



THE PHYSICAL IMPACTS OF REMOTE WORK DURING THE COVID-19 PANDEMIC

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Abstract

This document brings the results of a research and extension project, "Each one in his square (cube): rethinking the spaces of housing, work and culture in times of pandemic", being the research front to study the impacts brought about by the change in the work (study) -home relationship during the pandemic period, issues related to the health and well-being of the affected population. To this end, parameters such as ergonomics and space functions linked to performance, quality and problems of the actions performed in the home-office were taken into account, in addition, how could the adequacy of the architecture and furniture design modify these issues. To obtain the necessary information, bibliographic reviews and interviews were carried out. Through the research, it was possible to suppose that changes in the physical space and in the way the tasks are performed, together with the advice of professionals in the area, such as architects and physiotherapists, can help to reduce the negative impacts of the new work and/or study model introduced even before the period of the pandemic, and after it, accelerated and intensified.

Keywords: *Home Office*, COVID-19, Ergonomics and Impacts.

1. INTRODUCTION

The COVID-19 pandemic that began in China at the end of 2019 has brought with it several changes in society, in the ways of acting, relating, studying, and working. Regarding the last two factors, due to the imposition of telework and remote studies, there was a significant change in the relationship between housing and work/study, bringing some benefits, such as less time spent in traffic to go to work, greater possibility of autonomy and, from the perspective of employers, they saw their expenses reduced with physical environments. However, one can ask what were the negative impacts brought about by this modification of environments and relationships.

The objective of the research is to identify such impacts, especially the negative ones, brought about by the change in the work-housing relationship, judging the study in higher education as a form of work, in the pandemic period and raising issues related to the health and

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well-being of the affected population. Taking into account parameters such as ergonomics and functions of the space linked to the performance and quality of the actions carried out there. Furthermore, how could adaptation by architecture modify these issues?

The target population was higher education workers and students who were affected by the forced adaptation to teleworking and remote study in the period of spread of the COVID-19 pandemic. To this end, bibliographic research was carried out based on data from institutions such as the Brazilian Institute of Geography and Statistics (IBGE), the Institute of Applied Economic Research (IPEA) and the General Register of Employed and Unemployed (CAGED). In addition, it was possible to conduct an interview in March 2021 with two employees of a *facilities² company*, which provides services to a large multinational company in the field of online services and software in the United States, to understand how the management of this modification of environments took place in such a large, international company and, which has more abundant resources, so that, having it as an aspirational company, what could be replicated, adapted to circumstances and locations, to small and medium-sized Brazilian companies.

2. DEVELOPMENT

2.1. Socioeconomic Profile:

According to Ipea (2020), the *Home Office* in 2020 could reach 22.5% of occupations in Brazil. Women are the vast majority who adhered to remote work during the quarantine period in the COVID-19 pandemic, accounting for 57% of the amount. Regarding color/race and level of education, the white population had 65.4% and 76.1% had higher education. As well as age, 31.6% are between 30 and 39 years old and 84.1% are in the informal sector.

In the economy classes, class A/B is ahead with telecommuting, occupying 52%. (C6 Bank/ Datafolha, 2020)

The large percentage of women in the *Home Office* also brings up an issue that has been discussed: the responsibility of care still maintained as a duty of women, such as domestic chores and child education in some or many Brazilian homes. Not to mention that the woman is the main or only provider of the house. All this generating a second or third working day for women. In the pandemic period, in which a portion of these women had to manage these tasks while maintaining their economic work activity, it may have brought more impacts than the rest of the population. Part of this impact was measured by the *Parent in Science* group (2020)¹, in



which it showed the relationship between gender, race, and the presence of the need for care (such as children) impacted, during the pandemic period, mainly with the relationship of academic publications among women in the scientific environment, reaching the conclusion that

"Especially for article submissions, black women (with or without children) and white women with children (mainly aged up to 12 years) were the groups whose academic productivity was most affected by the pandemic. The academic productivity of men, especially those without children, was the least affected by the pandemic." (*PARENT IN SCIENCE*, P. 12, 2020.)

On the other hand, scholars Abreu, Marques and Diniz (2020), show the reality of women who deal with basic jobs, self-employed services, among others, had a large increase in the workload within the home due to the lack of division of labor. In addition, it shows that women are the vast majority in jobs related to professions in the health area, making them run more Risk of contract the Covid-19. Furthermore, one of the jobs that is commonly left as an obligation to women is care, that is, taking care of sick people, the elderly and children. Therefore, during the pandemic period, this work also had a large increase, since the virus itself caused more people to be sick, as said, "*women, when they are not part of risk groups, are part of care groups and, therefore, the moment is especially critical for them.*" (ABREU, MARQUES AND DINIZ, P. 6, 2020); Another point is the issue of child care, who in the period in question could not have the help of daycare centers and schools to stay during the day, making it more

The researchers also point out that this greater difficulty in household chores changes according to class and race, since "the poorer the families, the greater the amount of free work to be performed (no dishwasher, no washing machine, etc.), adding to the lack of resources to pay another woman to perform some of her tasks." (ABREU, MARQUES AND DINIZ, P. 6, 2020)

¹ *Parent in Science* aims to raise the discussion about motherhood and fatherhood within the universe of science in Brazil, created in 2005 and is formed by 15 mothers and 1 father, who in addition to this activity, are researchers and teachers.

² "Facility Management: "organizational function that integrates people, spaces and processes within a built environment with the objective of improving people's quality of life and the productivity of the main business"" (ABNT, 201-)



According to UN Women (2020), in addition to the impacts caused by the poor distribution of tasks within homes, women are still the most affected by unemployment also during periods of economic crisis, such as that caused by the COVID-19 pandemic. It is also pointed out that one of the major means of services for women in informal jobs is work as domestic workers, another range of services widely affected by the virus.

As well as, there is the portion of the population such as women who are teachers and mothers, who have had their lives largely changed due to the new normal. Due to this change in the work-home relationship, in addition to being responsible, most of the time, for the work of taking care of children and/or dependent people at home, with the pandemic and remote classes, it was possible to notice an increase in the workload of this population, so that, in general, the time of work performed by these women has increased significantly. In addition, this overload results in health problems, especially in mental health, leading to cases such as Burnout Syndrome, which is characterized by the worker's loss of will and sense with their work, making them no longer feel encouraged and reason to perform it. (JASKIW; LOPES, 2020)

Therefore, the new relationship of reconciling work, which was previously performed outside the home, with activities already performed inside homes, must take into account the multiplicity of roles that women play, something that was already consolidated even before the pandemic and that continued as the new form of work, a discussion that should take the stage in society, so that these injustices become evident, lucid and can be taken in relation to them.

Ademias, it was verified which types of jobs were the most modified for the *home office* relationship, which were exemplified below in tables 1 and 2. Since some areas tend to be able to adapt better to the remote model than others.



Table 1: Impact of the home office on the types of work

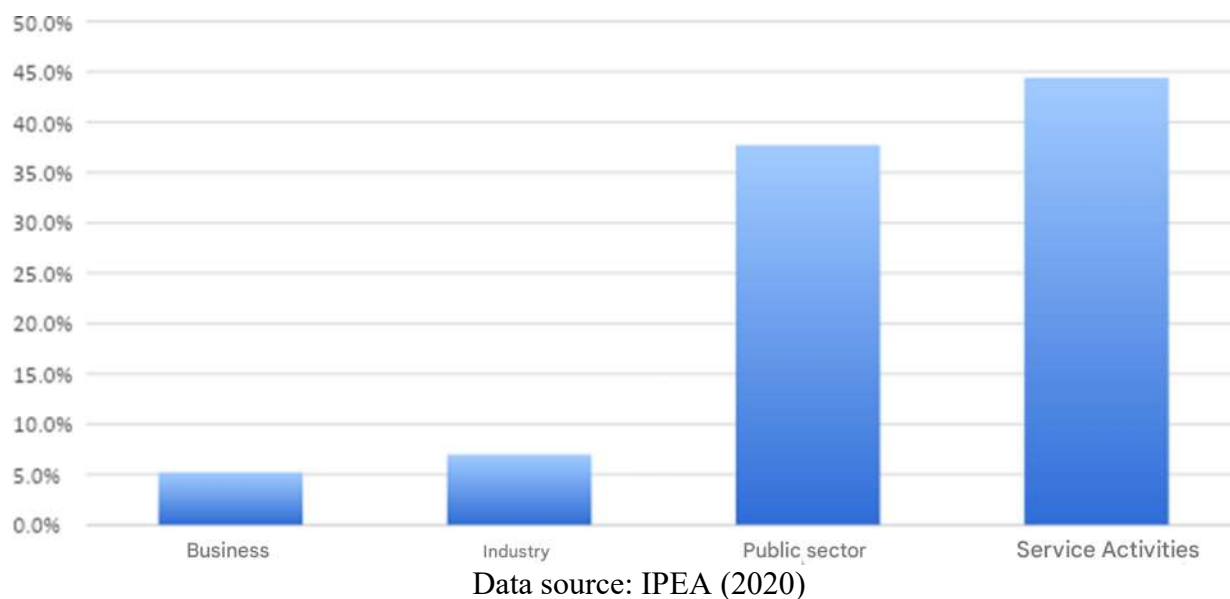
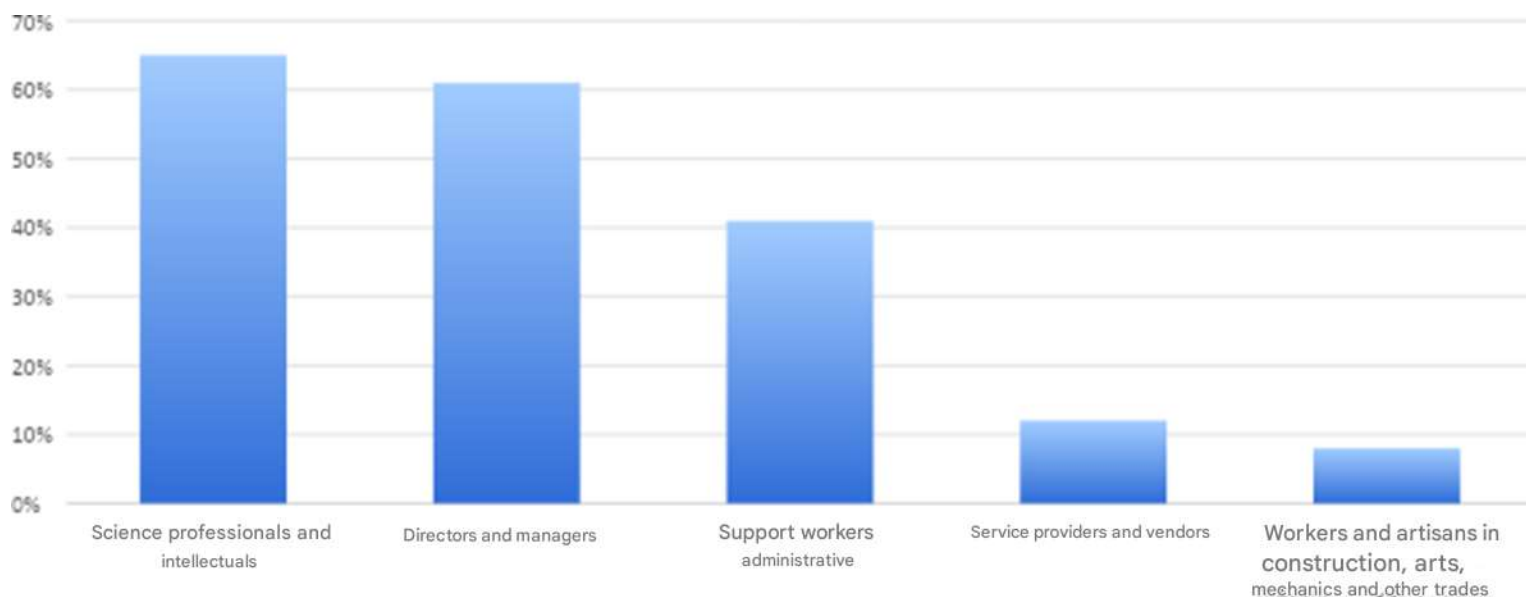


Table 2: Types of jobs that tend to *work from home*



2.2. The Home as a Workplace

Does Brazilian society have prerequisites in housing issues to meet these changes? As defended by Mendonça (2010), the residence as it is known today has been a process of great transformations over the years. In ancient civilizations, it was common for the work environment and living to be shared, something that now the population needs to learn to reconcile again. As discussed, however, these changes are happening too quickly, therefore, it



is not thought of in spaces for only work and study within homes, but rather in an adaptation of existing spaces, with the performance of more than one task per space produced. Not to mention that in large metropolises spaces are increasingly reduced, and performing several tasks in the same space is inevitable.

As shown in his case study research of new developments in the city of São Paulo - SP, in the years 2006 to 2009, there was already a concern about the adequacy of the new architectural plans in 22% of the projects, but the quality of the place placed was limited to the minimum dimensions necessary. (MENDONÇA, 2010)

In the survey carried out by *Archademy* in 2021 (ZANATTA, 2021), it shows that the demand for optimizing homes for the inclusion of *the Home Office*, or due to the longer time that it was necessary to stay only at home, increased significantly during the period of the COVID-19 pandemic. And "*85% of the 650 offices interviewed generated proposals during the period of social isolation. [...] Among them, 50.5% involved adapting environments to home office [...]*" (ZANATTA, P.1, 2021)

On the issue of subjective, psychological well-being, factors external to remote work can interfere with this relationship and results. A survey carried out by Lizote et al (2020), among undergraduate students, who are close to a professional life, brought as results "*that there is a perception of damage to well-being, since on average, the perception of negative affects is greater than positive affects.*" (LIZOTE, P. 262, 2020). In addition, "*it was also observed that the less the activities are related to intrinsic and autonomous reasons, the greater the incidence of perception of negative affects*", (LIZOTE, P. 261, 2020).

2.3. Negative impacts observed in the new home-work relationships

According to a survey carried out by the Getúlio Vargas Foundation (FGV) in partnership with the *Institute of Employment Studies* (IES) of the United Kingdom and with the technical support of the company *Sharecare*, it shows that the imposed modality of the *Home Office* due to the Covi-19 pandemic brought several impacts to the lives of workers, both physical and psychological. Aiming mainly at the physical impacts, the survey in question shows that the most frequent complaints among the people who were collected the data are "*back pain (58%), neck pain (75%), eye fatigue (55%), sleep loss (55%) and headaches (53%).*" (BORI; p.1, 2020). As well as 63% said they are not exercising in the way and frequency they did before the circulation of the virus and 46% are having difficulties in imposing the hours worked, causing the workload to increase and be irregular. These impacts are mainly caused by



the lack of an environment, with adequate furniture and comfort indexes, in relation to the body. In the psychological area, the stress and the situation of the pandemic and relationship already consolidated before this moment, may have helped to bring these problems to individuals.

According to a survey carried out in Germany in 2021, workplaces that have become in their own homes are similar to those of office environments that use computer devices, such as computers, and therefore their problems and solutions are based on the same base of guidelines. Some points that must be taken into account when measuring greater comfort are issues such as the appropriate lighting ratio to the work tables (each type of work requires a certain amount of lighting, with Brazilian parameters in NBR 5413, which deals with interior illuminance); Another point is the issue of the temperature of the environment, whether it is adequate for a better performance of the worker. (MOJTAHEDZADEH, et al, 2021)

The issue of hours worked must also be taken into account, since in this type of work there is greater difficulty in imposing time limits and preventing further interruptions, which can lead, in addition to the increase in the workload, in contrast, to a higher rate of errors and a decrease in productivity and, with these points, increased stress. In addition to the greater number of hours worked can be an impact, the difficulty of disconnecting from matters due to the environment being the same also becomes a problem, which can lead to exhaustion of these workers and problems with sleep, for not being able to separate and stop thinking about the impasses that occurred during work. (MOJTAHEDZADEH, et al, 2021)

Taking into account the similarity of the jobs mentioned above, a research project that aimed to highlight the work-related impacts in a financial sector, also brought competent points with the telework modality, especially the resulting impacts on WMSD (Work-Related Musculoskeletal Disorders). These results are due to furniture and utilities that do not properly adapt to the work produced, such as chairs with inadequate adjustment, height of computer monitors or use of cell phones with wrong posture, lack of support on the table for documents and the like, increasing the need for rotation and flexion, lack of footrest or the misuse of such objects, such as the armrests that prevent the correct posture of the torso in relation to the table. Another point is the position of the instruments, such as the monitors positioned in front of the entry of light, making it difficult to read and for this the posture to be disarranged. (FERREIRA; SHIMANO; FONSECA, 2009)

On the other hand, it is necessary to understand which measures could help reduce these impacts caused by remote work, as in a study carried out by Tanoue, et al (2016), showing how the use of a more appropriate chair can prevent future lumbar and pelvic problems, as well as



influence on fatigue and work performance. In the research, two "types of sitting" were examined, one with a static chair, which does not allow movements and another with a more dynamic chair, in which there is the possibility of more frequent movements and through this analysis of the two types, it was possible to deduce that the use of a dynamic chair helps to reduce fatigue and physical problems, making working seated less impactful throughout the workday.

In addition, studies carried out by Jan Dul and Bernard Weerdmeester (2012) indicate that the practice of alternating the way of studying/working standing and sitting, in order to eliminate prolonged postures that are harmful because they are subjected to long tensions. Therefore, the workstation, if possible, should be designed to accommodate both types of positions. In addition, exercise and breaks during this process are also recommended.

As well as, those who work remotely without the correct help on how to use electronic equipment can also suffer from eye fatigue due to the time exposed to screens, the inadequacy in relation to the necessary angles and distances, which can lead to other problems such as headache, caused by eye fatigue. According to researchers Coles-Brennan, Sulley, and Young (2019), something that can help reduce these impacts is the ergonomics of digital devices, such as the adequacy of incident lighting, careful positioning, adjustments to image parameters, and intervals. Regarding the last topic, the eye rest method called 20/20/20 is indicated, practiced as follows, every 20 min using a digital device, pause for 20 seconds looking at an object/landscape that is at least 20 feet (approximately 6m) away (See Figure 1).



Figure 1 Illustration of the 20/20/20 Eye Rest Method.

Source: <https://www.juststand.org/blog/prevent-eye-strain-with-the-20-20-20-rule/>.

Accessed on June 29, 2021.

In addition, in Brazil there is the NR 17 standard that provides for ergonomics, applied by MTb Ordinance No. 3,214, of June 8, 1978, bringing some parameters necessary for ergonomics within work environments. One of the bases that the document brings is in relation to the environmental comfort in general of a work environment, it should be noted that it is foreseen that the noise levels of the environment must be in accordance with the Brazilian standard registered with INMETRO, NBR 10125, such as the effective temperature must not exceed 23°C or less than 20°C and the relative humidity of the air less than 40% and its speed lower than 0.75m/s, in addition to adequate lighting for the activity performed.

On the other hand, these measures, within conventional workstations, were already difficult to execute and supervise, when moving to telework, whose proposal carried out in a hurry and without great planning and foundations, there is a great possibility that most homes do not have these parameters, as well as companies have not been able to provide this support to adapt to telework or *home-office*.

Regarding the ergonomics of furniture and work tools, NR 17 brings the following parameters for a better adaptation of the work environment, the video monitor must have correct



angulation and height adjustment, since for each person there will be an exact height that must be adjusted so that the monitor is in front of the person's eyes, so that it does not cause eye strain and spinal problems. As well, the keyboard and mouse must be accommodated so that the arms are not at an angle different from 90° with the body, and there is also the need for this furniture to be adjustable, so that each person can adjust in the best way (See Figure 2).

Still in relation to the table furniture, it must have space for, in addition to accommodating electronic devices, space to support documents and other items necessary for the work in question, with a minimum depth of 75 centimeters in case there are no reference materials and 90cm with the materials. Regarding the chair, it should also have an ergonomic design to support the lumbar and there should be no conformation of the base, and if these measurements are not enough for the person to be able to reach the floor with their feet correctly, a support apparatus is necessary for this (See Figure 2).

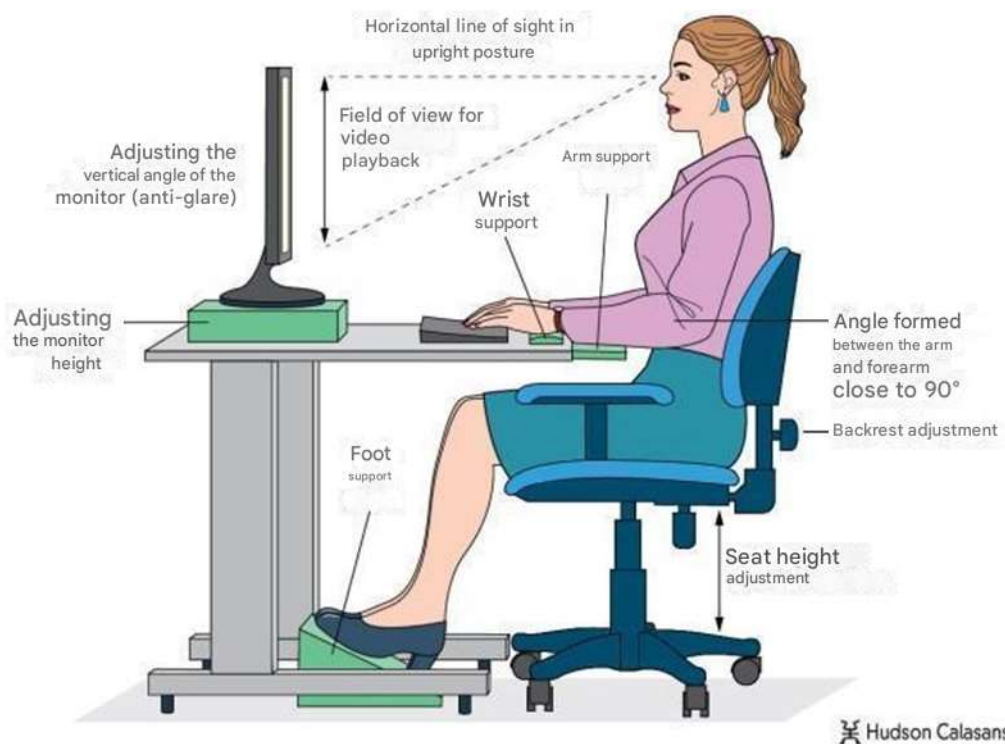


Figure 2 Schematic of how the furniture should fit the body to cause less impact.

Source: <https://riosassuncao.com.br/2020/04/22/ergonomia-e-home-office/>. Accessed on: June 29, 2021

Another point that can contribute to the reduction of the impact due to repetitive work and bad postures due to inadequate furniture to perform the activities, is Workplace Gymnastics, which consists of exercises, which take an average of 5 to 15 minutes, in order to prevent injuries, such as Repetitive Strain Injuries (RSI) and Work-Related Musculoskeletal



Disorders (WMSD), as well as the reduction of stress, through stretching and relaxation exercises.

This type of practice can be divided into three sectors, preparatory gymnastics, which is performed before work hours, as a stretching and to be able to focus the mind, disconnecting from the outside; The second is compensatory gymnastics, which makes the muscles that are most used during work relax and in counterpoint, puts the others in exercises. The third type of gymnastics is relaxing, done at the end of the workday through relaxation and venting the tensions of the muscles most used during the day and, like the first, aims to disconnect from the task that was being exercised, to be able to move on to the next stage of the day. Therefore, elements of paramount importance when working remotely, especially preparatory and relaxing, since they manage, through exercises, to place barriers that better separate each moment and type of work during the day. (LIMA; NOGUEIRA, 2017)

2.4. Adaptation of workspaces by Companies / Institutions

According to Law No. 13,467, of July 13, 2017, which Amends the Consolidation of Labor Laws (CLT), approved by Decree-Law No. 5,452, of May 1, 1943, and Laws No. 6,019, of January 3, 1974, 8,036, of May 11, 1990, and 8,212, of July 24, 1991, in order to adapt the legislation to the new labor relations, it brings the Telework regime in Art-75 A to Art. 75-E, in which they describe that the performance of work remotely can be carried out legally, as long as it is carried out by mutual agreement between the parties, this imposed in the contract. In addition, it is governed that the provision of minimum equipment for the performance of tasks by the employee is the responsibility of the employer and these must be provided for by means of a contract, in addition to the employer's instructions to employees in relation to the prevention of occupational diseases and accidents.

On the other hand, this constitution of labor rights takes into account remote workers who are registered in this modality, and the telework caused by the Covid-19 pandemic was something without prior planning, meaning that workers did not have the power to demand at least the minimum that is supported by this law. It should be noted that the existing laws so far are vague regarding several points regarding remote work.

Given as an example, Article 75-D, which is responsible for the provision of work tools, leaves it up to the employer and employee relationship to define what is essential for this, so the possibility of adequate ergonomic items, such as a chair and table of comfortable heights and materials, can pass as non-essential items, but which may imply future health problems for



workers, such as lumbar, vision or even psychological problems, since there is no provision by law for the employer to provide a basis for the person conditioned to telework to be able to deal in a healthy way with the new relationship of their housing and routine activities and formal work.

Another point that the legislation could meet is the issues related to the necessary breaks during the working day, so that there are no problems such as muscle fatigue in cases of repetitive work or eye fatigue due to a long period of exposure to electronic equipment, such as the computer. To this end, it would be necessary to have a set of professionals (medical specialists, physiotherapists, etc.) to determine the most coherent periods of breaks during the use of the Home Office method, making it possible to location with practices such as workplace gymnastics, which has also been seen as a good option to reduce the physical and psychological impacts caused by uninterrupted work.

Tangent to the last point made, another necessary concern is related to the mental health of employees. That said, there should be instruments within the law that can ensure this type of support for workers by companies, for example, in companies that have a larger contingent of employees, have help from professionals such as psychologists, or even when offering health plans, verify that these franchises cover a service in the area.

2.5. Aspirational company

The survey conducted an interview in March 2021, with the presence of two employees of a *facilities* company, which provides services to a large multinational online services and *software* company in the United States, which hosts and develops a series of internet-based services and products, and installed in some Brazilian capitals. The interview aimed to understand how a large company behaved in relation to the *home office* during the COVID-19 pandemic period. Since, the abundance of resources in a company as such is different compared to smaller companies, however, the possibility of taking it as a base is understood.

Another point in question is that the company that receives *facilities* services is known for its welcoming work environment that allows various functions within the company itself, such as beauty care, health, food, among others; therefore, this modification would also change this culture of the work environment, which aims to retain talent, since it is still a branch of great competition. Therefore, the workplace is very important to recruit these people, making the work performed only within the physical institution, with only remote work being allowed to reduce the distances between branches.



As stated by the interviewees, the company in question, being a multinational, was already previously, as far as possible, prepared for the arrival of the virus, since it had already reached other branches in the world, so the procedures were already being designed for these cases and some of the ideas put into practice in other places could be used.

It should be added that the company had previously already had a program focused only on ergonomics within the workspace, therefore, there was already this concern with the impact of furniture in relation to the body, examples being the use of tables and chairs with height adjustments for each individual to be able to leave the apparatus so that the arms form 90° angles and the head is straight in relation to the monitors or can have a view of the means of work without sudden changes of position.

With the arrival of the pandemic and the transition to *working from home*, the company continued with the program in question, taking these consultancies from spaces and furniture to the online environment, so that employees could clear their ergonomics doubts that would be necessary inside their homes.

At the beginning of this process of modifying environments, the company made it available for employees to take the company's furniture to their homes, but over time this began to become more difficult due to the small agglomerations that were happening with these displacements of employees, making them choose to stop this practice and provide a *voucher* of a necessary amount so that they could buy the most suitable apparatuses, such as chairs and tables and be able to make the workspace inside the house more pleasant and less likely to have negative impacts.

Another point was the company's concern with employee health issues, which is not only physical, but also mental health, with programs that help people to be able to focus on work, but also, on the other hand, to be able to take breaks and exercises that are not part of the service in question, as well as giving the necessary support for mental health issues, some of them, for example, are yoga classes, stretching and workplace gymnastics.

However, it is known that such a company has resources that are outside the standard curve of small and medium-sized Brazilian companies, since they do not have all this support due to funds or knowledge applied and studied for each business. Therefore, this example serves to have it as an aspirational company and understand what happens to large companies and see what can be adjusted for others, in different measures and numbers.

Companies that have fewer resources can still support the level of knowledge for their employees, making bulletins, in order to show which measures can be used to reduce the



impacts, such as which furniture would be more suitable, why separate activities within the same environments. In addition, being able to indicate public access channels in online networks that pass activities such as yoga, workplace gymnastics and the like, if there is no possibility of being able to afford a physical education or physiotherapy professional, without forgetting mental health care, which is also of great importance.

3. CONCLUSIONS

The COVID-19 pandemic has brought several changes to the daily lives of people around the world, one of them being the acceleration and increase in the transition from the work and study environment to *working from home* / *Home Office* / Telework. Alongside this transformation, it was possible to see that there were positive impacts, such as less time spent commuting to the workplace and greater autonomy of individuals. On the other hand, there were also negative impacts resulting from the interactions of the new workspace and the activities practiced, such as problems related to the physical (headaches, lower back; WMSD/RSI; tired eyes), as well as psychological, such as increased stress, difficulty imposing limits, syndromes and the like.

As initially proposed, this work further researched the negative physical impacts caused by the changes, influenced by the lack of ergonomics, adequate separation of spaces and tasks, and guidelines on how to proceed in the face of this "new normal", such as assessing which groups are affected and their relationship within the city.

As a result, it can be confirmed that a large part of the population that went to remote work and/or study had impacts on their life and housing, as well as it was possible to point out that not all classes, social groups and gender suffered in the same way. That said, it would be inappropriate to conduct a judgment of the impacts and how to minimize them without first being able to understand the social differences that already exist and that were accentuated during this pandemic period. Therefore, it is clear that it is necessary, concomitantly with the process of adapting the new jobs, the continuation and creation of projects that encompass the individualities of these less visible and more harmed social groups.

Through this research, it was seen that the ergonomic parameters of furniture and the use of pause and focus mechanisms can help to improve these negative impacts that have been affecting Brazilian workers. Some examples cited in this article are resumed: the use of chairs and tables with heights adjustable to each body; programs within companies that help employees maintain an adequate rhythm and know how to separate the various activities carried



out in the same environment; and, whenever possible, the guidance of professionals from each area to encompass these changes, such as physical education and physiotherapy professionals for activities that involve the exercise of the human body, and the relationship between the architect and urban planner to adapt the environments where work and/or study activities will be carried out.

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