

# DYNAMICS OF PARK USERS DURING COVID-19 PANDEMIC: A CASE STUDY OF SHIKISHIMA PARK IN MAEBASHI

\*Xingyu Tao<sup>1</sup>, Shinya Tsukada<sup>2</sup>, Tetsuo Morita<sup>1</sup> and Toshikazu Nishio<sup>3</sup>

<sup>1</sup>Maebashi Institute of Technology, Japan; <sup>2</sup>Maebashi City Municipality, Japan; <sup>3</sup>Maebashi Technical High School, Japan

\*Corresponding Author, Received: 07 Feb 2021, Revised: 27 April 2022, Accepted: 28 May 2022

**ABSTRACT:** In this study, Shikishima Park in Maebashi, Gunma Prefecture, was used as a research case to investigate the dynamics of park users during the COVID-19 pandemic. In this study, we analyzed user traffic measured by cameras installed in the parking lot of Shikishima Park. User behavior during each infection period was analyzed, and it was demonstrated that the number of users increased during the second wave period even after the infection spread. The results of were considered. (1) COVID-19 restricted the use of indoor dense spaces in recreational facilities, which was considered to be one of the reasons why Shikishima Park, which is an outdoor open space, was preferred and the number of park users increased. (2) It is thought that the number of park users has increased because the residential environment surrounding Shikishima Park is not as dense as the park shown in the case of Tokyo. (3) The coverage of his COVID-19 infection by Gunma Prefecture and the Jomo Shimbun did not directly affect the increase or decrease in the number of park users.

*Keywords: COVID-19, Shikishima Park, Number of users, Observation survey, Infection and impact of press*

## 1. INTRODUCTION

The novel coronavirus (COVID-19), reported in Wuhan City, Hubei Province, China, in December 2019, has spread worldwide and has not subsided to date. The infection has rapidly spread in Japan after the first infection was reported in January 2020. In April 2020, a state of emergency was issued owing to the spread of COVID-19; it was requested to refrain from unnecessarily going out. It is presumed that the spread of this infectious disease has considerably changed the lifestyles and behavior patterns of people. Therefore, it is possible that the usage pattern of the park, which is a familiar green open space, will change. This study provides an archive of the actual use of parks in local cities during the COVID-19 pandemic [1].

## 2. RESEARCH SIGNIFICANCE

### 2.1 Previous Research on Parks During the COVID-19 Pandemic

The national and local governments took measures against the infectious COVID-19 disease via press conferences and websites with the spread of infection. Hiroi demonstrated that despite the state of emergency in April 2020 reducing the trips for commuting purposes, it made little change in trips for meals and sightseeing purposes [2]. Moreover, Li et al. demonstrated a positive correlation between the risk perception for coronavirus infection and the degree of countermeasure implementation [3]. Furthermore,

Moriwaki et al. analyzed an opinion survey conducted in November 2020 and concluded that a decrease in life satisfaction was reported by multiple respondents. The cause was a decrease in the frequency of going out [4]. Under these circumstances, it is meaningful to know how the use of parks has changed for determining the future of parks. To date, many studies have focused on the COVID-19 pandemic and park use. Takeyama et al. analyzed the actual number of park users during the period of infectious disease control implemented by Hyogo Prefecture and other periods using Big Data obtained from the location information of smartphones [5]. Takeuchi et al. analyzed the actual usage of large-scale parks in Tokyo by performing hearing surveys and determining the number of park users using line census data [6]. Hashimura et al. clarified the relationship between preschoolers and their mothers' use of parks and child-rearing stress under the COVID-19 pandemic using a questionnaire survey in Tokyo [7]. Osamura et al. performed a questionnaire survey of university students in Tokyo to understand sports implementation and usage of space changes during the COVID-19 expansion period [8].

### 2.2 Purpose of the Study

These studies were conducted in the parks of large cities such as Tokyo and Hyogo Prefectures. However, not many studies have been conducted in local cities such as Gunma Prefecture. Therefore, the originality of this study is to capture the traffic dynamics of COVID-19 by determining the traffic

volume of park users by constant observation surveys in Maebashi City, Gunma Prefecture. The studied location is shown in Fig.1. Herein, we observe changes in pedestrian traffic volume in city parks during the COVID-19 expansion period in local cities. The purpose of this study was to obtain basic materials useful for archiving the actual state of park use under the COVID-19 pandemic, thereby helping the park management plan of the “With Corona era.”

### 3. RESEARCH METHOD

This study provides an archive of the actual use of parks in local cities during the COVID-19 pandemic. In this study, cameras were set up in the parking lots of urban parks in Gunma Prefecture to determine the number of people using the parks and those wearing masks. We then analyzed the relationship between the number of park users, number of PCR tests, and number of park users and newspaper reports related to COVID-19. The survey target of the study, facilities of the park, and study procedure are presented as follows.

#### 3.1 Subject of the Study

Maebashi City has been the prefectural capital of Gunma Prefecture. Maebashi has a population of 334,204 with 152,466 households (as of June 30, 2021). The population distribution of Maebashi City by occupation is 1.2% for agriculture and forestry, 21.9% for industries, and 76.9% for services. The citizens of Maebashi City have maintained a great relationship between water resources and greenery [9]. Moreover, Maebashi citizens are interested in park management [10].

There are 425 city parks in Maebashi City,

Gunma Prefecture, with 395.78 ha, which translates to 11.8 m<sup>2</sup> in terms of park area per capita.

There are two large-scale parks in Maebashi City, i.e., Maebashi and Shikishima Parks. Open garden activities were being conducted around Shikishima Park [11].

This study focused on Shikishima Park, the most well-known in a citizen questionnaire [12]. Shikishima Park is an athletic park (with an area of 36.6 ha) that serves as the backbone park of the city. The facility scale and contents are the same as those of Komazawa Olympic Park (area 41.1 ha, athletic park) in Tokyo, subject to previous research [5].



Fig.1 Location of Maebashi City, Gunma Prefecture

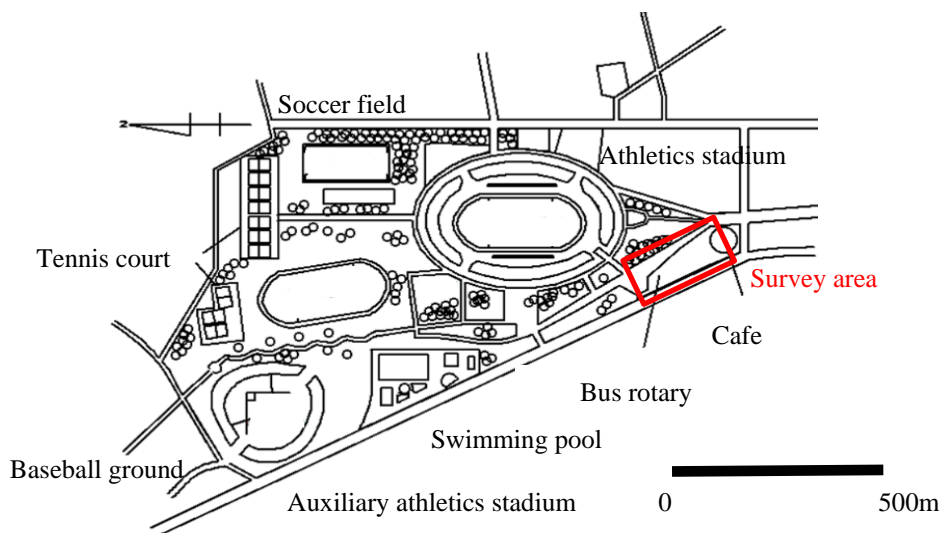


Fig.2 Facility overview of Shikishim Park

Understanding the COVID-19 measures as per the Gunma Prefecture website Counting the COVID-19 coverage using the Jomo News website
Capturing changes in the traffic volume in Shikishima Park during the COVID-19 pandemic with still images captured using a camera.
Relationship between the number of PCR-positive people and number of pedestrians Relationship between the number of PCR-positive people and mask-wearing rate
Relationship between the COVID-19 measures and number of park users in Gunma Prefecture Relationship between the COVID-19 measures and number of park users in Gunma Prefecture
Consider the actual traffic conditions of the Shikishima park users and impact on the surrounding environment

Fig.3 Research procedures

### 3.2 Facilities of Shikishima Park

Shikishima Park is a city park having a long history established in 1922 by the Maebashi City Council as a park around a river site known as Koidegawara. It is an athletic park located ~3 km northwest of the center of Maebashi City, bordering the Tone River on the west side. Full-scale athletic facilities, such as a baseball field and 400-m track and field stadium, have been installed at this location. Gunma Prefecture manages the park facilities (Fig.2).

### 3.3 Procedure of the Study

This study was conducted as follows (Fig.3).

First, the countermeasures and media coverage of the COVID-19 pandemic were determined using the websites of Gunma Prefecture [13] and Jomo Shimbun [14]. Second, we captured the changes in the traffic volume in Shikishima Park during the COVID-19 pandemic with still images using the camera. The survey was conducted on a record of the cross-sectional traffic volume of park users by installing a camera in the parking lot of Shikishima Park. Finally. It's impact on the surrounding environment should be considered.

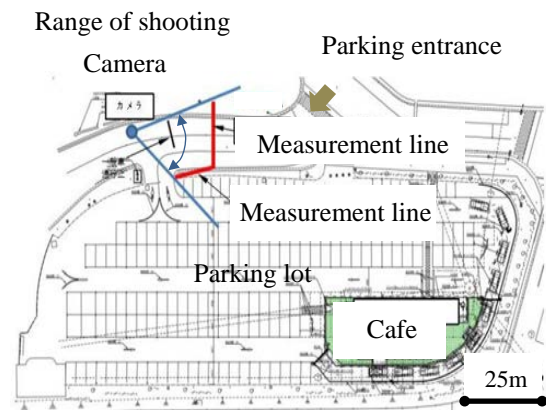


Fig.4 Survey point



Fig.5 Image of the survey location (shooting range from the camera, Fig.4)

Table 1 Summary of the survey

Investigation period	March 30, 2020–September 27, 2020
Survey method	Capture the changes in the traffic volume during the COVID-19 pandemic in still images captured using a camera
Totalization	(i) Hourly pedestrians, bicycles, and cars (ii) Mask-wearing status of pedestrians and cyclists

Fig.4 showed the location of the camera, its shooting range, and measurement lines in the parking lot of Shikishima Park, the survey point. The shooting range was approximately 60 degrees horizontally and within 25 meters lines from the camera. Differences could be observed depending on the surface on which the target pedestrians,

motorcycles, buses, and automobiles pass. Therefore, we measured two cross-sections, one (roads) for pedestrians, bicycles, and buses and the other (parking lot entrances and exits) for automobiles and motorcycles. We imaged pedestrians, bicycles, buses, cars, and motorcycles entering the shooting area by installing an automatic measurement camera.

Fig.5 showed images taken from an automatic measurement camera set at the survey point. We were able to identify moving pedestrians, buses, cars, and motorcycles or vehicles at our survey points. It was verified whether the camera could capture the cross-sectional traffic volume in the captured still images. Furthermore, capturing the mask-wearing situation in the still images was possible.

We attempted to determine the age of park users and whether they were wearing masks by verifying the captured images. However, determining an individual's age wearing a mask was difficult. Table 1 shows the summary of the survey. We hypothesized that the use of the park under the COVID-19 pandemic was influenced by three factors: the infection situation, government measures, and press. In this study, the traffic volume was defined as the number of pedestrians and number of park facility users. In addition to the traffic volume of pedestrians and bicycles, the wearing status of masks was tabulated. During the research, the analysis period was set as follows.

In Japan, the “first wave” of the COVID-19

pandemic was from mid-March to mid-May 2020 (red line in each figure). Furthermore, the “second wave” was from late June to September 2020 (yellow line in the later figures).

In this study, the analysis period was set from March 30 to September 30, 2020, including the first, second, and third waves (blue line in the later figures).

#### 4. RESULTS AND DISCUSSIONS OF SHIKISHIMA PARK DURING THE COVID-19 PANDEMIC

##### 4.1 Relationship Between the Number of PCR-Positive People and Number of Pedestrians in Shikishima Park

We surveyed the usage of Shikishima Park. The results of this survey were analyzed as follows. The relationship between the number of PCR-positive people (Japan) on the X-axis and the number of pedestrians in the park observed by using the camera on the Y-axis was analyzed (Fig. 6). From the figure, the relationship between the number of PCR-positive people and number of pedestrians demonstrated that the number of pedestrians increased from July to August when the second wave of infection spread.

##### 4.2 Relationship Between the Number of PCR-Positive People and Mask-Wearing Rate in Shikishima Park

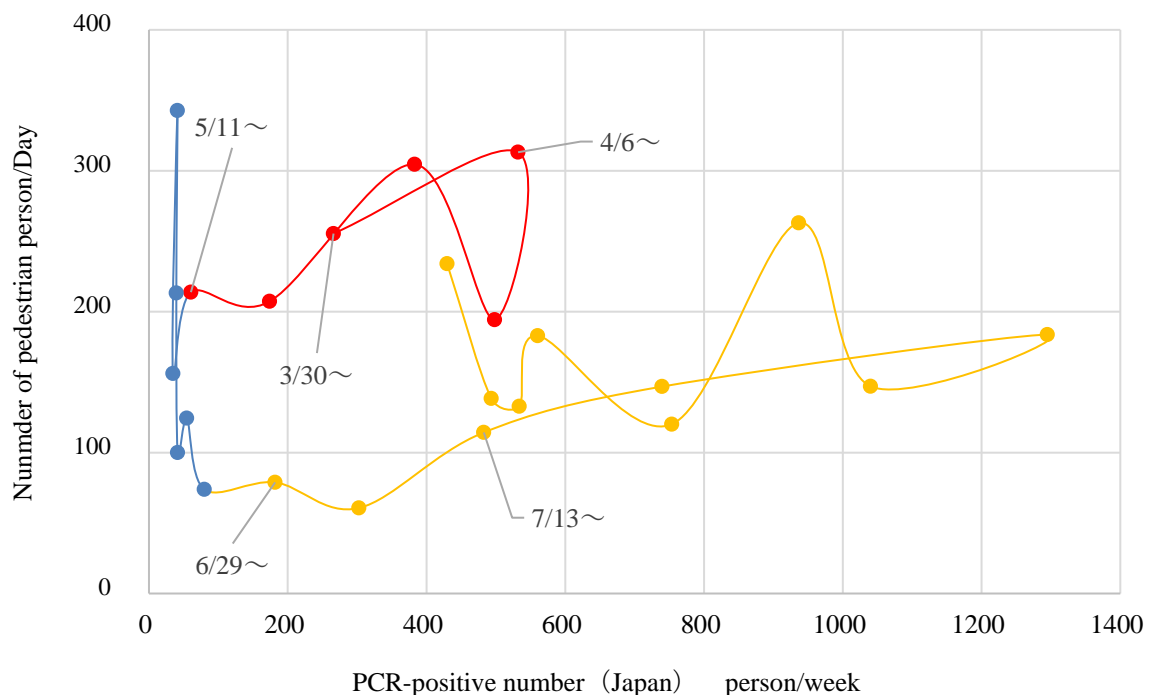


Fig.6 Relationship between the number of PCR-positive people and number of pedestrians in the park

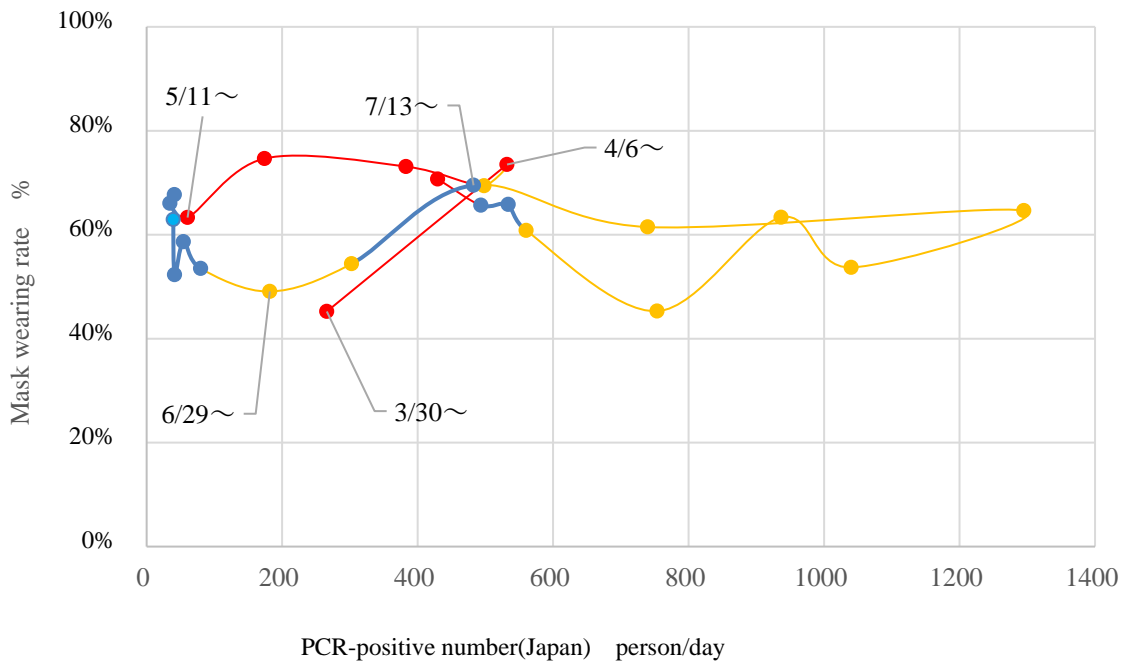


Fig.7 Relationship between the number of PCR-positive people and mask-wearing rate

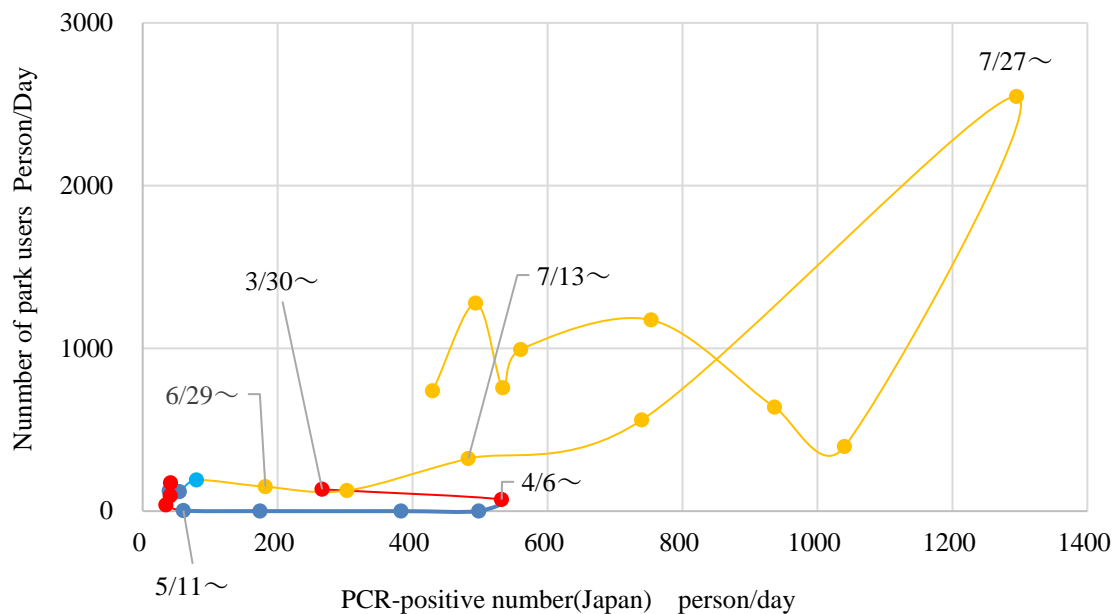


Fig.8 Relationship between the number of PCR-positive people and number of users in the park

The relationship between the number of PCR-positive people (Japan) on the X-axis and the mask-wearing rate of pedestrians on the Y-axis was analyzed (Fig. 7).

From the figure, in terms of the relationship between the number of PCR-positive people (Japan) and mask-wearing rate of pedestrians, the mask-wearing rate of pedestrians increased from March to early April in the first wave period.

Then, it reduced after the cancellation of the state of emergency on May 13. Furthermore, it was flat during the second wave period of infection spread.

#### 4.3 Relationship Between the Number of PCR-Positive People and Number of Park Users in Shikishima Park

The relationship between the number of PCR-positive people (Japan) on the X-axis and the number of users in the park observed by using the camera on the Y-axis was analyzed (Fig.8).

In terms of the relationship between the number of PCR-test positives and number of park users, although the infection spread in the second wave, the number of park facility users increased from July to August.

Therefore, despite the spread of infection in the second wave, the number of park users increased from July to August because many people used the park during the summer vacation.

The pedestrian mask-wearing rate increased from March to early April during the first wave; however, with the termination of the state of emergency on May 13, the mask-wearing rate of pedestrians decreased.

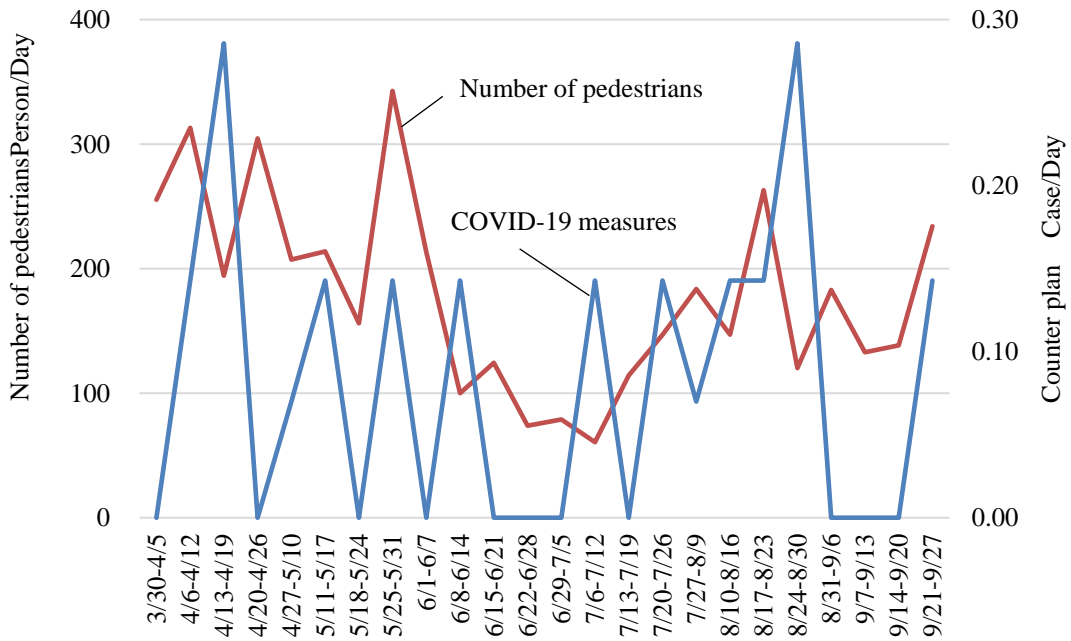


Fig.9 Relationship between the COVID-19 measures in Gunma Prefecture and number of users in the park

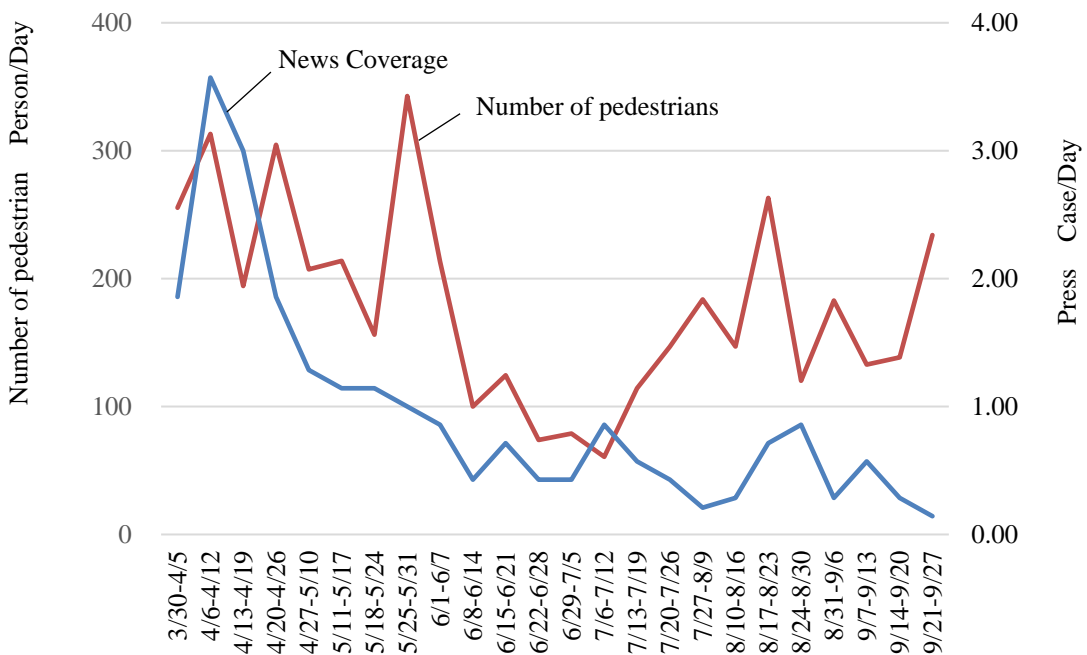


Fig.10 Relationship between the news coverage by Jomo News and number of users in the park

Moreover, the mask-wearing rate of pedestrians remained at approximately the same level after the end of June, which was the period of the second wave of infection.

## **5. RELATIONSHIP BETWEEN THE SURROUNDING ENVIRONMENT AND PARK USERS**

### **5.1 Relationship Between the COVID-19 Measures in Gunma Prefecture and Number of Users in Shikishima Park**

Fig. 9 shows the relationship between the number of measures obtained by Gunma Prefecture as well as number of pedestrians [13].

The number of COVID-19 pandemic countermeasures issued by Gunma Prefecture was primarily of three types: “Declaration,” “Request,” and “Policy.” In terms of measures taken by the Gunma Prefecture, we searched the “Gunma Prefecture Homepage” on the Internet. We then extracted it from the “Summary of Coronavirus Infectious Diseases” page.

Furthermore, measures against the COVID-19 pandemic taken by Maebashi City were not included in the number of extractions because they were included in the measures taken by Gunma Prefecture. There are “state of emergency,” “request for self-restraint,” and “policy to prevent the spread of COVID-19”; each of these extracted items are counted as one case. Gunma Prefecture took measures during each of the first and second waves of infection; however, during the Golden Week holidays in May, the number of pedestrians around the park increased.

### **5.2 Relationship Between the News Coverage by Jomo News and Number of Users in Shikishima Park**

The relationship between the number of pedestrians and number of news articles on COVID-19 by the Jomo Shimbun, a local newspaper in Gunma Prefecture is shown in Fig. 10. To extract news articles, we searched the local newspaper “Jomo Shimbun” in Gunma Prefecture on the Internet, opened the homepage, and entered “Gunma Corona” in the search box [14]. The number of studies on COVID-19 in the Jomo Shimbun during the second wave period was decreasing. However, the number of pedestrians increased during this period.

## **6. CONCLUSIONS**

This study used an observation camera to examine the actual traffic conditions of park users

considering Shikishima Park in Maebashi City as an example. The results of this study are as follows.

We analyzed the walking behavior of pedestrians in city parks during the COVID-19 pandemic. The number of Komazawa Olympic Park users, which has a similar scale and facilities to those of Shikishima Park, significantly decreased in May and continued to decrease after June (previous study [2]).

However, during the second wave of the infection, the number of pedestrians the number of pedestrians in Shikishima Park increased despite the spread of COVID-19. The number of pedestrians and users of the park increased during the Golden Week holidays in May and from July to August because many people use the park on long holidays such as a summer vacation. Furthermore, the pedestrian mask-wearing rate decreased with the cancellation of the state of emergency on May 13. Thereafter, the pedestrian mask-wearing rate was stable after the second wave at 60%–80%. Therefore, pedestrians have become accustomed to wearing masks after the second wave of COVID-19.

Furthermore, to understand the impact of information management on park users, we analyzed the announcement of measures against the COVID-19 disease in Gunma Prefecture and the coverage of the Jomo Newspaper. Because of this analysis, the measures taken by Gunma Prefecture and the coverage of COVID-19-related news by the Jomo Shimbun increased during the first and second wave. However, despite measures taken in Gunma Prefecture and newspaper reports, the number of pedestrians around the park tended to increase during the Golden Week holidays in May.

From the results of this study, the following were considered. Compared with the results shown in the previous studies [2] using parks in Tokyo as an example, the following backgrounds were considered. 1. COVID-19 restricted the use of indoor dense spaces in recreational facilities, which was considered to be one of the reasons why Shikishima Park, which is an outdoor open space, was preferred and the number of park users increased. 2. It is thought that the number of park users has increased because the residential environment surrounding Shikishima Park is not as dense as the park shown in the case of Tokyo.

3. The coverage of his COVID-19 infection by Gunma Prefecture and the Jomo Shimbun did not directly affect the increase or decrease in the number of park users.

## **7. NEXT STUDY THEME**

In order to verify the above considerations 1 to 3, it is a future task to compare COVID-19 infection

with other recreational facilities. It is also an issue to make a comparison by grasping the actual situation of park use between regions and to perform a detailed analysis of the content of the report.

In the use of parks after COVID-19, the time will come when we will consider equalizing the use of parks. It is effective for us to think about the park usage plan while determining the actual conditions of the park access and usage.

In future, it will be necessary to conduct a more detailed analysis and understand the usage status of the park concerning other urban facilities.

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