

# The Impact of COVID-19 on Research Productivity of Postgraduate Students in Japan: Based on the Cross-Sectional Survey

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## Abstract

Globally the students' life and study have been affected by the Coronavirus disease 2019 (COVID-19). This study aims to explore the current report and seeks to explore how the Pandemic impacted doctoral students' research productivity in Japan by examining the following research questions: How have Covid-19 and the related measures impacted the postgraduate students' research productivity, and research engagement time, delay graduation in Japan? And how has Covid-19 impacted their research activities specifically, including conference participation, research meeting, attending lectures, entering laboratories, using the library, conducting outdoor surveys, international exchanges, and delayed graduation? A sample of 5091 Japanese doctoral students completed an online survey including measures for the perceived impact on research productivity, completion of graduation degree, the changes in research engagement time, and research output during the COVID-19 pandemic. 50% of doctoral students on average said that COVID-19 and its response affected the research productivity as a whole temporarily, and the impact on research productivity was acceptable. One-fifth of them reported that their research time has decreased to 80%. More than 60% of doctoral students reported that they expected it would take a longer time to complete their degrees. More than two-thirds of the students reported that visiting certain countries and regions (69%) and invitations from certain countries and regions (60%) are still an unacceptable impact on research productivity. Based on these results, several policy implications are discussed to help graduate students adapt to recent university changes.

## Keywords

COVID-19, Postgraduate Students, Research Productivity, Japan

## 1. Introduction

All over the world, the coronavirus disease 2019 (COVID-19) pandemic has caused a significant loss of life and threatened the recent advances in health and progress towards global development (Onyeaka et al., 2021). According to the World Health Organization (WHO), the COVID-19 pandemic is causing significant loss of life, disrupting livelihoods, and threatening the recent advances in health and progress towards global development. In education, additionally, the COVID-19 pandemic has significantly impacted the students' life and study globally, the pandemic swept the world in 2020, interrupting schooling for more than 1.6 billion learners at its peak (UNESCO, 2022). To track education delivery, timely and reliable data and information are needed to assess the impact of school closures during a pandemic, and this study can then be used to help countries develop strategies and response plans so that they can more successfully mitigate negative impacts. With a severe impact on higher education as universities closed their premises and countries shut their borders in response to lockdown measures (Mannah-Blankson & Asiseh, 2021), including impacts on students' academic experiences and health shocks. Due to the coronavirus outbreak, many countries are facing a dramatic situation in terms of higher education, and the closure of university campuses is affecting many students all over the world, with face-to-face classes suspended (Tang et al., 2021).

According to the UNESCO-UNICEF-World Bank collaborative survey on National Education Responses to COVID-19 School Closures, 20% of students in East Asia and the Asia-Pacific subregion, and 38% of students in South Asia who were forced to stay home due to school closures, did not have access to any form of remote learning during school closures (UNESCO, 2022), and among the 46 countries of the Asia-Pacific, almost two-thirds developed online teaching and learning programs (UNESCO, 2021).

In Japan, the first case of COVID-19 was confirmed in Japan in January 2020 (Amengual & Atsumi, 2021), and the government of Japan has issued a State of Emergency on April 7, 2020, which encouraged people in seven large cities, including Tokyo's metropolis, to stay at home and refrain from inter-prefectural travels and non-essential outings (Sugimoto et al., 2020). In November 2020, a new wave of Covid-19 swept Japan. Since then, the Japanese Government has taken an action and issued a second State of Emergency on January 7, 2021, in Tokyo, Kanagawa, Saitama, and Chiba Prefectures. A state of emergency declaration has given prefectural governors the legal authority to ask residents to cooperate with anti-coronavirus measures, the governors, the authority to close prefectural high schools and make requests regarding private schools and elementary and junior high schools, according to the NHK news in Japan (Nao, 2021). At present (April, 2022), the students can choose online learning or face-to-face learning at Japanese colleges and universities, but for graduate students and international graduate students, on line teaching is mainly adopted. The COVID-19 impact on the research output of Japanese universities and the

education of doctoral students has also been severe. Graduate students and researchers were also forced to stay at home online learning or conduct research activities. However, little research has examined the impact of COVID-19 on researchers' or graduate students' research productivity.

Given the remarkable achievements in research productivity in Japan, it is important to explore the Japanese experience of doctoral research production in the context of the epidemic. The current study seeks to show researchers an insight into how the duration of doctoral research, the acquisition of doctoral degrees, and other matters related to doctoral research activities have changed in the context of the epidemic. This study will benefit universities and research institutions involved in the training of doctoral students, government agencies responsible for doctoral education in each country, and researchers involved in graduate education. The results of this study may provide empirical evidence that will enable better implementation of graduate education during this critical period. Therefore, the current study seeks to explore how the Pandemic impacted the doctoral students' research productivity in Japan by examining the following research questions: How have COVID-19 and the related measures impacted the postgraduate students' research productivity, and research engagement time, delayed graduation? And how has COVID-19 impacted their research activities specifically, including conference participation, research meeting, attending lectures, entering laboratories, using the library, conducting outdoor surveys, international exchanges, and delayed graduation?

## **2. Method**

### **2.1. Data Source**

The data was derived from the 2020 national survey on the impact of response to the COVID-19 epidemic on research productivity carried out by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. The purpose of the cross-sectional survey series is to evaluate doctoral students' research productivity consequences of the COVID-19 pandemic in Japan, starting from May 2020. The second survey (Survey-2), in particular, aims to examine whether the graduate student's research productivity has impacted when the economy reopens and restrictions are loosened, and also to consider measures and policies to improve researchers' environment. Survey-2 was conducted three months after a provincial state of emergency was declared in Japan on March 17, 2020, as a result of high COVID-19 transmission rates in the first wave of the COVID-19 outbreak. Specifically, Survey-2 is an online national survey (Web Questionnaire Survey on Japan Graduates Database), conducted from May 25, 2021-June 14, 2021. The survey request was also emailed to all respondents, and responses were requested to answer the questionnaires. In addition, the survey request is written in both Japanese and English, and a web questionnaire. The final sample size of respondents is 5091 and the response rate is 20.8% of the survey. In this survey, the progress and achievements of research and develop-

ment are defined as research production, and the efficiency of producing research production is defined as “research productivity”. Impact of response to COVID-19 on research productivity was measured by multiple items (**Table 1**) asking respondents in Japan. The current study is based on the research report which was issued by the national institute of science and technology policy (齋藤経史, 浜岡一弘, 星野利彦, 2021). Further details about the study protocol can be found at <https://jgrad.nistep.go.jp/home.html>.

## 2.2. Ethical Considerations and Data Accessibility

The ethical approval was not required for the research involving secondary use of the national survey data. The current analyses are based solely on data published by the MEXT and researchers through the Japan Graduates Database (JGRAD), and are geared toward accessible public use by Japanese and global researchers. Data for public use are fully de-identified and made public through appropriate methods to protect their confidentiality. Therefore, data from the survey involving national survey on the impact of response to the COVID-19 epidemic on research productivity (2020), a study based on the MEXT and JGRAD, are considered non-human subject research and do not require institutional ethical review.

## 3. Results and Discussion

### 3.1. Impact on Research Productivity

In this survey, the progress and achievements of research and development are

**Table 1.** Survey categories and item information.

Survey Category	No. of Items	Item Format
Demographic	2	Single-choice & Open-ended question
General Impact of Response to Covid-19 on Research Productivity	11	Single-choice & Open-ended question
Research Environment	2	Multiple choice & Open-ended question
Research Engagement Time and Research Productivity	2	Single-choice
Delay Graduation	1	Single-choice
Commuting Frequency	2	Single-choice
Income Changes	2	Single-choice
Research Fund	4	Multiple-choice & Open-ended questions
Additional Thoughts	2	Open-ended questions

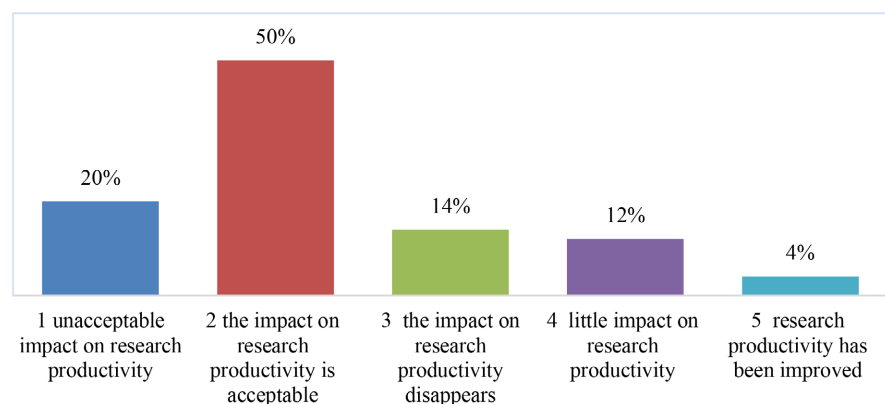
Source: Japan Graduates Database (JGRAD) survey. Note: JGRAD is the national database for collecting career information on doctoral human resources who have studied in the Ph.D. program in Japan. JGRAD, which has been in development since 2014, was established in May 2021, with 50 universities (36 national universities, 8 public universities, 6 private universities) has participated. (<https://jgrad.nistep.go.jp/home.html>).

defined as research production, and the efficiency of producing research production is defined as “research productivity”. Even if the change research content or method based on the same research production level, please consider the research productivity is the same. The impact of response to COVID-19 on research productivity was measured by a single item asking respondents: In January 2020, the COVID-19 was first confirmed in Japan. From January 2020 to now, how have COVID-19 and its response affected your research productivity as a whole? (Question 1) The 5-point response was then reversely grouped into 1) Even now, there is still an unacceptable impact on research productivity. 2) Though there was a temporary impact, the impact on research productivity is acceptable now. 3) Though there was a temporary impact, the impact on research productivity disappears now. 4) There has been little impact on research productivity from this factor since January 2020. 5) My research productivity has been improved by reducing commuting time, online tools, etc.

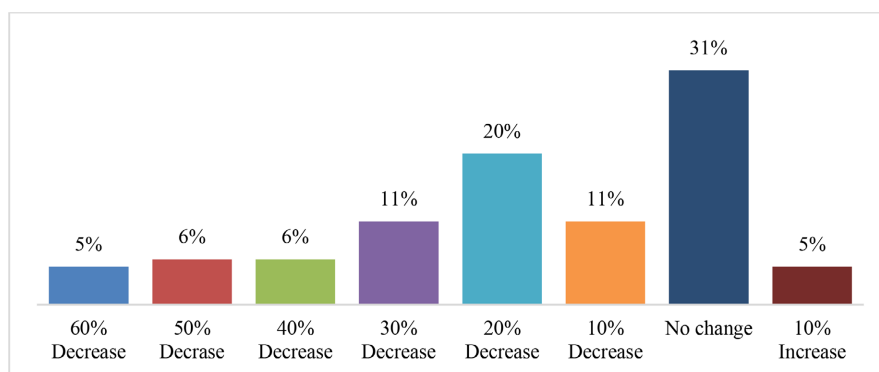
The percentage of responses to the question “How have the COVID-19 and its response affected your research productivity as a whole” of doctoral students shown in **Chart 1** is 50% of doctoral students on average, said that “Temporarily the impact of research productivity was acceptable by the time of response.” But there are 20% of them on average answered that is “still unacceptable to research productivity.

### 3.2. Change in Research Engagement Time

Assume that there were no COVID-19 epidemics and their responses, your research time would be 10. How much is your research time as an integral number with current COVID-19 epidemics and their response? If your research time decreases due to an increase in administrative work related to the COVID-19 epidemics and their responses, the number will decrease. On the other hand, if your research time increases due to a reduction in commuting time or online efficiency, the number will increase. The 10-point response was then reversely grouped into three levels to operationalize research time change (research time decreases = 4 or less, 5, 6, 7, 8, 9; Not change = 10; research time increases = 11, 12 or more).



**Chart 1.** Impact on research productivity.



**Chart 2.** Change in research engagement time.

As can be seen from **Chart 2**, more than one-third of the PH.D. candidate students (31%) said that their research time has not changed with the current COVID-19 epidemics and its response. And next one-fifth of them reported that their research time decreased by 20%. In addition, more than 10% of them believe that their research time had decreased by 30% and decreased by 10%, respectively.

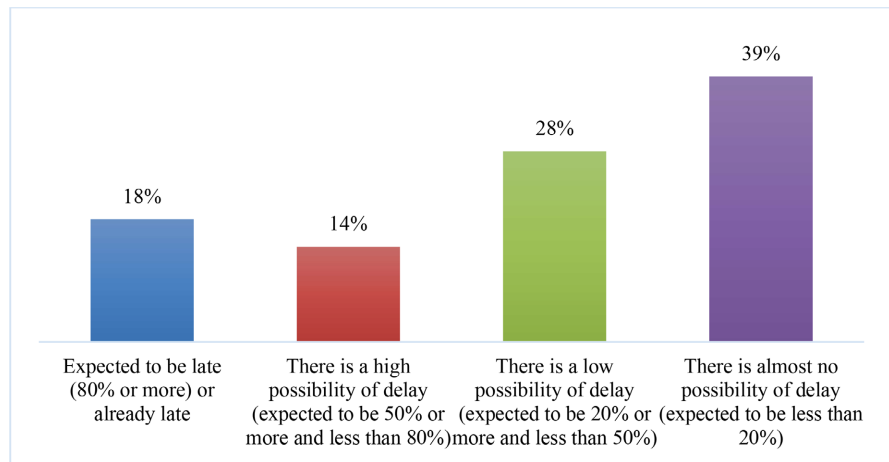
### 3.3. Delay Graduation

Do you think that there is a possibility that the COVID-19 epidemics and their responses will delay the completion of your Ph.D. degree? The 4-point response was then reversely grouped into two levels to delays in Degree Completion, 1) Expected to be late (80% or more) or already late 2) There is a high possibility of delay (expected to be 50% or more and less than 80%) 3) There is a low possibility of delay (expected to be 20% or more and less than 50%) 4) There is almost no possibility of delay (expected to be less than 20%).

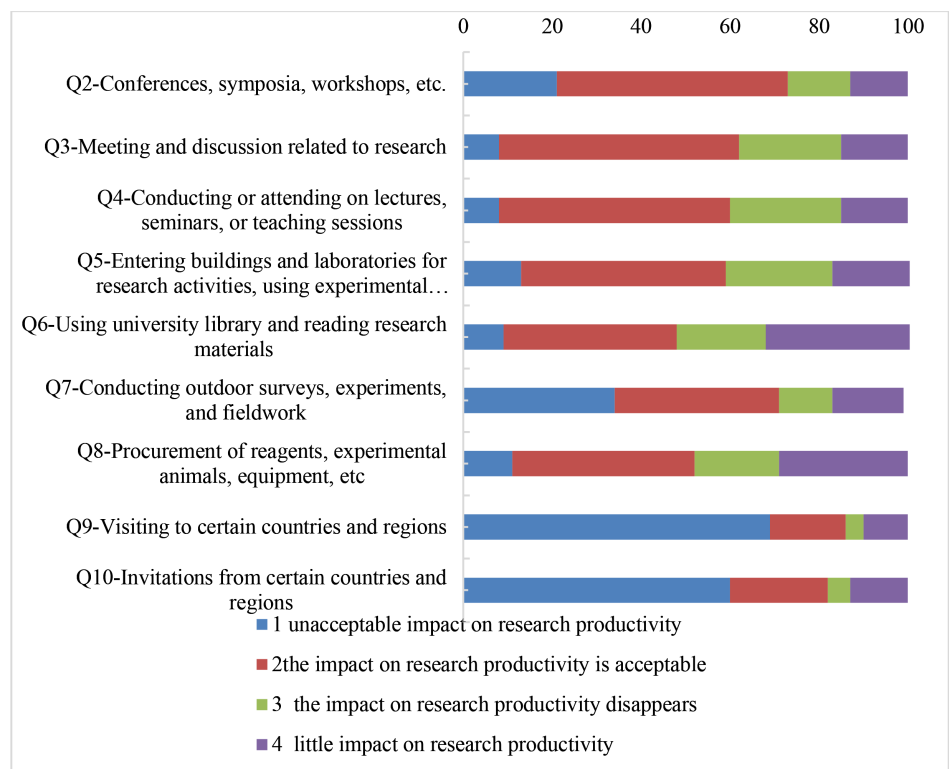
It can be seen in **Chart 3**, overall, 60% of doctoral students (18% + 14% + 28%) reported that they expected it would take a longer time to complete their degrees. And there is almost one-third of students (18% + 14%) answered that there is a high possibility (more than 50% probability) to be delayed their degrees. However, 39% of graduate students said that there is a low possibility or almost no possibility to take longer to complete their degrees.

### 3.4. Impact on Research Activities

How have the COVID-19 epidemics and their responses affected 9 factors of your research productivity, including from 2020 January to now? (Question 2 - 10) such as Conferences, symposia, workshops, etc.; meetings and discussions related to research; Conducting or attending lectures, seminars, or teaching sessions; Entering buildings and laboratories for research activities, using experimental equipment, etc.; Using university library and reading research materials; Conducting outdoor surveys, experiments, and fieldwork; Procurement of reagents, experimental animals, equipment, etc; Visiting certain countries and regions; Invitations from certain countries and regions. And the 4-point response



**Chart 3.** Delays in graduation.



**Chart 4.** Impact on research activities.

was then reversely grouped into 1) Even now, there is still an unacceptable impact on research productivity. 2) Though there was a temporary impact, the impact on research productivity is acceptable now. 3) Though there was a temporary impact, the impact on research productivity disappears now. 4) There has been little impact on research productivity from this factor since January 2020.

The percentage of responses in Question 2 - 10 “How have the COVID-19 and its response affected your research productivity” of doctoral students shown in **Chart 4** is 50% of doctoral students on average, said that the factors of “Conferences, symposia, workshops, etc.” (52%); “Meeting and discussion related to re-

search”(54%); “Q4-Conducting or attending on lectures, seminars, or teaching sessions”(52%); “Q5-Entering buildings and laboratories for research activities, using experimental equipment, etc.”(46%) are “Though there was a temporary impact, the impact on research productivity is acceptable now.” However, more than two-thirds of the students reported that “Visiting certain countries and regions” (69%) and “Invitations from certain countries and regions” (60%) are “Even now, there is still an unacceptable impact on research productivity”.

The present study examined the impact of the pandemic and its causal measures on the research productivity and research activities of Japanese doctoral students. The first question explored the levels of the COVID-19 and the related measures impacted the postgraduate students’ research productivity, and research engagement time, delayed graduation. Based on the above findings, about half of the PhD students reported that COVID-19 and its response temporarily affected overall research productivity, but overall, the impact on their research productivity was at an acceptable level. However, one fifth of them reported that receiving the impact of the outbreak reduced their research time to 80%. These findings indicate that a number of them believe that the epidemic has had an unavoidable negative impact on their research productivity and PhD attainment during their PhD. These findings are supported by a previous study that doctoral students were impacted by and responded to the academic, professional, and personal challenges created by the COVID-19 pandemic (Tang et al., 2021). The article has shown the impact of COVID-19 measures on the research environment and motivation of Japanese scientists during the current pandemic (Miki et al., 2020). Similarly, it was found that Filipino Graduate students experienced moderate to high levels of stress, fear, and anxiety related to COVID-19 (Bukko & Dhesi, 2021). Other previous articles reflected mental health as the second largest area of impact for online graduate-level students due to the pandemic (Holden & Brown, 2021; Patias et al., 2021). Contrary to expectation, we also find evidence that the pandemic improved some students’ perceptions of their research productivity.

The second research question focused on the levels of COVID-19 impacted their research activities specifically, including conference participation, research meeting, attending lectures, entering laboratories, using the library, conducting outdoor surveys, international exchanges, and delayed graduation? Based on the above results, we found that most of graduate students believe that international exchange activities, which are closely related to their doctoral research activities, have been seriously affected, and that these have directly or indirectly impacted their research productivity. This is supported by the wider survey findings, the previous survey showed that research associated work output during the pandemic decreased dramatically compared to the pre-COVID situation. Similarly, it was found that COVID-19 outbreak has disrupted the existing research mobility model (Gan, 2021). Additionally, in the coming years, researchers may be less willing or able to serve outside their home countries, which could deepen or

change the global disparity in scientific capacity (Myers et al., 2020).

#### 4. Recommendation and Conclusion

Based on this survey, the COVID-19 and the related measures had significantly impacted the Japanese doctoral students' research productivity, research engagement time, and research activities, including impacts on academic conference participation, research meeting, attending lectures, entering laboratories, using the library, conducting outdoor surveys, international exchanges, and graduation year. The survey showed that the Japanese doctoral students' research work output decreased dramatically compared to the pre-COVID19 situation. Doctorate students in particular lost the opportunity to make presentations at academic conferences or go overseas on exchange.

Although the Japanese government and universities have taken action to relieve the impact on education and the students, the reduction of research productivity is the reality. Factors associated with research productivity were individual-related factors, such as age, gender, motivation, self-efficacy, academic discipline, research design, access to resources, workload, mental health, and finances. (Aulawi, 2021; Donohue et al., 2021) Based on the findings and experiences, the current study offers some suggestions for university or college policymakers to help graduates to improve their research productivity and graduate successfully.

The universities may offer a supporting system to graduate students who may need extended time to complete their degrees, in addition to implementing the following initiatives to address both immediate and longer-term needs. For doctoral students, the supporting system includes financial support or supporting students with the greatest financial need and taking steps to ensure that all students can continue with their educational programs. In addition to the academic and daily disruptions of students' lives, many in the community are being impacted personally by the global pandemic. It would be possible to support graduate students who are at a high risk of mental illness and need help during the period of COVID-19. Kindness, patience, and empathy may be helpful as graduate students continue to navigate these challenging times.

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#### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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