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RESEARCH ARTICLE

Impact of Social Distancing on Research Activities: An online cross-sectional survey

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ABSTRACT

During the Coronavirus Disease 2019 (COVID-19) pandemic, many institutions enforced social distancing measures to limit or restrict access to offices, laboratories, and workplaces, disrupting the standard workflow of research. This survey investigates the impact of social distancing measures in universities and research institutes on research and research training. An online survey was designed for distribution to researchers and students worldwide to researchers in medical physics, engineering, science, clinical, arts and social studies. In addition to demographic questions, we surveyed the impact of social distancing in terms of research output, training activities, and mental health of the researchers and students. One hundred and thirty participants completed the survey, of which 72% of the respondents were from Malaysia, and 58% of the respondents were female. Prior to the pandemic, 59% worked in hospitals and universities. There was a variation in how strict social distancing was practised/enforced in different institutions, with 85% reporting limited or completely no access to laboratories or research facilities. A significant difference was found between genders, with female respondents reporting to be less affected by the social distancing measures. No correlation was found between age and the reported effect of social distancing research activities. The most affected research activities were research progress, presentation of results at conferences, and data collection. The pandemic also affected the respondents' mental health, reporting demotivation, feeling isolated, and losing focus on their work. Measures to alleviate the negative impact of COVID-19 suggested enhancing research and training, including improved communications, making research training more accessible, and adjusting administration, work and research goals.

Keywords: social distancing, COVID-19, pandemic, research impact, mental health

1. Introduction

During the Coronavirus Disease 2019 (COVID-19) pandemic, many countries were put on partial or complete lockdowns. Everyone was asked to practice social distancing as one of the measures to break the chain of infection (Dadras et al., 2021). The measures taken in different countries to break the transmission of COVID-19 differed by the method and extent of the implementation; from enforcing the use of masks and physical distancing to complete lockdown with stay-at-home orders and travel restrictions across borders. Workplaces implemented remote working schedules and online learning for schools. For universities and research institutes, many institutions enforced measures to limit or restrict access to offices, laboratories, and workplaces to achieve this. As we transition into the post-pandemic world, social distancing measures have been lifted in many countries.

However, it is crucial to understand the mechanism and impact of social distancing in research, so as to help the community prepare for future events of a pandemic or other unforeseen challenges. Implementing social distancing in universities and research institutes disrupts students' and staff's research and research training. Depending on the strictness level of social distancing practised by each institution or region, the impact may differ for the researchers and students. While social distancing was unavoidable during the pandemic, the impact of social distancing should be understood to enable measures to promote and sustain the growth of research during future difficult times.

Regarding social distancing, studies have highlighted the impact of social distancing on mental wellbeing (Abdelrahman et al., 2022; Cao et al., 2020; Marroquín et al., 2020; Odriozola-González et al., 2020; Peterson et al., 2021). However, data on the impact on research sustainability are still scarce (Bratan et al., 2021; Dong et al., 2022). Bratan et al. (2021) surveyed research investigators from selected funding programmes in Germany on the impact of the COVID-19 pandemic on ongoing health research projects. Their studies reflected the widespread impact of the pandemic, not specifically on social distancing. Dong et al. (2022) surveyed the perspective of postgraduate students involved in medical research in China. However, both studies were focused on medical research and limited to the social distancing practices of their countries. The impact of social distancing on a broader range of research and research training is still not yet well understood. The present study investigates how social distancing affects research in various fields, including medical physics, clinical, and engineering research. The impact on the research training, mentoring, and mental health was also evaluated.

2. Material & Methods

A cross-sectional online survey was designed for distribution to researchers and students worldwide from February to June 2021. The data for the study were collected and managed using the REDCap electronic data capture tool hosted at the Universiti Malaya (https://redcap.link/wvihx9eh). The survey was disseminated via email invitation, phone messages, and organisation email lists. Only those who consented were included in the study. In addition to demographic questions, we surveyed the impact of social distancing in terms of research output, training activities, and mental health of the researchers and students.

The survey tool used a mixed-method design, which comprised 19 multiple-choice and free answer questions. No personal data was collected, although demographic data such as country of residence,

age, study level, occupation, and research fields were collected. The survey questions are shown in Appendix Table A1. All researchers, academics, or students at institutions of higher learning were eligible to participate in the survey. The following terms and definition were adopted in this survey:

i) 'social distancing': Maintaining a set physical distance (e.g., 1-2 m) with the people around us, practising distancing measures, e.g., no handshake or hugs when greeting. This also included official measures to enforce social distancing, such as partial lockdowns, reduced staffing, and limited access to research/university facilities.
ii) 'research activities': Literature search, discussion with supervisors/supervisees, data collection, data analysis, presentation of results at conferences, securing research grants, research output, research progress, writing, etc.
iii) 'research training': Research methodology training, hands-on/laboratory training, mentoring activities (discussion with supervisors/supervisees), progress management etc.

The results were analysed using SPSS version 22. Numerical data were evaluated for normality using the Shapiro-Wilks test. Data that were not normally distributed were evaluated using non-parametric tests such as the Mann-Whitney *U*-test, Friedman test and Spearman's Rank correlation. Demographic data were reported in mean, median, standard deviation, and inter-quartile range (IQR). Statistical significance was declared at $p < 0.05$. Free text answers were analysed using the framework analysis approach (Creswell & Creswell, 2018). A thematic analysis approach was also used to obtain further insights into how different genders were affected by social distancing measures.

3. Results

A total of 130 participants from 15 countries completed the survey, of which 72% of the respondents were from Malaysia. For the international respondents, the main contributors were from China (8%) and Australia (5%). The rest of the respondents were from Brazil, The Philippines, the United Kingdom, Thailand, India, Maldives, Cambodia, Singapore, Jordan, Finland, Indonesia, and Japan. Table 1 presents the demographics of the survey respondents. Fifty-eight percent (58%) of the respondents were female. The survey participants' age ranged from 22 to 70 years old, with a median age of 35 years (IQR = 30 to 42 years). The respondents were primarily academics and researchers (51%), while students comprised 34% of the respondents. Amongst the 55 students, 58% of them were doing their master's studies at the time of the survey. The second-largest student cohort was the doctoral students. Thirty-seven percent (37%) of the respondents worked in medical physics, 25% in clinical, and 15% in science domains. Prior to the pandemic, 36% worked in hospitals, 23% worked in universities, 19% in laboratories, and 14% in offices.

Prior to the pandemic, respondents' time allocated to research activities varied from <20% to more than 80% of their working/study hours. A total of 23% of the respondents reported spending more than 60% of their time on research activities. The student's study level was moderately correlated with the amount of research time (Spearman's Rank correlation, $r = .42$, $p = 0.001$).

Different workplaces practiced different measures to ensure adherence to social distancing, which also translated to the level of social distancing strictness in the research environment. The majority of the

respondents (61%) reported limited access to laboratory/research facilities/campuses. Almost a quarter of the respondents (24%) reported that they could not access laboratory/research facilities/campuses.

Table 1: Demographics of the survey respondents.

Description	N (%)
Respondents	130 (100)
Female	76 (58)
Male	54 (42)
Countries (N)	15
Malaysia	94 (72)
Others	36 (28)
Age (years)*	35 (IQR = 30 to 42)
Occupation**	
Academics	49 (30)
Researcher	34 (21)
Student	55 (34)
Others	25 (15)
Current study level (for students)	
Undergraduate	4 (7)
Masters	32 (58)
Doctoral	19 (35)
Field of research	
Medical physics	48(37)
Engineering	7 (6)
Science	20 (15)
Clinical	33 (25)
Arts & social studies	9 (7)
Others	13 (10)
Prior to the pandemic, how often were you involved/participated in research activities (as a percentage of your working/study hours)?	
<20%	29 (22)
20 to <40%	33 (26)
40 to <60%	38 (29)
60 to <80%	14 (11)
80% or more	16 (12)
Prior to the pandemic, where did you mainly conduct your research activities? **	30 (14)
Office	41 (19)
Laboratory	77 (36)
Hospital	8 (4)
Industry/Field site	51 (23)
University	9 (4)
Others	
In the last 6 months, how strict is the level of social distancing practised/ enforced at your institution?	
Only required to maintain 1 m distance between people	17 (13)
Limited access to laboratory/ research facilities/campus	79 (61)
Completely no access to laboratory/ research facilities/campus	31(24)
Other	3 (2)

Note: NA – not available, *Median, ** Total is >130 because some respondents held multiple roles.

The respondents rated the impact of social distancing on a scale of 100, from 0 (*not at all*) to 50 (*somewhat*) to 100 (*totally*). Female respondents reported a significantly lower level of being affected by social distancing measures (median rate = 65) than male respondents (median rate = 72) (Mann-Whitney *U*, *z* = -1.965, *p* = 0.049) (Figure 1). No significant correlations were found between respondents' age (Spearman's Rank correlation, *r* = -0.962, *p* = 0.288) or the study levels (Spearman's Rank correlation, *r* = -0.027, *p* = 0.843) of the students with the perceived impact of social distancing on their research. Some respondents held many different roles simultaneously. However, the higher number of roles did not correlate with their perception of the impact of social distancing.

There was a significant correlation between the strictness level of social distancing measures and the impact of social distancing on research (Spearman's Rank correlation, *r* = 0.367, *p* < 0.001). Respondents that reported stricter social distancing measures also reported a larger impact on their research. The perceived impact of social distancing were also not correlated with the study level and time spent on research prior to the pandemic.

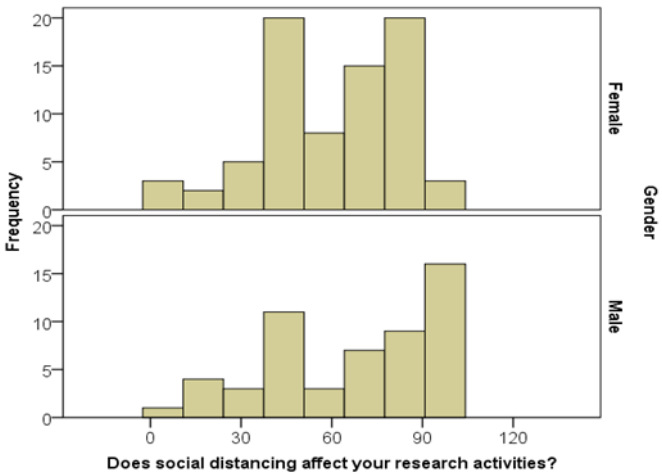

Figure 1: Histogram distribution of the perceived effects of social distancing on research activities, according to gender.
Note: Ratings are on a scale of 100; from 0 (*not at all*) to 50 (*somewhat*) to 100 (*totally*)

Figure 2 shows the response distribution on how social distancing affected research activities. Activities considered included literature search, data collection, thesis writing, scientific manuscript writing, conference presentations, general research progress, output, and securing grants. Research progress, conference presentation and data collection were negatively affected. Activities that were not affected by social distancing measures were literature search, scientific manuscript writing, and thesis writing. Interestingly, activities with the highest number of responders reporting positive enhancement were scientific manuscript and thesis writing and conference presentation. This may be due to the cheaper online registration fees for most conferences.

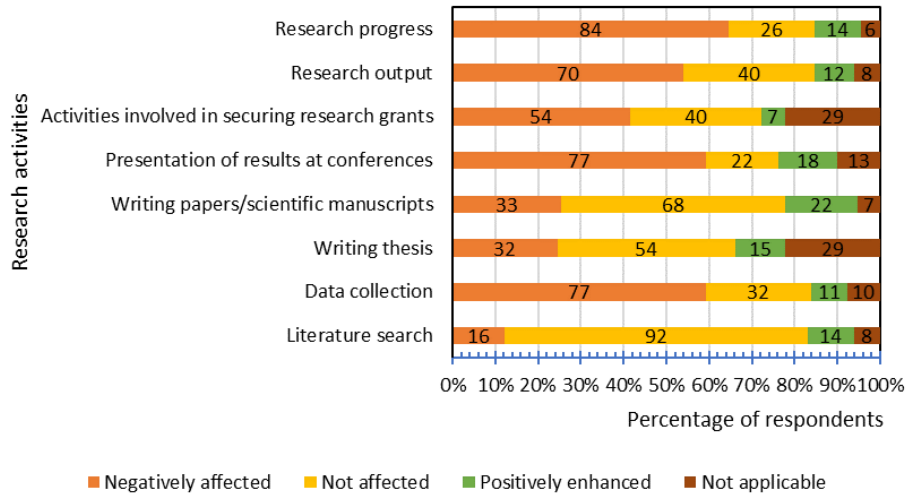

Figure 2: Distribution of the response on how by social distancing affected various research activities.

Figure 3 shows the distribution of the responses on how by social distancing affected research training activities, such as mentoring, hands-on/laboratory training, and research methodology training. Hands-on/laboratory-based training was the most negatively affected of the three activities.

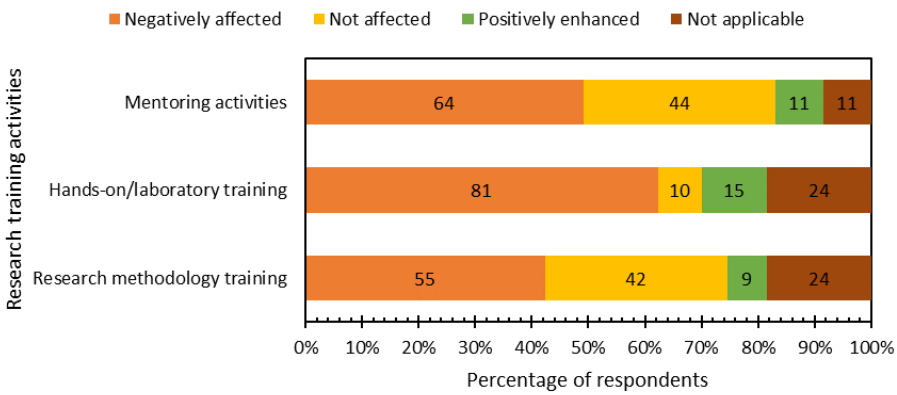

Figure 3: Distribution of the response on how by social distancing affected various research training activities.

Research training of researchers was mainly affected in terms of mentoring, hands-on/laboratory training and research methodology training. Respondents reported that face-to-face discussions were more effective when analysing data with their supervisors. While meetings could be conducted over online meeting platforms, communication was less effective. Physical meetings were also limited to small groups of three students or less. Different types of research work require a different level of

laboratory access. One respondent shared that research work and training could still be carried out in a timely manner with unconventional arrangements.

> *We reduce the number of trainees, use more facilities, performed the training after office hour/ lunchtime. The graduate student research was within the timeline and could meet the target as planned. Social distancing is not negative but also positive to the training program.*

We asked about the number of publications to measure the research productivity over three years since the pandemic (Figure 4). Interestingly, there was no statistically significant difference in the publication output in the three years since 2018 (Friedman test, $\chi^2 = 4.024$, $p = 0.134$).

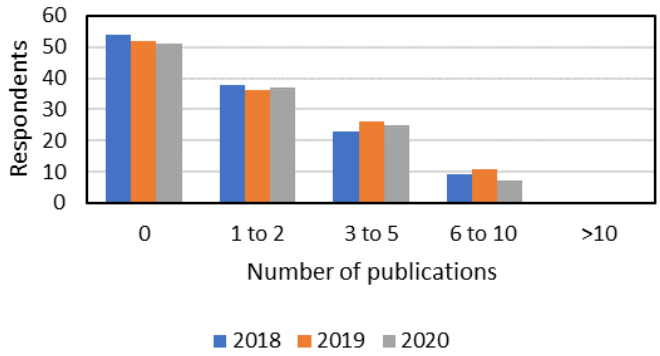

Figure 4: Number of publications for three consecutive years.

Figure 5 shows the number of conferences, seminars, workshops, webinars, or other training activities that the respondents had attended in the last three years (2018 to 2020). There was a significant difference in conference or seminar attendance (Friedman test, $\chi^2 = 7.071$, $p = 0.029$). The highest number of conference attendance was in 2019. The number of conferences, seminars, workshops, webinars, or other training activities attended by the respondents was significantly higher in 2019 compared to 2018. However, there was a slight decrease in the numbers in 2020, though it was not statistically significant. The proliferation of online webinars and courses enabled research training course material to be moved onto online platforms, enabling students to access from all over the world and at their own convenience.

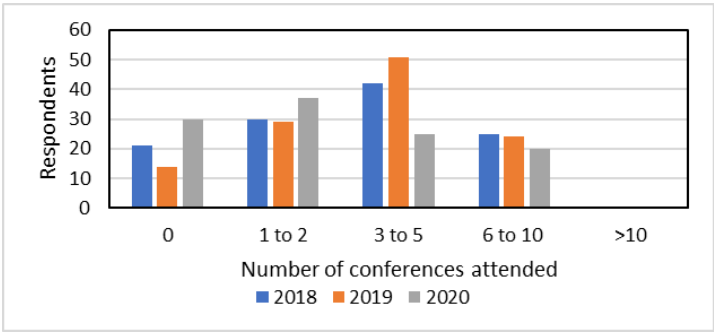

Figure 5: Number of conferences attended for three consecutive years.

During the pandemic, researchers had to modify their research methodology to adapt to the social distancing requirement (Figure 6). The most affected research activities were data collection where 72.5% of respondents reported needing to postpone or delay their data collection. About half of the respondents reported having to develop new tools or skills (52%), redesign their research methodologies (50%), and reduce the sample size (48%). Some of these tools involved tools that would enable them to collect data remotely. Only 36% of the respondents reported that they needed to change their research objectives, and 14% reported terminating their research.

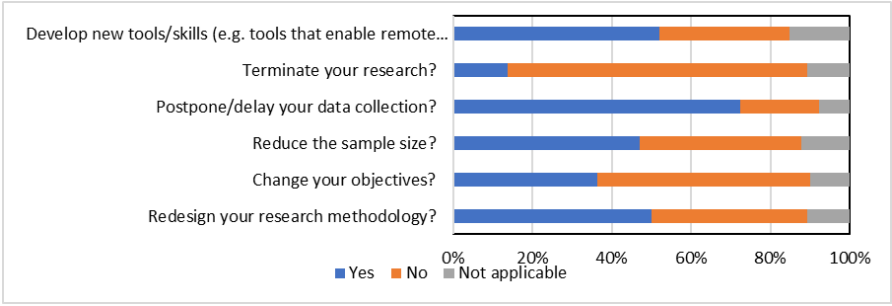

Figure 6: Measures to adapt to the requirements of social distancing.

In terms of mental health, the survey respondents reported increased mental stress. More than 50 respondents claimed that they were demotivated, felt isolated/alone and lost focus (Figure 7). Many of them reported suffering from multiple adverse effects.

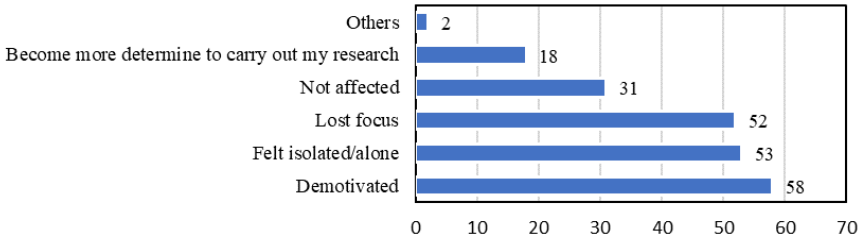

Figure 7: How social distancing affects the mental health of researchers.

A thematic analysis was carried out on the open-ended answers of 26 female and 13 male respondents that provided extended elaboration on how social distancing affected them. This was to elucidate how males and females respondents were affected by social distancing (Table 2). For female respondents, four of the most cited negative effects were that they felt isolated/alone, demotivated, distracted, and lost focus, perhaps due to the extra responsibilities and problems with data collection/writing. However, 14% of the responses indicated that they were not being affected or even had positive effects. On the other hand, for male respondents, the top three most cited negative effects were isolation, feeling that their output was lower, and changes in the daily work/research practices.

Table 2: How social distancing measures affected male and female respondents .

	Female	Male
	N (%)	N (%)
Demotivated	7 (9)	1 (2)
Felt isolated/alone	8 (11)	4 (7)
Loss of passion	1 (1)	
Problem with data collection, writing	5 (7)	1 (2)
Lost focus, extra work/family responsibilities	5 (7)	1 (2)
No support from supervisors	1 (1)	
Stressed	4 (5)	2 (4)
Output expectation/ Lack of output		4 (7)
Lack of understanding from peers/collaborators		1 (2)
Changes in work/research practices		3 (6)
Not affected	4 (5)	2 (4)
Positive effects	7 (9)	
Did not elaborate	50 (66)	41 (76)

Note: The responses have been identified from the open-ended answers, and multiple answers for a single respondent are possible.

The lack of research output and the constant awareness of the limited research/study time exacerbated the mental stress as exemplified in the following extracts:

I felt alone most of the time and demotivated to do anything.

At the same time, keeping in mind that the clock is still ticking in terms of deadlines for research papers/publication, bringing about stress in its own way!

Social distancing measures resulted in "forced" quiet times. This was reported by both male and female respondents as feeling isolated/alone and is one of the most cited negative effects of social distancing. Mental support from fellow researchers or forming a research team was also reported to help manage mental health as described by one of the respondents:

It was not easy. I was frustrated, but I had to be strong for the research group. We met online every week and motivated each other: motivation was the key! Every week we will end the meeting with something positive to keep the momentum going. Teamwork is so important.

However, it was also interesting to note that 31 of the respondents reported that their mental health was not affected by the social distancing measures. 18 respondents reported the positive effect of being more determined to carry out their research despite the restrictions, as shown in Figure 7. Some female respondents elaborated on how they had been positively affected by social distancing, as exemplified in the following extracts.

I become more determined and focused to carry out my research.

I quite enjoyed it.

> *Working from home saves me a lot of time in travelling and provides me more time to be self-alone. Then, I have more time to reschedule my timetable and re-evaluate myself as well as my research activities. Daily meditation provides a good platform and channel to have a better self-understanding.*

The respondents' feedback on the changes they would like to see to enhance research and research training were mainly in the areas of improving communication, facility/training support, extending deadlines, adjusting expectations/work/meetings, adjusting pandemic measures and increasing social support. Many also said that more efficient communication needs to be established between students and supervisors, taking advantage of the various online platforms. To keep track of the research progress and to seek solutions to difficulties in research, one-to-one meeting or coaching sessions could be organised at more frequent intervals to assist students.

The respondents' suggestions on improving facility and training support included setting clear and explicit instructions on the function of the research facilities and standard operating procedures. Field research that could be carried out with the implementation of distancing measures should be allowed to continue. In other words, a rational assessment of the real risk of COVID-19 infection (or future pandemics) in every research facility needs to be implemented, thus, making appropriate adjustments of pandemic management measures to ease unnecessary restrictions on research. This would enable more flexibility for researchers and students to continue to carry out certain types of research work, despite the social distancing measures. It was also suggested that research training be moved online, enabling blended learning or self-directed online learning modules. Increased online research support was also suggested, and small-scale workshops/seminars could also be conducted.

In addition, the respondents proposed adjusting the administration/work/research goals. Examples included extending research deadlines and making expected research output less demanding. It was suggested that the supervisor's goals and the research student's goals should be distinguished, as explained by one of the respondents:

> *The objectives of 'research training' should be revised. Training goals should not be set to publish papers and should instead focus on teaching the process of research. There is an obvious difference in the objectives held by both the chief researcher and the research students: the chief researcher aims to publish while the student is completing the research as part of the course. If the curriculum is unable to do without the publication of a research subject, perhaps research publication should be allowed to be extended beyond the clinical training period - at least until an acceptable degree of normalcy has been reclaimed from the effect of the pandemic.*

4. Discussion

In this study, we surveyed a diverse group of researchers and students, the majority residing in Malaysia, a developing country in south-east Asia. The research areas included niche research areas such as medical physics and more general areas such as clinical and engineering. The cohort of students surveyed also ranged from undergraduate to doctoral degrees. This may be the reason for the wide variation of perceived impact due to the implementation of social distancing measures in their respective universities or institutes. The study cohort was somewhat different from those surveyed by

Dong et al. (2022) and Bratan et al. (2021). The postgraduate medical students in Dong et al. reported an overall moderate impact on their research. Their study was also focused on a single centre, whereby the social distancing measures were quite similar.

In our survey, female respondents reported a significantly lower impact level than male respondents, even though 85% of respondents reported limited or completely no access to their research workplaces. Female respondents predominantly felt isolated and distracted, perhaps due to the work from home arrangement leading to needing to balance work and family responsibilities at the same time. The lack of access of research facilities affected data collection and writing work of the female researchers. On the other hand, the response from the male respondents elucidated that they had a high expectation on research output which was negatively impacted because of the social distancing measures. The changes in the daily work routine such as reduced staffing at the hospitals were also mentioned in their responses. Responses from the female respondents showed that some of them were more proactive in their response to the social distancing measures, leading to more positive experiences. Dong et al. (2022) reported that female postgraduate students reported lesser damage or data loss due to sudden laboratory closure.

The respondents reported that research progress was delayed mainly because data collection could not be carried out and citing delivery of consumables from an external vendor and international sources were delayed. These findings were similar to the study by Bratan et al. (2021) whereby 67% to 80% of the researchers reported that data collection and intervention could not be carried out as initially planned. For research involving recruiting patients or volunteers at hospitals, respondents reported that strict standard operating procedures (SOPs) and social distancing measures resulted in postponed appointments to reduce hospital crowds. The general fear of contracting COVID-19 during hospital visits may also lower patient recruitment (Ellehuus et al., 2021). Administrative matters were also often delayed when fewer administrative staff worked in the office. The unavailability of staff has been reported to be associated with perceived incivility of faculty by students (Alt et al., 2022).

In terms of research output, there was no significant reduction in the publication output in 2020 compared to the pre-pandemic times. This contrasts with Bratan et al. (2021), as more than half of their investigators reported that publications were delayed or not feasible at a similar time point (May 2020). Dong et al. (2022) reported that students' paper publications were negatively affected by social distancing. However, both surveys were based on perceived impact that may not be validated quantitatively. A quick literature search in PubMed using the keyword "Covid-19" and "pandemic" revealed more than 147,774 publications. This shows that while much existing research was affected, opportunistic research and surveys on pandemic related aspects such as the pandemic impact on education, mental health, medical treatments of non-COVID-19 diseases, lifestyle changes and social distancing had surged tremendously (Abdelrahman et al., 2022; Alessi et al., 2021; Azlan et al., 2020; Brog et al., 2022; Chasset et al., 2022; Eberle & Stichling, 2021; Ellehuus et al., 2021; Losso et al., 2021; Mathew et al., 2022; Peterson et al., 2021). Nevertheless, we believe that the impact of social distancing on the number of scientific publications may only be more accurately determined after one to two years post-pandemic, as publications often trail the actual research work.

Social distancing measures led to innovation in research methods, tools and training methods and have been demonstrated in several studies (Bratan et al., 2021; Brito-Brito et al., 2022; Brog et al., 2022; Chasset et al., 2022; Garg et al., 2022; Greenough et al., 2022). Social distancing has acted as a catalyst for innovation and changes in research. The use of digital platforms for research training and mentoring, modelled on online teaching methods, are also valuable for ensuring sustainability in research and research training (Azlan et al., 2020; Bratan et al., 2021).

The impact of social distancing on mental stress in researchers and students was not surprising, as many other surveys had reported similar conditions in different populations (Alessi et al., 2021; Alt et al., 2022; Cao et al., 2020; Dong et al., 2022). The personal experience and observation of the authors indicated that social distancing indeed had led to the distancing of researchers and reduced social interactions between researchers. In the pre-COVID-19 times, social gatherings, discussion meet-ups, and lunches were often spontaneous events. Researchers from different backgrounds may often interact and exchange ideas in these social events, indirectly enriching the research environment's academic and social spheres. In contrast, social distancing measures discourage gathering people in a closed space for long periods. Carvalho Aguiar Melo and de Sousa Soares (2020) called for discussion on the impact of social distancing on mental wellbeing. Further, Venkatesh and Edirappuli (2020) mentioned that mitigation of the negative impact on mental health requires concerted effort. The same can be said for the other research and research training aspects.

Research work should also be recognised as a distinct social component. Students and supervisors often gather for discussions, coffee/tea breaks or lunch discussions. These social behaviours are synergistic in encouraging a healthy research output and essential to promoting the group's sense of belonging and togetherness, facilitating the exchange of ideas and social support. Social distancing inevitably reduces this spontaneous social behaviour, indirectly affecting research students and reducing collaborative opportunities in research. More conscious effort is necessary to set up small groups to get together in a suitable environment and with sufficient physical distancing measures. Setting up formal mentoring systems to guide younger researchers or students would also be helpful.

We acknowledge that there were several limitations in this study. The study sample size may be small and may not be able to be generalised to every research institute. The study sample comprised mainly respondents from Malaysia and the social distancing measures enforced in this country. Thus, this limitation implies that the findings may mainly reflect the impact of social distancing in Malaysia. Another limitation is that, while social distancing in this survey extends to lockdowns in the definition, the impact on conference travel may be related to a further extension of the social distancing measures that affected more extensive global travel restrictions and not social distancing per se. The third limitation of this study was that the validity and reliability of the survey tool were not retested in our study and so our results should be interpreted within the context of these limitations.

5. Conclusion

During the COVID-19 pandemic, social distancing was one of the crucial measures in breaking the chain of virus spread. Due to the nature of the academic workplace, institutional management implementation of limited facility access affected research progress and output of researchers. This study provided

insights into the impact of social distancing on the research output and the mental health of researchers and students from various research areas, education levels and research activities. It is notable that female researchers reported a lower impact by social distancing measures than their male counterparts. Higher social distancing measures were associated with a higher impact on research. The majority of the researchers reported delays in research progress and delays or inability to collect data. Research productivity in scientific publications was not significantly lower in 2020 than in pre-pandemic time. Conference attendance was also lower, likely due to social distancing measures and global travel restrictions. Although less preferred by researchers, research supervision and training via online platforms ensured the continuity of research progress where implementation of social distancing measures was stricter. The pandemic also affected the respondents' mental health; reporting demotivation, feeling isolated, and losing focus on their work. Suggested measures to alleviate the negative impact of COVID-19 included enhancing research and training, improved communications, making more research training accessible, and adjusting administration/work/research goals.

In the post-pandemic era, social distancing measures have been lifted in most places and countries. Physical presence in research institutions, hospitals, and conferences has mostly resumed. Social distancing may no longer be relevant in many contexts. However, understanding the mechanisms and repercussions of social distancing within the realm of research is instrumental in preparing for future unforeseen challenges. Paradigm changes in research and training, such as remote and online learning, have continued to prevail in many facets of our professional and social lives. A clear understanding of the negative impact on the mental health of researchers and students will be crucial for university and research management to provide better support for staff and students.

Acknowledgement

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Appendix

Table A1: Survey questionnaire

No.	Survey Questions
1.	What is your age? (in years)? *[Open-ended response]*
2.	Which country are you residing in now? *[Choose from dropdown menu]*
3.	Your gender: a. Male b. Female c. Other
4.	Occupation (you can choose more than 1): a. Academician b. Researcher c. Student d. Others: Please specify [open-ended response]
5.	If you are a student, what level of study are you currently in? a. Undergraduate b. Master's candidate c. Doctoral candidate d. Not applicable
6.	Field of research: a. Medical physics b. Engineering c. Science d. Clinical e. Arts & social studies f. Others: What is your field of research? [open-ended response]
7.	Prior to the pandemic, how often were you involved/participated in research activities (as a percentage of your working/study hours)? a. <20% b. 20 to <40% c. 40 to <60% d. 60 to <80% e. 80% or more
8.	Prior to the pandemic, where did you mainly conduct your research activities? a. Office b. Laboratory c. Hospital d. Industry/Field site e. University f. Other: Please specify. [Free text response]
9.	Does social distancing affect your research activities? [Change the slider to set a response.] Slider bar ranged from: Not at all (0) – Somewhat (50) – Totally (100)
10.	In the last 6 months, how strict is the level of social distancing practised/enforced at your institution? a. Only required to maintain 1 m distance between people b. Limited access to laboratory/ research facilities / campus c. Completely no access to laboratory/ research facilities / campus d. Other: Please specify_____

11. How has social distancing affected your research activities?
[For each of the following activity, choose between Negatively affected, Not affected, Positively enhanced, Not applicable]
    a. Literature search
    b. Data collection
    c. Writing thesis
    d. Writing papers/scientific manuscripts
    e. Presentation of results at conferences
    f. Activities involved in securing research grants
    g. Research output
    h. Research progress

12. Please share any other effects of social distancing on your research, if any.
[Open-ended response]

13. How has social distancing affected your research training?
[For each of the following activity, choose between Negatively affected, Not affected, Positively enhanced, Not applicable]
    a. Research methodology training
    b. Hands-on/laboratory training
    c. Mentoring activities

14. Please share any other effects of social distancing on your research training, if any.
[Open-ended response]

15. How many scientific papers have you co-authored in the following years (on average)?
[For each of the following year, 0, 1 to 2, 3 to 5, 6 to 10, or >10]
    a. 2018
    b. 2019
    c. 2020

16. How many conferences, seminars, workshops, webinars, or other training activities have you attended in the following years? (on average)?
Please include online and physical events.
[For each of the following year, 0, 1 to 2, 3 to 5, 6 to 10, or >10]
    a. 2018
    b. 2019
    c. 2020

17. In your research, to adapt to the social distancing requirements, did you need to …
[For each of the following activity, choose between Yes, No, Not applicable]
    a. redesign your research methodology?
    b. change your objectives?
    c. reduce the sample size?
    d. postpone/delay your data collection?
    e. terminate your research?
    f. develop new tools/skills (e.g., tools that enable remote data collection)?

18. In terms of mental health, how has social distancing affected you?
[Check all that apply]
    a. Not affected
    b. I lost focus
    c. I was demotivated
    d. I felt isolated/alone in my work
    e. I became more determined to carry out my research
    f. Other: Please describe how social distancing affected your mental health ____
    g. [Free text response]

19. What kind of changes would you like to see in order to enhance research and research training, while practicing social distancing measures?
[Open-ended response]