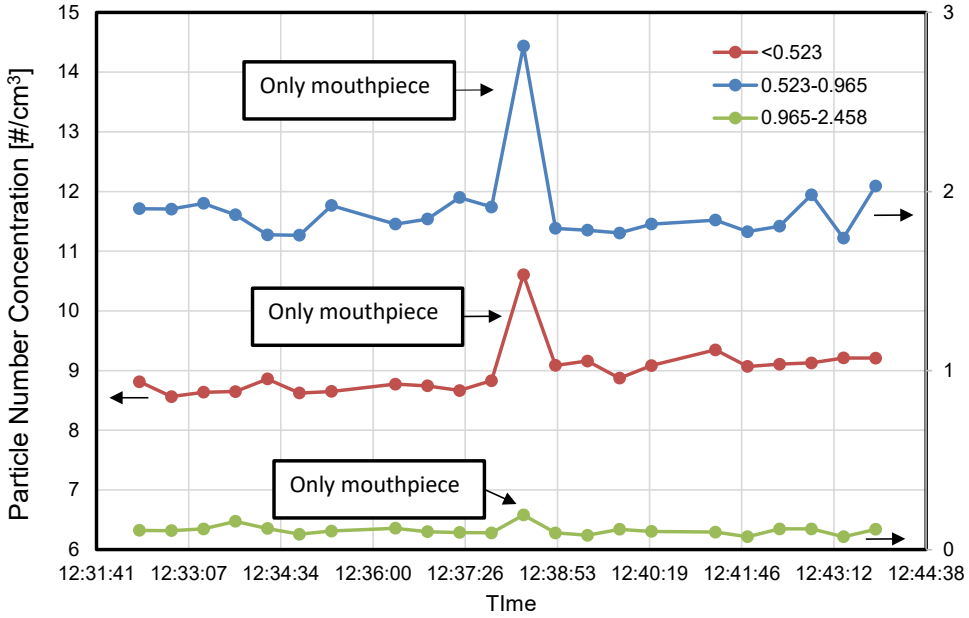
Only the mouthpiece was measured for a total of 5 seconds, confirmed droplets were recorded 2 times.

The entire instrument was measured for a total of 19 seconds, 0 confirmed droplets were recorded.

While the blown mouthpiece itself was being measured, clear droplets were identified; however, no recognizable droplets were found when the instrument was played.

(b) Particle measuring device

When the blown mouthpiece only was placed close to the air suction port of the measuring instrument, the 0.5-1 μm and 1-2 μm particles both increased slightly.



Graph. Changes in atmospheric particle count while playing the tuba

2-8. Trombone

(a) Visualization device

Of the total measurement time of 32 seconds, 10 confirmed droplets were recorded.

Had the largest number of droplets out of the instruments. This can be thought that the movable parts located next to the tube may allow droplets to escape.

(b) Particle measuring device

During the 5 minutes the instrument was played, there was one time where the particle count clearly increased; however, it was difficult to distinguish whether or not that was from playing the trombone.

2-9. Flute

(a) Visualization device

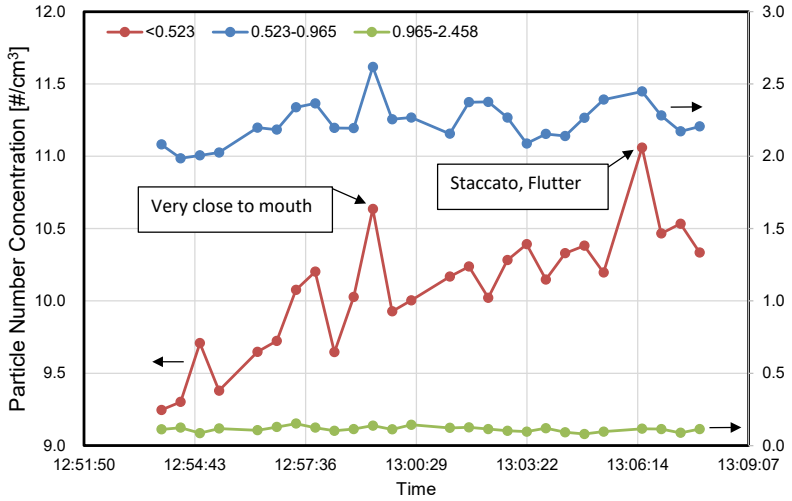
Of the total measurement time of 17 seconds, 8 confirmed droplets were recorded.

Had the greatest number of confirmed droplets out of all instruments tested.

(b) Particle measuring device

During the 10 minutes of playing with normal technique, when the air suction port

was placed 10 cm distance from the mouth, it seemed as though the 0.5-1 μm particle number increased. Afterward, no recognizable droplets were recorded; however, when other techniques such as the staccato and flutter were being played, the 0.5 μm particle count seemed to have increased.



Graph: Changes in atmospheric particle count while playing the flute

2-10. Piccolo

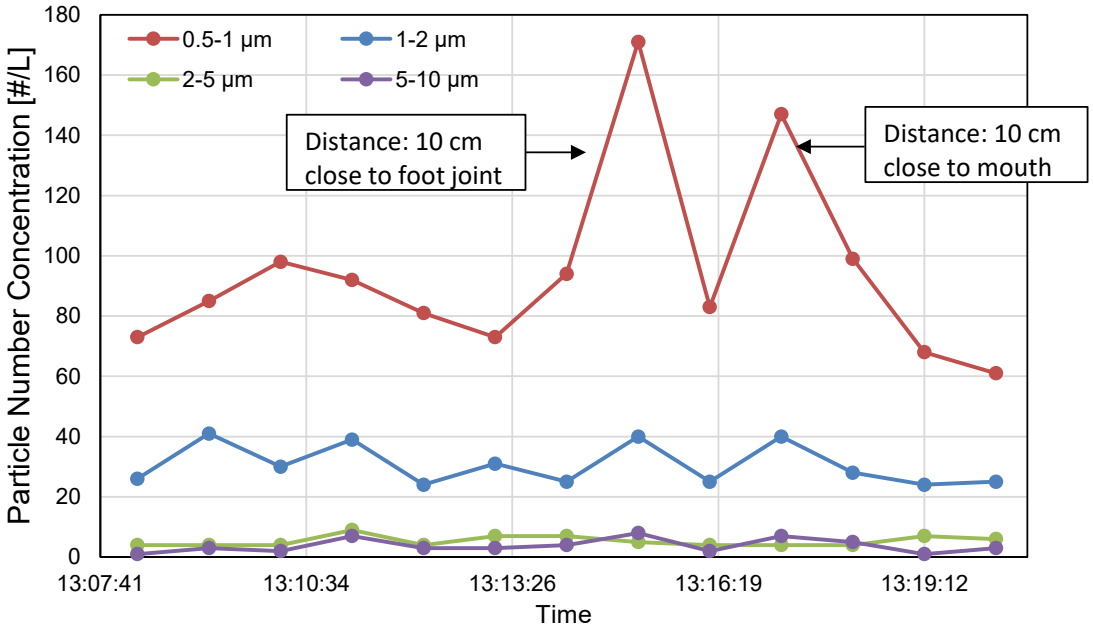
(a) Visualization device

Of the total measurement time of 6 seconds, 0 confirmed droplets were recorded.

The playing method is similar to that of the flute; however, no clear emissions of droplets were recorded this time.

(b) Particle measuring device

During the 5 minute playing time, various styles such as normal playing and the staccato were tested, but no recognizable changes in numerical values were observed by OPC. However, the peaks of 0.5-1 μm particle number were detected by OPS. (This part has been added on July 13th).



Graph: Changes in atmospheric particle count while playing the piccolo

2-11. Bassoon

(a) Visualization device

Of the total measurement time of 23 seconds, 0 confirmed droplets were recorded.

(b) Particle measuring device: No recognizable changes in numerical values were observed.

2-12. Clarinet

(a) Visualization device

Of the total measurement time of 23 seconds, 4 confirmed droplets were recorded.

A few droplets were detected from the tip of the bell.

(b) Particle measuring device: No recognizable changes in numerical values were observed.

2-13. Bass Clarinet

(a) Visualization device

Of the total measurement time of 13 seconds, confirmed droplet was recorded 1 time.

When a key was being pressed, small number of droplets being released was observed.

(b) Particle measuring device: No recognizable changes in numerical values were observed.

2-14. Measurement of droplets emitted during stage ensemble

(a) Visualization device: No clear droplets were observed.

(b) Particle measuring device: No recognizable changes in numerical values were observed.

2-15. Measurements of droplets traveled to the front seat

(a) The visualization of droplets did not take place.

(b) Particle measuring device: No recognizable changes in numerical values were observed.

Regarding 2-14 and 2-15, meaningful data was not obtained due to the fact that the air suction rate of the measuring instrument was too small in comparison to the room size.

3. Other/points of caution

As is evident to wind instrument players, and as mentioned in theoretical discussion, it is considered that while playing a wind instrument, most of the droplets emitted from the mouth accumulate inside of the instrument. **From the viewpoint of disease infection control, it is more important to properly treat the condensed water containing droplets emitted from mouth accumulated in the instrument rather than the droplets and particles released into the air during a performance. Additionally, note that blowing air through a mouthpiece releases more droplets than playing the instrument itself, so caution must be taken. If it is assumed that classical concerts take place in large spaces, it is thought that the risk of infection is not high during the performance, but**

rather that more caution should be taken during events before and after it. Moreover, small particles remain in space for a long time after being released; thus, it is increasingly important to monitor the ventilation status of the space. Lastly, although the data presented in this report are experimental facts, the opinions and theoretical considerations were written based on the knowledge as of 2020/6/23. Note that it is possible for opinions to change due to the addition of knowledge and information in the future.

■ References

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Maestro Kazushi Ono, the Tokyo Metropolitan Symphony Orchestra, Tokyo Bunka Kaikan, many more people were involved during this measurement campaign. Much corporation has been received regarding the visualization of droplets from Mr. Fujimura and Mr. Kobayashi of Kato Koken Co., Ltd.; in addition to Dr. Ayumi Iwata, Research Associate of Faculty of Science and Technology at Keio University, and 4th year undergraduate students, Mr. Hibiki Saito, and Ms. Yukimi Shinke who helped with the particle measurement. Ms. Jetisha Airi Edwards was involved in translation of this report. Thank you for the cooperation.

Document 3: Summary of the proceedings of the meeting held after the trial performances

Tokyo Metropolitan Symphony Orchestra/ Tokyo Bunka Kaikan
Trial performances in preparation for the resumption of concerts under the influence of COVID-19 (novel coronavirus)

Summary of the proceedings of the meeting held after the trial performances

Date and time: 3:45 p.m. – 4:45 p.m., Friday, June 12, 2020
Venue: Rehearsal room A, Tokyo Bunka Kaikan
Participants:

(Tokyo Metropolitan Symphony Orchestra)	Kazushi ONO (Music Director), Tatsuya YABE (Solo-concertmaster), Tomoshige YAMAMOTO (Concertmaster), Tomoyuki HIROTA (Principal Oboe), Yoshihiro ANDO (Principal Timpani & Percussion), Ryosuke MORIYAMA (Violoncello), Yasuo HAYASHI (Viola), Tomohiro NAITO (Trumpet), Takashi ONO (Manasing Director), Tetsuki KUNISHIO (Director of Artistic Planning)
(Tokyo Bunka Kaikan)	Kumiko HAYASHI (Deputy Director), Akinori OHASHI (Sales Promotion Section Manager), Naoko KAJI (Business Planning Section Manager)
(Other)	Koichi IRIYAMA (The Council for the Management and Promotion of Classical Music Performances)
(Experts)	Tomoaki OKUDA (Professor, Faculty of Science and Technology, Keio University) Kimihiko MASUDA (Community Medicine Coordination Manager/ Medical Director, Center for Pulmonary Diseases, National Hospital Organization Tokyo National Hospital) Hirokazu KAWASE (Professor, Department of Paediatric Surgery, St. Marianna University School of Medicine/ General Manager, Hospital Management Office) Hideki KOMATSUZAKI (Director, Komatsuzaki Clinic/ visiting lecturer, Sophia University)

(Titles omitted)

Aerosol spray from the performers

- Numerical analysis remains to be carried out, but my impression was that particles did not fly as far as I thought they would.
- I had heard that playing the flute requires breathing hard, but there was no large volume of spray emitted.
- Singers do emit aerosol droplets, but my impression is that most are large particles which fall to the ground.
- There was no great difference in the numbers seen on stage, at least based on measurements taken right in front of the wind instruments and right behind the strings. Even if the performers were moved a little closer together, I do not think the numbers would change much. I think it would basically be the same even if performers were on a tiered stage.

Physicians' opinions on the distance between performers

- It seems that European guidelines call for 1.5 m or 1 m, but I think that it would probably be OK to start with the performers in their usual positions.
- Doctors examine outpatients at a distance of less than 1 m. However, as long as we make sure to wear masks and to wash our hands and sanitize with alcohol after we finish examining each patient, it is not so easy to become infected.
- As long as orchestra members keep the same kind of rules, such as washing your hands when you enter the rehearsal venue, I think that you could probably restart your activities.
- Where it is possible to maintain a distance, it is best to do so; but basically, if you remain 1 m apart, you can prevent infection. Rather, it is the usual infection prevention measures, such as handwashing and checking temperatures, which are important.
- On the other hand, singers emit a relatively large volume of spray. Infectious disease medicine tells us that this spray basically travels 2 m, so in order to be on the safe side, we should remain at twice this distance. I think that this helps us to understand how far away from the stage we should position the audience's seats.

The wearing of masks by performers

- Of course, there is nothing better than wearing a mask, but I think it should be OK to remove it at the time of the performance.
- Rather, you should take care during casual conversations in common rooms, or while you are eating.

Ventilation of the hall and infection prevention measures

- We weren't able to take measurements this time, but I felt that it would be difficult for an infectious disease to spread in a large hall. It is important to find out how the air flows.
- It is best to start from the premise that people who look unwell or seem to be carrying the virus will not come inside. E.g. install thermographic equipment.
- It might also be safest to know the contact details of the person in each seat, just in case an infected person was there.

The conditions in rehearsal room

- There are large air vents, and the room is very large in terms of both floor area and volume, so there is no problem.
- It might be necessary to check the air flow.
- As long as you are a bit more thorough than usual with infection prevention measures, such as wearing masks during practices as a basic rule, it's fine.
- Even if it is smaller than the hall, it's not as though you are performing shoulder to shoulder.
- I am worried instead about break times in the lobby. In the hospital, we tell people not to face each other in the cafeteria, and not to chat to each other.

Condensation on the wind instruments

- If an infected person were to play, there would be a risk of infection through contact with the condensation.
- It is necessary to make sure that the absorbent sheets are thrown away, as you did this time.

PCR testing

- PCR tests are not conclusive.
- During rehearsals, the conductor sometimes addresses the orchestra members in a loud voice. We might think, for example, about having just the conductor take a PCR test, for the sake of reassuring the orchestra members.