

ORIGINAL ARTICLE

## Changes in Work and Occupational Behavior in a Brazilian Sample During the COVID-19 Pandemic: A Longitudinal Study

**Mudanças no Trabalho e no Comportamento Ocupacional em uma Amostra de Brasileiros Durante a Pandemia da COVID-19: Um Estudo Longitudinal**

**Cambios en el Trabajo y en el Comportamiento Ocupacional en una Muestra de Brasileños Durante la Pandemia del COVID-19: Un Estudio Longitudinal**

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### Abstract

The COVID-19 pandemic led to changes in occupational behaviors, affecting millions of workers. This study aimed to assess changes in various perceptions about work at the beginning of the pandemic in Brazil, and six months later. 702 individuals of both sexes (566 females, 80.62%), aged between 16 and 75 years ( $M=41.8$ ;  $SD=13.5$ ), residents in 24 different states of Brazil (most from the Southeast region, 59.26%) participated in this research and answered an online survey about their work experience during the pandemic at two different timepoints. The questionnaire included questions about increased/decreased productivity, fear of contamination by COVID-19 at work, need for going out to work, performing voluntary work, waiting for the return of their work/study activities, previous/current experience working-from-home, use of video conference programs, performing voluntary work to fight COVID-19, job loss and incidence of health problems that prevented the

participant from carrying out daily/work/study activities. The results indicated that workers experienced new ways of performing their activities, changed their perceptions about their productivity, how/where they worked, and how they felt about their routine, although the majority of variables remained stable between timepoints.

**Keywords:** Work; Workplace; Work from home; Productivity; COVID-19; Pandemic

## Resumo

A pandemia da COVID-19 resultou em mudanças nos comportamentos ocupacionais, afetando milhões de trabalhadores. Este estudo teve como objetivo avaliar as mudanças em diferentes percepções sobre o trabalho no início da pandemia no Brasil e seis meses depois. 702 indivíduos de ambos os sexos (566 sexo feminino, 80,62%), com idade entre 16 e 75 anos ( $M = 41,8$ ;  $DP = 13,5$ ), residentes em 24 diferentes estados do Brasil (maioria da região Sudeste, 59,26%) participaram e responderam a uma pesquisa online sobre sua experiência de trabalho durante a pandemia em dois momentos diferentes. O questionário incluía questões sobre aumento/diminuição da produtividade, medo de contaminação pelo COVID-19 no trabalho, necessidade de sair para trabalhar, realização de trabalho voluntário, espera pelo retorno de suas atividades de trabalho/estudo, experiência anterior/atual de trabalho remoto, utilização de programas de videoconferência, realização de trabalho voluntário de combate ao COVID-19, perda de emprego e incidência de problemas de saúde que o impediram de realizar atividades cotidianas/laborais/de estudo. Os resultados indicaram que os trabalhadores vivenciaram novas formas de realizar suas atividades, mudaram suas percepções sobre sua produtividade, como/onde trabalhavam e como se sentiam em relação ao seu cotidiano, apesar da maioria das variáveis se manterem estáveis entre os dois momentos.

**Palavras-chaves:** Trabalho; Local de trabalho; Home office; Produtividade; COVID-19; Pandemia

## Resumen

La pandemia del COVID-19 resultó en cambios en los comportamientos ocupacionales, afectando millones de trabajadores. Este estudio tiene como objetivo evaluar los cambios en diferentes percepciones sobre el trabajo en el inicio de la pandemia en Brasil e seis meses después. 702 individuos de ambos sexos (566 mujeres, 80,62%), con edades entre los 16 y 75 años ( $M=41,8$ ;  $DP=13,5$ ) 702 individuos de ambos sexos (566 mujeres, 80,62%), con edades entre 16 y 75 años ( $M = 41,8$ ;  $DT = 13,5$ ), residentes en 24 estados diferentes de Brasil (la mayoría de la región Sudeste, 59,26%) participaron en esta investigación y respondieron a cuestiones sobre su experiencia de trabajo durante la pandemia en dos momentos distintos. El cuestionario on-line incluía preguntas sobre aumento/disminución de la productividad, miedo a la contaminación por COVID-19 en el trabajo, necesidad de salir a trabajar, realizar trabajo voluntario, esperar el regreso de sus actividades laborales/de estudio, experiencia previa/actual trabajando home office, uso de programas de videoconferencia, realización de trabajo voluntario para combatir COVID-19, pérdida de empleo e incidencia de problemas de salud que impedían al participante realizar actividades diarias/laborales/de estudio. Los resultados indicaron

que los trabajadores vivenciaron nuevas formas de realizar sus actividades, cambiaron sus percepciones sobre su productividad, como/donde trabajaban y como se sentían en relación a su cotidiano, aunque la mayoría de las variables se mantuvieron estables entre los dos momentos.

**Palabras clave:** Trabajo; Lugar de trabajo; Home office; Productividad; COVID-19

## 1. Introduction

In 2020, the World Health Organization (WHO) declared a global pandemic caused by the new coronavirus (Sars-Cov-2). As a result, countries worldwide had to adopt specific measures to combat COVID-19, such as social distancing<sup>1,2</sup>, lockdown<sup>3</sup>, the use of masks<sup>2</sup>, closing schools<sup>4</sup> and workplaces<sup>5</sup>, in an attempt to contain the disease. These actions impacted people's daily lives: they changed their social interactions, private and public activities, daily routines, public transportation, and occupational behaviors<sup>5</sup>. The pandemic increased the exposure of workers to stressful conditions, including infobesity, financial loss, job insecurity, and the risk of stigma directed to those associated with the disease because of their occupation (e.g., health professionals<sup>6</sup>).

Many companies, schools, and universities changed totally or partially to remote work/learning. As a result, thousands of jobs and activities had to be adapted to this new reality, generating novel challenges for businesses and a greater demand for using online resources<sup>7</sup>. Furthermore, this scenario significantly impacted the work of low-income populations, especially those whose services cannot be performed remotely<sup>8</sup>.

The findings about work-from-home (WFH) are controversial. McDowell et al.<sup>9</sup> point out that WFH required workers to sit for a more extended period, and they found an association with higher levels of sedentarism. In Dubey and Tripathi<sup>10</sup>, they observed that Twitter reactions about WFH suggested that most twitter users have a positive perception about their experience. In turn, Kaur and Sharma<sup>11</sup> suggest that WFH is more challenging for some, such as women, since in many situations they are the ones who need to face a double journey of both domestic and regular work.

The environments we are exposed to can have important influences on mental health, including the work environment and social relationships between peers and leadership. An example of a protective feature is good communication between workers and supervisors, which seems to be a key factor for mental health at work<sup>12</sup>. And for a negative feature, we can mention the impact of losing a job: Collie et al.<sup>13</sup> observed a high prevalence of psychological distress in people who lost their jobs during the coronavirus pandemic, and this has an important role as a potential economic burden.

In this study, we aimed (1) investigate how were the general aspects of the work condition during the pandemic, including increased/decreased productivity, fear of contamination by COVID-19 at work, need for going out to work, performing voluntary work, waiting for the return of their work/study activities, previous/current experience working-from-home, use of video conference programs, performing voluntary work to fight COVID-19, job loss and incidence of health problems that prevented the participant from carrying out daily/work/study activities; and (2) assess if changes occurred between these features in two timepoints six months

apart. This paper was an exploratory study. Since this is the first moment in history that a pandemic takes place in a globalized world, with workers having access to the internet and working remotely, hypotheses were not previously established. Therefore, our objective was to carry out an initial investigation of perceptions, behaviors, and working conditions in a novel context.

## 2. Material and Method

This research is part of the project “Influência da COVID-19 na Saúde Mental da população brasileira e de seus profissionais de saúde” (Influence of COVID-19 on the Mental Health of the Brazilian population and its health professionals), and was approved by the National Research Ethics Commission (CONEP) in May 2020 (CAAE: 30823620.6.0000.5149). It follows the principles of the Declaration of Helsinki<sup>14</sup>. The main project aims to investigate the impact of COVID-19 on mental health including its relationship with other vital areas (as, for example, work routine and behavior, physical symptoms, preventive health measures, socioeconomic gradient, habits and quality of life).

### 2.1 Participants and Pandemic Context

Eligible participants for this study were those who lived in Brazil and were over 20 years of age. There were no restrictions regarding state, sex, income, type of work, or education. All participants were informed about the project’s objectives and declared their consent by signing the Free and Informed Consent Term.

Two timepoints of the COVID-19 pandemic were evaluated: the first data collection occurred between May and July 2020 (n = 6225). At the end of July 2020, Brazil had 2.66 million confirmed cases of COVID-19 and 92,475 confirmed deaths<sup>15</sup>. The second data collection took place between November 2020 and January 2021 (n = 3049). At the end of the second period of data collection, Brazil had 9.20 million confirmed cases, 224,504 confirmed deaths, and less than 1% of the population vaccinated<sup>15</sup>. Each respondent was identified by a unique code generated from their access and the answers they reported. Only those who answered the questionnaire at both timepoints were selected for the present study (n= 702). All the others who responded at just one of the timepoints, as well those who self-reported neurological diseases (epilepsy, seizures, brain tumors, hydrocephalus, agenesis of the corpus callosum, etc.) with a declared impact on cognitive capacity were also excluded.

On February 7, 2020, Law No. 13.979/2020 was approved in Brazil<sup>16</sup>. The law had the goal of presenting measures to combat COVID-19, even before the first documented case of the disease. In Article 3, it was determined that in order to face the disease, isolation measures should be adopted, such as quarantine; determination of the compulsory performance of medical exams; laboratory tests; collection of clinical samples; vaccination; exceptional and temporary restriction of entry and exit from the country; among others. The first case of COVID-19 registered in Brazil occurred on February 25, 2020, before the creation of the 13.979/2020 law that would allow for coping measures. However, quarantine at the federal level was only adopted on March

17, 2020. Several activities began to be carried out remotely, and it was recommended that only essential services would remain presencial. In addition, the use of masks and hygiene measures were encouraged to contain the disease<sup>16</sup>. These measures generated a lot of controversy in Brazil, as the sectors of the federal government had different positions<sup>17-18</sup>. On April 15, 2020, the Federal Supreme Court decided that the social isolation measures would be the responsibility of the states and municipalities through ADI 6341 MC/DF. Since then, there was a favorable adoption of coping measures; however, most municipalities made these actions more flexible over time<sup>19</sup>.

## 2.2 Instruments

*Questions related to the COVID-19 outbreak.* Sentences related to the COVID-19 outbreak were presented in a checkbox format (checked = yes; non-checked = no), in an online questionnaire. Participants were asked to select amongst the options what was compatible with their experience based on the previous 14 days before responding. The questionnaire was based on the same questions presented in the first study published on the psychological impacts of the COVID-19 pandemic, done in China<sup>20</sup>, with the addition of new questions we found appropriate for the Brazilian context at the time (i.e., April 2020). The structured questionnaire consisted of sentences that covered four domains: 1) physical health status; 2) COVID-19 diagnosis and contact history; 3) perceptions and concerns related to COVID-19 pandemic; and 4) precautionary measures against COVID-19. This paper focuses on questions from the third and fourth domains, especially those related to the workplace.

Concerning the variable “Liberal Professional” on table 1, it means a professional with a technical or higher level of education, who exercises his profession, generally regulated, as a service provider or setting up a company (e.g. lawyers, doctors, nurses, etc.). “Self-employed” professionals provide services on their own, without any formal or informal employment relationship. “Salaried” professionals perform activities regulated by the Brazilian labor legislation, and have a professional registry.

## 2.3 Procedures

Quantitative data were collected through the online platform SurveyMonkey<sup>21</sup>. The online questionnaire was made available and widely disseminated through social media and contact lists, which characterizes the sampling method as non-probabilistic and results in a convenience sample of Brazilian respondents. The database was exported and processed using the Knime software<sup>22</sup>, and the analyzes were performed using Jamovi (version 1.6)<sup>23</sup>. After the descriptive analysis of the sample were carried out, a comparative analysis was conducted between the first and second timepoints.

McNemar test for paired samples (2x2) was used, with a significance level of .05. Both the p value (< 0.05) and the odds ratio (OR CI 95% ≠ 1) were considered for a possible change between timepoints to be significant. The effect size for the odds ratios will be interpreted according to the Olivier and Bell<sup>24</sup> guidelines, where  $OR \leq 1.22$  are trivial,  $1.22 < OR < 1.86$  are small,  $1.86 \leq OR < 3.00$  are medium and  $OR \geq 3.00$  are large.

### 3. Results

Considering the data collected at the timepoint 1, most respondents were female ( $n = 566$ ; 81.7%). The average age was 41.8 years, with an age range of 16 — 75 years, and a standard deviation of 13.5. Considering ethnicity, there was a majority of white skin (70.23%). More than half of respondents reported having at least completed higher education (68.01%), and 48.14% had an income of at least \$979.00 dollars per month, whereas the minimum wage in Brazil in 2020 was approximately \$201.64 dollars per month (\*BRL to USD, all monetary conversions done on July 28, 2021). This characterizes the sample as one consisting of individuals with high education and income by Brazilian standards. Table 1 shows the sociodemographic data of the sample, reported both at timepoint 1 and 2.

**Table 1.** Demographic information for total sample reported at timepoint 1 and timepoint 2 ( $n= 702$ ).

Variable	Timepoint 1		Timepoint 2	
	f	%	f	%
Biological Sex				
Female	566	80.63	569	81.05
Male	127	18.09	132	18.80
Missing data	9	1.28	1	0.14
Ethnicity				
White skin	493	70.23	500	71.22
Brown skin	166	23.65	156	22.22
Black skin	33	4.70	36	5.12
Yellow skin	5	0.71	6	0.85
Indigenous	1	0.14	3	0.42
Missing data	4	0.57	1	0.14
Education				
Complete Elementary I/Incomplete Elementary II	5	0.71	4	0.57
Complete Elementary/Incomplete High School	11	1.57	10	1.42
Complete High School (Full High School)/Incomplete Higher Education	187	26.64	178	25.35
Graduated	314	44.73	339	48.29
Master's degree	99	14.10	102	14.29
Doctorate	64	9.12	66	9.40
Missing data	22	3.13	3	0.42
Marital Status				
Married/Living together	337	48.01	343	48.86
Separated/Divorced	68	9.69	71	10.11
Single	260	37.04	269	38.31
Widower/Widow	2	0.28	16	2.27
Missing data	35	4.99	3	0.42
Household income per month (*BRL to USD, approximation)				
Up to \$293.00 USD	58	8.26	55	7.83

Variable	Timepoint 1		Timepoint 2	
	f	%	f	%
Between \$294.00 and R\$489.00 USD	82	11.68	69	9.83
Between \$490.00 and R\$783.00 USD	143	20.37	135	19.23
Between \$784.00 and R\$978.00 USD	71	10.11	85	12.11
Between \$979.00 and R\$1,957.00 USD	168	23.93	173	24.64
Between \$1,958.00 and R\$4,894.00 USD	132	18.80	129	18.38
More than \$4,895.00 USD	38	5.41	44	6.27
<i>Missing data</i>	10	1.42	12	1.71
Work Type				
Salaried	139	19.80	135	19.23
Self-Employed	86	12.25	65	9.26
Unemployed	142	20.23	127	18.09
Liberal Professional	66	9.40	72	10.26
Public Servant	237	33.76	206	29.34
Retired	0	0.00	68	9.69
Business Owner	0	0.00	16	2.28
<i>Missing data</i>	32	4.56	13	1.85

Some variables such as sex and ethnicity ended up showing different values in each of the timepoints. This is probably due to the difference in the amount of missing data between the timepoints, as well as to a possible incorrect marking by a minority of participants.

24 states and the federal district were represented in the survey. The Southeast region was the most represented (n=416), with 59.26% of participants (27.49% São Paulo, 18.09% Minas Gerais, 10.83% Rio de Janeiro, 2.85% Espírito Santo); followed by the South region (n=126), with 17.95% (8.97% Rio Grande do Sul, 5.41% Paraná, 3.56% Santa Catarina); Northeast (n=86), with 12.25% (4.56% Bahia, 2.99% Pernambuco, 1.28% Ceará, 1.14% Rio Grande do Norte, 1.00% Paraíba, 0.57% Alagoas, 0.43% Piauí, 0.28% Maranhão); Midwest region (plus the Federal District) (n=31), with 4.42% (1.71% Goiás, 1.42% Federal District, 1.28% Mato Grosso); and finally, the North (n=17), with 2.42% (0.85% Pará, 0.71% Amazonas, 0.43% Tocantins, 0.14% Rondônia, 0.14% Acre, 0.14% Amapá). None of the participants lived in Roraima, Sergipe or Mato Grosso do Sul, and a missing of 3.70% (n=26) was observed.

As for the work-related questions, the information reported by the participants can be seen in table 2. As it was observed, about 11% of participants said that while they needed to go out to work, they felt afraid of COVID-19. An increase of  $\Delta 7.5\%$  could be observed between the timepoint 1 and 2 among those who reported feeling afraid of becoming infected, while at the same time they needed to go out to work. However, the effect size for this question was trivial, and therefore, non-significant.

Among the respondents, 11.8% reported that they continued to go to work normally, at timepoint 1, with an increase of  $\Delta 10.3\%$  at timepoint 2. Going to work normally means the individual had to leave their home to go to their usual workplace, instead of performing WFH. Even so, the effect size for this question was

trivial, and therefore, non-significant.

When asked if they were waiting to return to work or study activities as soon as the social isolation decree was suspended, only 10.4% reported a positive answer. This proportion was significantly reduced by  $\Delta 7.1\%$  when participants answered the questionnaire again, demonstrating an important difference between the two timepoints. The effect size for this question was large.

Regarding the reduction of working hours or adoption of a special work schedule, 14.5% stated that they had experienced at least one of them. When comparing timepoint 1 with timepoint 2, a significant decrease of  $\Delta 4.8\%$  in those who experienced a reduction in working hours/adopted a special work schedule could be observed. The effect size for this question was small. Less than 8% of participants reported that they had an experience with the WFH regime before the pandemic, while about half of the participants said they were studying/working from home when they completed the questionnaire. There wasn't a significant difference between the two timepoints for these question, as expected.

**Table 2.** "Yes" reported to work-related questions on both timepoints.

Variable	Timepoint 1	Timepoint 2	$\chi^2(df)$	$p$	OR [95% CI]
	n (%)	n (%)			
1. I need to go out to work, but I'm afraid of COVID-19.	77 (11.0)	130 (18.5)	376 (1)	< .001	0.54 [0.40; 0.73]
2. I keep leaving home to work, normally.	83 (11.8)	155 (22.1)	340 (1)	< .001	0.47 [0.35; 0.63]
3. I am not working/studying at home, but I am employed/enrolled and will return to my activities as soon as the social isolation decree ends.	73 (10.4)	23 (3.3)	487 (1)	< .001	3.42 [2.12; 5.54]
4. I'm working on reduced hours or on a special work schedule.	102 (14.5)	68 (9.7)	383 (1)	< .001	1.58 [1.14; 2.20]
5. I was already working from home (WFH) before the COVID-19 pandemic.	54 (7.7)	49 (7.0)	506 (1)	< .001	1.11 [0.74; 1.66]
6. I'm working (home office)/ studying from home	366 (51.9)	339 (48.1)	0.005(1)	0.941	1.16 [0.95; 1.44]
7. I feel more productive at work.	71 (10.1)	98 (14)	419 (1)	< .001	0.69 [0.50; 0.96]
8. I feel less productive at work.	268 (38.2)	273 (38.9)	36.7 (1)	< .001	0.97 [0.78; 1.20]
9. I started using online video conferencing programs and/or applications with great frequency.	347 (49.4)	397 (56.6)	2.58 (1)	0.108	0.75 [0.61; 0.93]
10. You worked as a volunteer to help fight COVID-19	46 (6.6)	48 (6.8)	526 (1)	< .001	0.95 [0.63; 1.45]

Variable	Timepoint 1	Timepoint 2	$\chi^2(df)$	$p$	OR [95% CI]
	n (%)	n (%)			
11. You had some health problem that prevented you from performing your activities (work, study, etc.) for more than a month in the last six months.	115 (16.4)	114 (16.2)	317 (1)	< .001	1.01 [0.76; 1.34]
12. You lost your job in the last six months	48 (6.8)	44 (6.3)	525 (1)	< .001	1.09 [0.72; 1.68]

Note:  $\chi^2$  Continuity Correction for dependent sample.

Regarding perception of increase in productivity, 10.1% affirmed that they felt more productive working-from-home at timepoint 1, and we observed an increase of  $\Delta 3.9\%$  of that perception at timepoint 2. However, the effect size for this question was trivial, and therefore, non-significant. On the other hand, about more than a third of workers affirmed that they felt less productive, without a significant difference between the two timepoints.

About half of the participants reported that they were using video conferencing programs or applications very frequently, without a statistically significant difference between the timepoints. About 16% of the sample also reported having had health problems that compromised their work/studies for more than a month in the last six months, maintaining the same levels in both timepoints. About 6% said they worked voluntarily to help fight COVID-19, and finally, about the same percentage indicated they had lost their job in the previous six months, without a significant difference between the timepoints for both questions.

#### 4. Discussion

The objective of this study was to investigate the work environment and behavior in the COVID-19 pandemic, as well as possible changes during it in a Brazilian sample. Therefore, longitudinal data from a non-random sample was gathered. According to data available on the online dashboard of the Center for Systems Science and Engineering<sup>25,26</sup>, the timepoint 1 of the present study coincides with the sharp rise of the first wave of COVID-19 cases in Brazil in 2020 (May to July). Timepoint 2, which took place between November 2020 and January 2021, overlapped with the country's second wave of COVID-19 cases. Considering this information and the data presented in this article, this indicates that while there was an increase in the number of disease cases in Brazil, approximately one fifth of people reported having to leave home to work normally. In addition to leaving home to work, a similar proportion left home while feeling afraid of the disease.

Very different results were obtained for other countries. For example, while we observed in our study a maximum of 18.5% of respondents who reported having to work while afraid of COVID-19, between 30% and 49% of COVID-19 frontline workers from Denmark said they were afraid of getting COVID-19 at work<sup>27</sup>, and 82.4% of respondents in a sample of Australian workers were concerned about the same<sup>28</sup>. Also, in a sample of 650 dentists from 30 different countries, 78% reported feeling anxious or afraid of getting the virus, and 87%

were afraid of being infected by one of their patients or co-workers<sup>29</sup>. This might suggest that the workers on our sample tended not to feel as afraid as workers who participated in studies from other countries, despite that Brazil was an epicenter of the disease in 2020, with the second-highest number of COVID-19 cases in the world<sup>30</sup>. As Joaquim et al.<sup>31</sup> have shown, despite the possible harm to mental health, fear is an important emotion because its role is to protect us from danger, which can be helpful in a pandemic. In Joaquim et al. research, the more emotionally stable participants tended to overestimate the risks of breaking social isolation.

Fewer people reported that they were waiting for the suspension of the social isolation decree to return to their work/study activities, despite being enrolled/employed and not working/studying-from-home (a decrease of 7.1%). Since the question was based not only on activities exclusively for work but also on study activities, this factor might have influenced the different results observed at timepoint 2. Also, fewer people reporting working with reduced hours/special work schedules (a decrease of 4.8%) might indicate less idle time. It is possible to hypothesize that this type of situation might be related to a context that political and economic pressures led to an increased need to return to work: even though social restricting measures were rapidly applied at the beginning of the pandemic, the Brazilian government was already easing them by May<sup>19</sup>.

During the pandemic period, the majority of participants from our sample did not report changes in their perception of productivity. In second place, there were participants who reported feeling less productive, followed by those reporting feeling more productivity. Other researchers should investigate possible factors among the various possible changes in the work environment and behavior during the pandemic related to these results, since it might be associated with an impact on the psychological well-being of workers, as their behaviors. Feng and Savani<sup>32</sup>, for example, observed on a sample of North American individuals that women tended to report lower productivity and job satisfaction compared to men during the pandemic, a situation that did not occur before and might be due to extra chores at home. Rubin et al.<sup>33</sup> also found that most respondents in their research felt less productive while WFH, and enjoying work less, despite feeling more prone to WFH again in the future. Another alarming hypothesis has already been proposed: that domestic violence against women in Brazil became more frequent during the pandemic. That concern was raised because in 2020 the number of google searches for how to report domestic violence increased, achieving its highest peak in the last 17 years<sup>34</sup>. Future studies should investigate the variables that could be impacting workers' productivity, including abuse.

About 7% of respondents reported having gone through a WFH experience since before the pandemic occurred, compared to approximately half who claimed that they were doing the same when completing the questionnaire (in this case, including studying-from-home too). Moreover, there were no significant changes from timepoint 1 to timepoint 2. This means that, most likely, a considerable portion of the sample subjects (approximately 43%) got involved for the first time in their lives in an experience of work/study-from-home during the pandemic, and that experience was stable and still happening at least until the second timepoint. A survey including workers from the United States, China, Japan, South Korea, UK, and Italy found an approximately similar proportion (39%) of workers who started a WFH regime in the first months of the pandemic<sup>35</sup> (data

available at <https://osf.io/aubkc/>). This proportion was more dramatic on Galanti et al.<sup>36</sup>: when analyzing a sample of Italian workers, they observed that approximately 91% were also having their first WFH experience during the pandemic.

This context generates demands for alternative means of communication, and it was possible to observe a congruent result: about half of our sample reported having started using video conference applications/software with great frequency, without significant changes from timepoint 1 to timepoint 2. Karl et al.<sup>37</sup> pointed out some advantages and concerns based on 549 comments from LinkedIn members: the use of polling, the virtual chat, and more personal interactions with co-workers were pointed out as advantages, while late/long meetings, lack of an agenda and multi-task were negatively evaluated.

About 6% of the sample reported having done voluntary work to help fight COVID-19. There was no significant increase or decrease between the two timepoints. Understanding what drives someone to volunteer might be essential to increase this behavior when needed. Mak and Fancourt<sup>38</sup>, when analyzing a large non-random sample of British adults, observed that the volunteer work that happens during the pandemic might not be the same as before. The authors found that different groups tended to behave differently about voluntary work: Some groups tended to do more, as older, highly educated, and socially supported adults. Others tended not to have increased, as such the ones who lived in urban areas. Characteristics like white ethnicity and employment were associated with fewer chances of decreasing volunteering, while divorce, neuroticism, and physical health conditions were associated with a decrease in volunteering.

Approximately the same proportion of participants observed in the previous question said the same about having lost their job in the last six months (6%). Similarly, in this case, there was no significant difference between timepoints. However, our results correspond to less than half of the unemployment rate reported by the Brazilian Institute of Geography and Statistics at similar times, which was 12.9% in May 2020 and 14.1% in November 2020<sup>39</sup>; it is possible that this difference may be due to the specific sociodemographic characteristics of our sample, such as high income and education.

About 16% said they had experienced a health problem that prevented them from working, studying, or carrying out their activities for longer than one month in the last six months, without a significant change between the responses provided at the two timepoints. One of the many possible factors that can play a role in this result is mental illness, and some individuals are more vulnerable to experiencing increased symptoms during the pandemic. Joaquim et al.<sup>40</sup> pointed out that a possible risk group consists of those who already had psychiatric diagnoses, or who lost loved ones during the pandemic. Mental illnesses can lead to significant difficulties in maintaining productivity when performing daily activities. It can even prevent someone from working or studying for as long as it perdures, depending on how severe the illness gets. Mental health cannot be disregarded for building a healthy workplace when facing new challenges, as the pandemic.

This study has several limitations. Considering the sociodemographic characteristics of the participants, as well as the selection of a non-randomized voluntary sample, the results must be interpreted with caution, and it is necessary to avoid extrapolations to a larger or different population. Therefore, it is prudent to

restrict the interpretations of the results only to the subjects who answered the survey. Generalizations for the entire Brazilian population are not adequate and should be avoided. It was not possible to assess the difference between essential and non-essential workers, and it was beyond the scope of our study to carry out a comparative analysis between sociodemographic data, such as gender, income and age, and the answers to the work questions. Future studies should address these issues in greater depth.

All data collected was self-reported, that is, the participants themselves were those who described their behavior. Thus, it was not possible to objectively assess issues as productivity without a risk for bias, for instance. Furthermore, some questions had more than one element contained in the same item, which can be another source of bias. For example: questions that involved work and studies at the same time, or both a special work schedule and reduced hours. This limits the interpretations that can be drawn from our results. It is also impossible to point out the cause of the results obtained in this research, since this is an observational study. Even so, hypotheses can be raised and hopefully encourage further research.

## 5. Conclusion

The pandemic context led workers to experience new ways of performing their activities, impacted their perceptions about their own productivity, the resources they used to work, where/how they worked, and how they felt about their routine. However, most variables tended to remain stable while the pandemic was still in place, when comparing the two different timepoints from may/july to nov/jan. Working is a crucial aspect of the individual's life and changes in the work environment stimulated by the measures to prevent COVID-19 infections can provide a relevant additional stress. Thus, assessing how the work context and routine are being perceived and experienced by the individuals and how they behave when exposed to this new reality is important. Other studies addressing the association between changes in the work environment and psychological distress can help clarify the impact of work-related COVID-19 changes in mental health.

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