

A systematic review on the impacts of Covid-19 on work: Contributions and a path forward from the perspectives of ergonomics and psychodynamics of work

Tiago F. A. C. Sigahi¹  | Bruno C. Kawasaki¹  | Ivan Bolis²  | Sandra N. Morioka³ 

¹Department of Production Engineering, University of São Paulo, São Paulo, SP, Brazil

²Department of Psychology, Federal University of Paraíba, Cidade Universitária, João Pessoa, PB, Brazil

³Department of Production Engineering, Federal University of Paraíba, Cidade Universitária, João Pessoa, PB, Brazil

Correspondence

Tiago F. A. C. Sigahi, Department of Production Engineering, University of São Paulo, Avenida Professor Luciano Gualberto, 530, São Paulo, SP 05508-010, Brazil.
Email: tiagosigahi@usp.br

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Abstract

Work is a major issue in the discussions on the Covid-19 pandemic, whose consequences impair the capacities of workers at all organizational levels and impose unexpected challenges on managers. Nevertheless, the scientific literature still lacks an overview of how researchers have been covering the issue. This article presents a systematic review to investigate the impact of Covid-19 on work and workers of all occupations, reveal research gaps, and help managers to adapt to organizations amid the pandemic. This review is based on a sample of 258 papers from Web of Science and Scopus databases. Quantitative and qualitative analysis indicated a vast majority of studies focused on frontline healthcare workers and a lack of empirical investigation on managers' work. We show how literature has been addressing different aspects of work (e.g., workers' health, working conditions, procedures, protection equipment, remote working, etc.) in the various economic sectors. We discuss the results in light of ergonomics and psychodynamics of work, two disciplines that conceive work and organization as intimately connected, and that can assist managers in meeting the difficulties brought by the pandemic. We highlight that considering the construction of health, interindividual variability, subjective relation to work, supportive workplace environment, and organizational and individual capabilities can play a key role in successfully adapting and transforming organizations in the current scenario.

KEYWORDS

Covid-19, ergonomics, management, psychodynamics of work, work

1 | INTRODUCTION

The Covid-19 pandemic has raised questions on how human life is and should be organized. Organizations and societies certainly have had their lives radically and rapidly transformed, whereas the effects of the pandemic crisis in the long term are uncertain. Studies in various fields of management have been trying to understand the impact of this crisis on organizations. The literature reveals diverse transformations in

business models (Ritter & Pedersen, 2020), innovation strategies (Chesbrough, 2020), corporate social responsibility, marketing (He & Harris, 2020), value chains (Verbeke, 2020), supply chains (Ivanov, 2020), consumer behavior (Sheth, 2020), and management education (Beech & Anseel, 2020; Brammer & Clark, 2020).

One aspect that permeates the aforementioned transformations, but deserves more scholarly attention, is work—including managers' work. The centrality of work in the construction of workers' health,

social relations, and organizations (Dejours & Deranty, 2010) points to the need to advance in the subject. The impact of Covid-19 on work and workers is diverse. After its outbreak, some of the ongoing transformations, such as the digitalization of work and the growing prevalence of mental health disorders, have accelerated. Also, novel discussions emerged on topics, including changes in work procedures, personal protection equipment (PPE), infection control strategies, behavior, gender, and ethics. In the scholarly literature, however, there is still much to explore on the impact of Covid-19 on work and workers, and the implications for management. In one of the few articles on this subject, Carnevale and Hatak (2020) explore both challenges and opportunities that the pandemic represents to human resources management (HRM), and claim that management scholars should coordinate research on it. In particular, the authors affirm the importance of integrating different disciplines so that HRM issues can be addressed in an integrative way. As Donthu and Gustafsson (2020, p. 284) state, Covid-19 is “a sharp reminder that pandemics, like other rarely occurring catastrophes, have happened in the past and will continue to happen in the future.”

This article, therefore, has the following objectives: (1) to review the current academic knowledge of the impact of Covid-19 on work and workers, thus revealing research gaps and managerial challenges; and (2) to help organizations understand how to adapt work while remaining competitive. To achieve the objectives, we conducted a systematic literature review based on scientific databases and discussed our findings based on concepts of ergonomics and psychodynamics of work (PDW), thus complementing Carnevale and Hatak (2020). Both disciplines can contribute to the field of management by promoting organizational improvements that are less prescriptive (top-down approach) and more communicative (bottom-up approach), in line with the need to manage broad organizational changes imposed by the pandemic crisis.

On the one hand, ergonomics investigates the relationships between workers and other components of a system, such as tools, equipment, and technologies. Interventions in ergonomics aim to enhance human wellbeing and system performance as well (International Ergonomics Association [IEA], 2020). On the other hand, PDW investigates the relationship between work, worker's health, and suffering associated with work organization. In PDW, interventions afford spaces of discussion where workers can rely on each other to disclose and debate aspects of work that usually remain silenced, for example, fears, constraints, and difficulties (Dashtipour & Vidaillet, 2017; Dejours, 1992, 2012). Both disciplines presume the centrality of work in organizations (Dejours & Deranty, 2010) and the importance of workers' involvement and participation (Bolis et al., 2012; Dejours, 2009) so that organizations can better deal with intrinsic and extrinsic variability in the production of goods or services (Falzon, 2004). In the context of drastic changes, such as the Covid-19 pandemic, considering workers and their subjectivity can be decisive for organizations. Workers at all organizational levels can contribute with their knowledge, skills, and creativity to help organizations restructure and adapt to new realities. Also, by

understanding how work is being affected by the pandemic, leaders can help their organizations respond more effectively in the short term and be better prepared in the long term.

2 | METHOD

Systematic literature reviews are based on objective, rigorous criteria that allow transparency and replicability by other researchers. In this sense, systematic reviews differ from literature reviews, which traditionally have author bias (Tranfield et al., 2003). Our systematic literature review thus comprised three main phases: definition of the sample of publications to be analyzed; descriptive and network analysis; and qualitative classification and analysis. Next, each phase is described.

2.1 | Definition of the sample

The definition of the sample of the systematic literature review began with a search in ISI Web of Science and Scopus databases for publications fitting the following conditions: (i) directly related to Covid-19: search for (covid-19 OR coronavirus OR sars-cov) in the title, abstract, or keywords; AND (ii) work-related issues: search for (work* OR job OR labor OR labor) in the title or keywords. In addition, only documents written in English, published in 2020, and classified as “article” or “review” were selected. The search was conducted on July 23, 2020.

The selection process of articles was conducted in steps as recommended by the PRISMA protocol (Moher et al., 2015) (Figure 1). After removing duplicate records, an initial screening based on article titles and abstracts was performed to eliminate articles in which Covid-19 and work or workers were not the core topic.

In the eligibility step, the following exclusion criteria were applied:

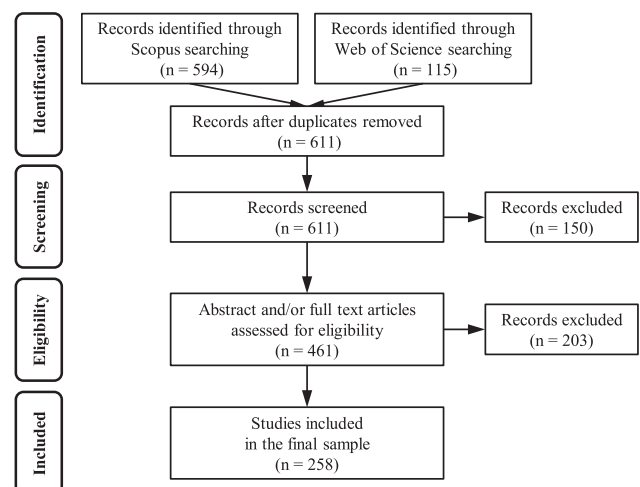


FIGURE 1 Selection process of the articles

- articles in which work or workers were not the core topic;
- articles focused on minimizing the spread of Covid-19 that do not result in organizational or work process changes (e.g., testing workers for infection);
- articles based on opinions on Covid-19 that have no clear impact on work;
- articles with religious biases;
- articles focused on public policies or initiatives that have no clear impact on work;
- articles consisting of tributes to a particular professional category;
- articles analyzing specific procedures without mentioning the impact on work; and
- research articles whose results were not submitted to a peer-review process.

To reduce the risk of bias, screening and eligibility steps were conducted by two researchers, who independently evaluated the articles. In the screening step, only articles with both researchers' rejection were excluded. In case of divergence, the article was accepted for the following step. In the eligibility step, the two researchers diverged on 47 articles, which was solved by a discussion with a third researcher. The final sample consisted of 258 articles (see Supporting Information Appendix A).

2.2 | Descriptive and network analysis

In the second phase, the sample was analyzed based on its metadata. The most frequent journals and the most cited papers were identified with MS Excel. Then, the journal co-citation and keyword networks were generated with VOSviewer software (van Eck & Waltman, 2010).

Each type of information was analyzed to obtain an initial overview of the sample (see Section 3.1). The keyword network was particularly relevant to identify thematic clusters, which also concerns the next research phase dedicated to categorization and qualitative analysis of the articles.

2.3 | Classification and qualitative content analysis

The third phase of the systematic review was performed to investigate the content of the articles. Two researchers read mainly the abstract and discussion sections and independently organized the articles on an MS Excel sheet. The content of each paper was thus extracted and categorized in two dimensions: *economic sector* and *aspects of work* addressed (e.g., effects on workers' health, working conditions, etc.). The definition of the aspects of work was based on keyword network analysis (developed in the previous phase) and qualitative analysis of the papers. Divergences on how to define them were solved by reaching a consensus among the researchers.

TABLE 1 Main journals of the sample

Journal	Articles
<i>International Journal of Environmental Research and Public Health</i>	12
<i>British Medical Journal</i>	7
<i>Journal of Hospital Infection</i>	5
<i>Asian Journal of Psychiatry</i>	5
<i>Psychiatry Research</i>	5
<i>Sustainability (Switzerland)</i>	4
<i>Journal of Medical Ethics</i>	3
<i>Anesthesia and Analgesia</i>	3
<i>Otolaryngology—Head and Neck Surgery</i>	3
<i>Journal of Gerontological Social Work</i>	3
<i>Brain, Behavior, and Immunity</i>	3
<i>Radiotherapy and Oncology</i>	3

The classification in two dimensions allowed to identify groups of articles discussing similar topics. By extracting and gathering information from each group, it was possible to understand what has been published about the impact of Covid-19 on work and workers (see Section 3.2). The results revealed research gaps and led to a discussion on how organizations can adapt work to protect workers amid the Covid-19 pandemic.

3 | RESULTS

3.1 | Descriptive and network analysis

The main journals, that is, the ones with three or more articles in the sample, are listed in Table 1. Around 20% of the articles are concentrated in 6% (12 out of 189) of the journals. Journals in the field of health predominate, except for the Sustainability (Switzerland) journal, whose scope includes environmental, cultural, economic, and social sustainability. Furthermore, only nine articles from journals of business, administration, or economics are in the sample, indicating that the impact of Covid-19 on work has been little explored in these fields.

Table 2 lists the most cited articles in the sample. Since they were published in 2020, the high number of citations (according to the Scopus database) indicates that the topic is in evidence in the scientific literature. Only one of the articles in the list addresses the impact of Covid-19 on the workforce in general (Zhang et al., 2020a); all others focus on healthcare workers (HCWs) concerning the following issues: mental health (Chew et al., 2020; Lai et al., 2020a; Lu et al., 2020; Shanafelt et al., 2020; Zhang et al., 2020b), changes in work organization (Forrester et al., 2020; Wong et al., 2020), respirators and PPE (Ranney et al., 2020; Bartoszko et al., 2020), contagion reduction strategies (Prem et al., 2020), and effects of

TABLE 2 Most cited articles in the sample

Author(s)	Citations
Lai et al. (2020a)	157
Wong et al. (2020)	81
Ranney et al. (2020)	63
Prem et al. (2020)	55
Shanafelt et al. (2020)	28
Lu et al. (2020)	16
Forrester et al. (2020)	15
Bartoszko et al. (2020)	14
Bayham and Fenichel (2020)	12
Zhang et al. (2020a)	11
Chew et al. (2020)	10
Zhang et al. (2020b)	10

school closure on workers' childcare obligations (Bayham & Fenichel, 2020).

In the journal co-citation network (Figure 2), the nodes represent the journals cited by the articles in the sample. The strength of the connection between two nodes is proportional to how many times the two respective journals were co-cited (i.e., cited together) by the articles in the sample, whereas the size of a node reflects how many times the respective journal was cited by the papers in the sample. Thus, the network highlights the main sources that have been consulted by researchers interested in work-related issues in

times of Covid-19. The restriction to elaborate the network is that the journal has been cited at least 10 times, which resulted in a network with 36 nodes. Again, journals in the field of health predominate. Highlights include the *New England Journal of Medicine*, *The Lancet*, and *JAMA (Journal of American Medical Association)*, but the network also shows journals with a wider scope, such as *PLOS One*, *Nature*, and *Science*. From an organizational point of view, it is worth mentioning the journal *Sustainability (Switzerland)*. Journals on oncology are grouped in a separate yellow cluster (upper right region of Figure 2), thus suggesting this topic has been addressed rather separately from the others.

Figure 3 shows the keyword network of the articles in the sample. Node sizes are proportional to how many times the respective keywords were cited by the articles. Two nodes are connected if the respective keywords were co-cited, that is, mentioned by an article, and the strength of the connection between two nodes is proportional to how many times the respective keywords were co-cited. The restriction to generate this network is that each keyword was cited at least twice, which resulted in 99 nodes. Since almost all articles of the sample cite Covid-19 or its variations (e.g., pandemic, novel coronavirus) as keywords, these terms were excluded from the network to make it easier to visualize.

The network in Figure 3 confirms the content of the most cited articles (Table 2) in the sense of showing a strong presence of studies on HCWs (node "hwc"), and mental health and related issues, for example, depression, stress, and anxiety (purple and yellow clusters, the lower left region of Figure 3). The topic, "changes in work procedures" (orange cluster, the upper region, including nodes "work-flow" and "leadership"), seems to be linked to ethical issues at work.

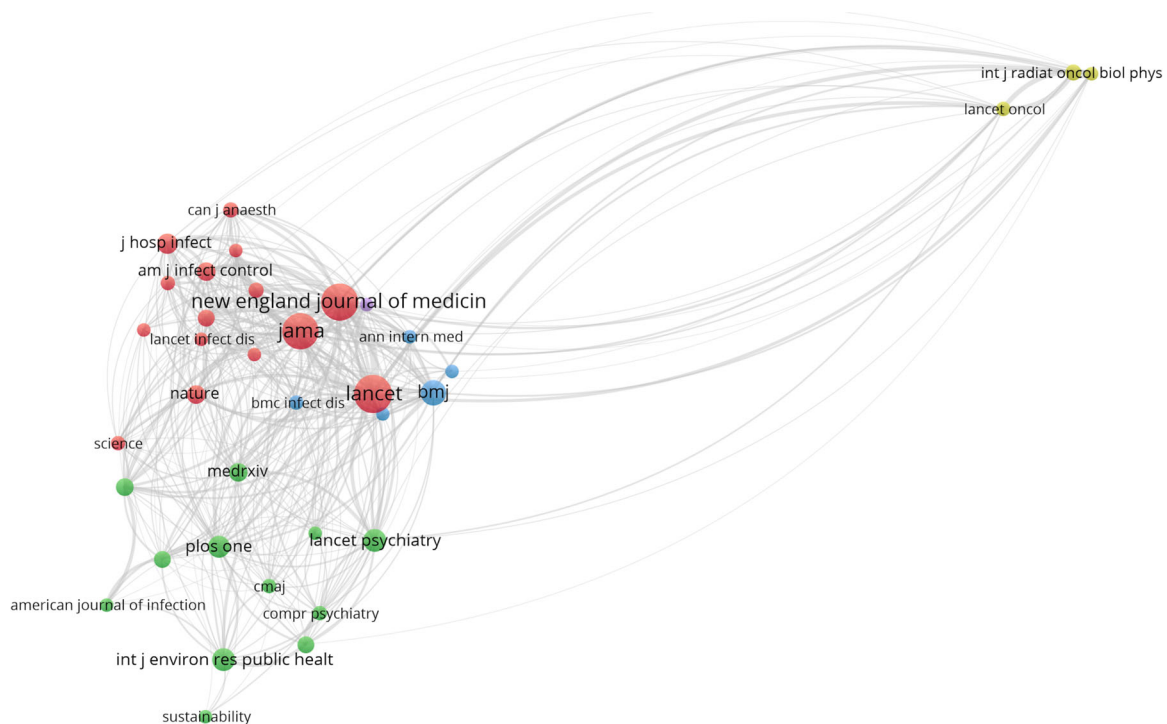
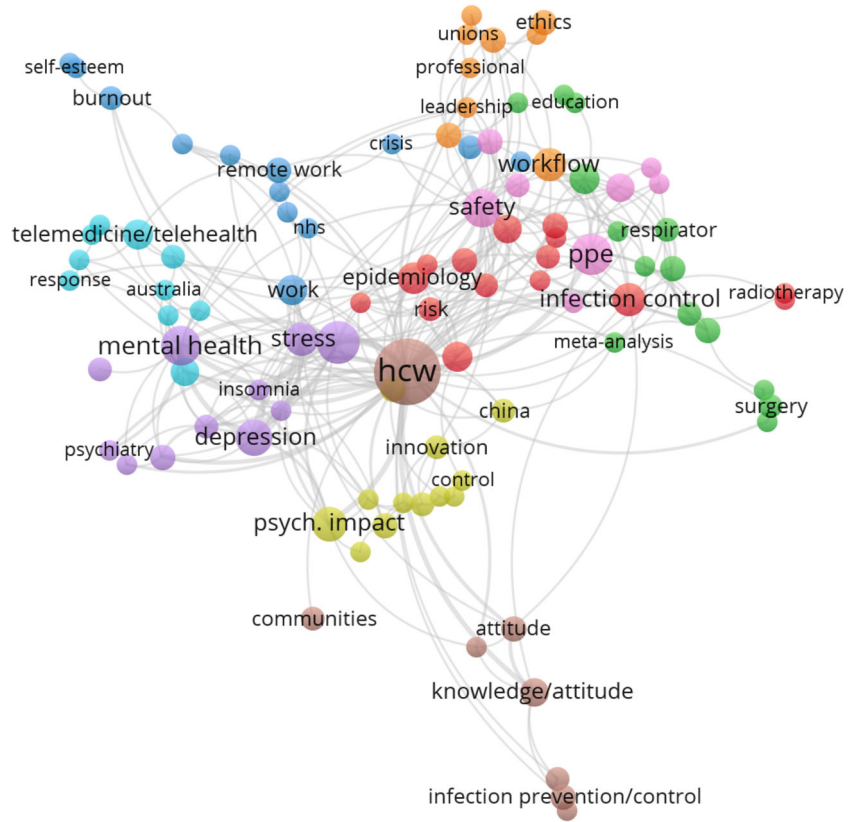
**FIGURE 2** Journal co-citation network

FIGURE 3 Keyword network



Respirators and PPE (nodes “ppe,” “masks,” “safety”) are represented by the pink and green clusters (right region). Contagion reduction strategies, previously identified in Table 2, are here verified in the red cluster (central right region, nodes “epidemiology,” and “infection control”) as well as in the brown cluster (bottom region, nodes linked to “knowledge” and “attitudes”). Effects on society and work are represented in the light blue and dark blue clusters (upper left region), which include remote working, telemedicine, academia, and flexible work. The keyword network analysis suggests that articles could be organized in two dimensions: economic sector (where the

healthcare sector predominates) and aspects of work (e.g., mental health, work procedures, ethical issues, PPE).

3.2 | Qualitative analysis: Literature content and gaps

The qualitative analysis of the sample allowed to categorize the articles in groups according to the dimensions “aspects of work” and “economic sector,” as shown in Table 3.

TABLE 3 Number of articles regarding the aspects of work and economic sectors addressed

Aspects of work	Economic sector							Worker in general
	Health	Education	Manufac-turing	Cybersecurity and IT	Food	Airlines	Apparel	
Effects on workers’ health	60	4	1	-	-	-	-	5
Changes in work processes	60	2	-	-	-	-	-	6
Protection equipment	38	-	-	-	-	-	-	2
Working conditions	22	2	1	1	1	1	1	3
Human resources	12	1	1	-	1	-	-	-
Remote working	9	5	-	1	-	-	-	7
Other topics	13	2	-	-	-	-	-	2
Total	214	16	3	2	2	1	1	25

Note: The same article can be classified in more than one aspect of work.

The groups of articles were analyzed with respect to content and literature gaps. Due to space limitation and size differences, some groups were analyzed separately and others together, as indicated by the boxes in Table 3. Only in the case of the health sector, the seven aspects of work were separately analyzed (Section 3.2.1). The education sector (Section 3.2.3) and other economic sectors (Section 3.2.3) were analyzed without explicit distinction between the aspects of work.

3.2.1 | HCWs and healthcare organizations

In this section, we analyze the papers whose focus is HCWs. On the one hand, various professional categories have been considered by the literature, such as nurses (Duncan, 2020; Howarth et al., 2020), surgeons (Berardi et al., 2020; Ducournau et al., 2020), community health workers (Ballard et al., 2020; Bhaumik et al., 2020), psychologists (Geoffroy et al., 2020; McBride et al., 2020; Thompson & Kramer, 2020), etc. On the other hand, we have identified the opportunity for future research on other occupations existing in hospitals (e.g., attendants, security guards and cleaning professionals, administrators and executives, heads of teams or sectors); public servants and other professionals directly involved in public health crisis committees; and workers (including researchers) engaged in developing or producing drugs, vaccines, supplies, or equipment to fight Covid-19. Next, the papers classified in the health sector are analyzed regarding different aspects of work.

Effects on workers' health

The effects on frontline HCWs' health, and especially mental health, have been widely addressed. Physical and emotional stress can compromise their performance during and after the pandemic, given the risk of posttraumatic stress disorder (Ornell et al., 2020).

In this group of articles, approximately half of them correspond to quantitative research related to epidemiological surveys. Editorials and expert commentaries represent about a third of the articles and have mainly addressed workers' mental health. The remaining articles are action research on the development of psychological support systems for HCWs, and qualitative empirical research on frontline work in hospitals.

The quantitative research papers concentrate on measuring the physical and psychological symptoms in frontline HCWs, thereby evidencing this category has been especially vulnerable. The symptoms include fatigue, headache, stress, irritability, anxiety, fear, depression, burnout, suicidal ideation, insomnia, and eating and mental disorders. Prolonged use of masks can compromise work performance as it contributes to headaches (Ong et al., 2020) and skin reactions (Hu et al., 2020).

While most literature on HCWs' health has been limited to describing their psychological symptoms, some studies have gone further, aiming to identify risk or protective factors too. The main mental health risk factors for HCWs are pre-existing medical conditions; being younger; having less professional experience; having

dependent children; having infected family members; being quarantined for a long period of time; suffering social stigma; being exposed to infected patients or colleagues; poor workplace infection control; lack of practical or organizational support; lack of PPE or not feeling safe with the one provided; and work overload (Kisely et al., 2020; Mhango et al., 2020; Sharif et al., 2020). Conversely, mental health protective factors include: having moderate rather than extreme concerns regarding family members; clear communication among hospital staff; practical and psychological support; adequate rest; and access to appropriate PPE (Kisely et al., 2020; Sharif et al., 2020). Hence, we note that among the risk and protective factors, there are aspects related to organizational support under the direct influence of healthcare managers.

Qualitative research in this group of articles is based on interviews and investigates the day-to-day and difficulties of frontline HCWs. In general, it corroborates that the risk and protective factors for the mental health of HCWs are directly associated with the level of organizational support. Other sources of anxiety identified by qualitative studies are: feeling helpless in the face of insufficient personnel, equipment, or materials; drastic changes in team composition and work organization, thus having to learn new tasks; social stigma due to daily contact with infected patients; and lack of reliable, clear, and updated information. Often there is insufficient information on the following issues: protocols to treat Covid-19; leaders, command structure, and situation of patients in the hospital; and evolution of the pandemic in the local and national contexts (Fawaz & Samaha, 2020; Liu et al., 2020; Shanafelt et al., 2020; Sun et al., 2020).

Among frontline HCWs, women are a group at risk for various reasons. Nurses are mostly women having to perform tasks that require a high level of contact with patients, which increases fear of contagion. Care work is often underpaid and women are generally paid less than men. In addition, more than men, women are expected to make sacrifices for the benefit of others (e.g., children, elderly, or diseased people) whom women are also supposed to care for at home. Consequently, women are at greater risk of being overburdened by domestic tasks (Bahn et al., 2020; López-Atanes et al., 2020; McLaren et al., 2020).

Qualitative studies, as well as expert commentaries, have discussed aspects that can enhance HCWs' morale. For example, having their sacrifices recognized by patients, government officials, and the general population is a source of motivation, although it cannot be directly controlled. But other aspects are under higher control by HCWs and their leaders, and we can interpret them as strategies to mitigate health problems. These strategies can be classified into two interrelated types.

The first type of strategy provides symbolic recognition and emotional support, but without directly addressing objective working conditions. For example: disseminating messages of work recognition from senior colleagues, managers, and public authorities; creating dialogue channels with supervisors; strengthening social bonds and support among coworkers; training in individual skills for "resilience," such as breathing and relaxation techniques, and activities to reduce

stress and anxiety; and creating psychological support systems (Fawaz & Samaha, 2020; Liu et al., 2020; Shanafelt et al., 2020; Sun et al., 2020). These systems rely on mental health professionals and provide HCWs with channels to externalize and treat their anguish, fears, and anxiety in individual or collective approaches. Support can occur either via videoconference or face-to-face meeting in spaces adapted to avoid contagion. Smartphone applications can aid in monitoring sleep, diet, and mood. Action research studies show the design and implementation of psychological support systems for frontline HCWs (Albott et al., 2020; Blake et al., 2020; Cole et al., 2020; Geoffroy et al., 2020).

The second type of strategy improves work organization, organizational support, and objective working conditions. For example, providing adequate PPE, updated protocols, Covid-19 tests, as well as transportation, housing, and food aid for HCWs; creating physical spaces for workers to rest or relax; reserving the last minutes of the shift for discussions and reflections; and assuring adequate remuneration, workload, and dimensioning of the workforce (Fawaz & Samaha, 2020; Liu et al., 2020; Shanafelt et al., 2020; Sun et al., 2020). By advancing in these concrete issues, leaders of health systems and organizations also show frontline HCWs respect and recognition.

We emphasize that workers' mental health is inseparable from adequate working conditions, which includes providing enough time to recover from fatigue. When working conditions deteriorate and workers feel exhausted, rest becomes a priority in the free time. Consequently, initiatives such as training in stress reduction techniques and implementing psychological support systems become ineffective and subject to low compliance (Chen et al., 2020). As noted by Belingheri et al. (2020), long work hours, additional shifts, sleep disorders, and stress can damage the immune system and make workers more vulnerable to illnesses and infections. Adequate sleep is therefore essential to preserve the health and performance of the workforce.

Although healthcare managers may face severe restrictions, thus becoming unable to provide ideal working conditions, their attitude toward subordinates has a major effect on the morale of frontline HCWs. Listening to their demands, creating spaces for discussion, and showing efforts to improve organizational support are examples of attitudes that demonstrate recognition and consideration, thereby positively affecting workers (Shanafelt et al., 2020). Conversely, when HCWs are not given a chance to verbalize their difficulties, omissions and absences tend to occur more frequently (Ornell et al., 2020).

Concerning research gaps, we have identified the following opportunities: (i) investigating the work, challenges, and limitations of healthcare team leaders and managers, whose jobs directly affect the level of organizational support for frontline HCWs; (ii) understanding the obstacles to improve working conditions of HCWs, which may include managerial, union, legal, and governmental issues; and (iii) advancing in qualitative empirical research. Since quantitative epidemiological studies have been predominant, expert commentaries based on scholarly literature and professional experience have helped to mitigate the lack of qualitative research.

Changes in work processes

In this group, the articles focus on providing guidelines or protocols to treat patients who are infected or suspected of being infected with Covid-19. Research topics include patient treatment and management (Bettinelli et al., 2020; Calvo et al., 2020); use of materials and equipment (Dine et al., 2020); (re)organization of spaces (Ahmed et al., 2020); setting priorities (Davies, 2020; Li, 2020); and workforce management, as HCWs need to be tested and trained in view of the novel situation (Cabas et al., 2020). There are both general and specific recommendations for each type of task or health profession. The instructions are mainly based on medical literature, recommendations from health agencies, and the professional experience of frontline HCWs.

The articles of this group are essentially normative, in the sense of establishing what (ideally) should be done to treat patients and simultaneously protect HCWs. Thus, given the peak of hospitalizations and recurrent resources shortage, it is still to be elucidated how HCWs have been dealing with difficulties in complying with the ideal procedures. This gap is partly filled by articles focused on the protection of HCWs, which will be commented on next.

Protection equipment

The articles classified in this group focus on procedures, PPE, and other artifacts designed to reduce the risk of contagion by Covid-19. The main topics are: (i) training and protocols for the use of masks and other PPE (Tan et al., 2020; Thomas et al., 2020); (ii) performance comparison of face masks (Bartoszkowski et al., 2020; Iannone et al., 2020); and (iii) protection strategies against the risk of contagion considering the scarcity of materials. The last topic includes low-cost techniques, artifacts, and solutions for workforce protection (Chien et al., 2020; Cordier et al., 2020; Ibrahim et al., 2020), as well as procedures, heuristics, or decision-making algorithms to optimize the use of PPE (Cetintepe & Ilhan, 2020; Forrester et al., 2020; Jones et al., 2020; Kampf et al., 2020). HCWs have thus mobilized their experience, intelligence, and creativity to mitigate the consequences of a shortage of PPE and other materials.

Protection strategies in the context of a shortage of materials have so far mostly referred to frontline HCWs' and their supervisors' responsibility. It is still unclear how hospital and health system managers of middle and top ranks should solve or work around this issue.

Working conditions

The articles classified in this group address different aspects of working conditions, such as availability of PPE (Almaghrabi et al., 2020; Felice et al., 2020), Covid-19 infection control (Mhango et al., 2020), workload (Belingheri et al., 2020; Zhang et al., 2020), training, supervision (Ballard et al., 2020), financial support and protection for family members (Bayham & Fenichel, 2020), and labor rights (Ghilarducci & Farmand, 2020). The set of articles shows that, amid the pandemic, working conditions have suffered severe restrictions, thereby threatening workers' health.

Although working conditions are essential to fight the pandemic, we note that so far, literature has not clarified how the different levels of management in health organizations and systems can ensure adequate working conditions—or, at least, improve them.

Human resources: Knowledge, attitudes, and practices

Based on self-reported surveys, the articles in this group evaluate knowledge, attitudes, and practices of HCWs regarding the following issues: general characteristics and forms of transmission of Covid-19; protocols to treat infected patients; and protocols to protect the workforce, including the correct use of PPE (Asaad et al., 2020; Moro et al., 2020; Saqlain et al., 2020; Zhang et al., 2020).

The articles suggest that the level of knowledge of HCWs varies significantly across and within countries. Also, it tends to be higher among physicians and nurses (Asaad et al., 2020), and among professionals with higher experience or qualifications (Kamate et al., 2020; Olum et al., 2020).

Exposure of HCWs to excessive, contradictory, or unreliable information available in the media and social networks is a common problem, which should encourage healthcare managers to develop training and information strategies. Self-administered questionnaires assessing workers' knowledge involve relatively low costs and can be part of these strategies (Huyh et al., 2020; Schwerdtl et al., 2020; Tran et al., 2020).

Remote working

Telemedicine health services (THS) have become critical given the restrictions caused by the pandemic. Even under lockdowns, THS enable advices on self-care and several routine, nonurgent health problems.

THS have the following advantages: (i) reducing personal contact and displacement to healthcare units, thus reducing the risk of contamination; (ii) reducing fear and anxiety among the population; (iii) enabling HCWs in regions that are less affected by Covid-19 to attend to patients living in severely affected regions, thereby alleviating work overload among HCWs. The last advantage, however, depends on managers of healthcare units and systems cooperating so as to elaborate common frameworks (Chauhan et al., 2020).

According to Chauhan et al. (2020), THS can be provided in the following modalities: real-time videoconferencing; remote monitoring with instruments operated by patients (e.g., thermometer, blood pressure instrument, pulse oximetry), without HCWs' physical presence; and robotic carts, screens, or medical equipment controlled by HCWs (Celesti et al., 2020; Yang et al., 2020).

Scholarly literature on THS has so far focused on real-time videoconferencing, probably since the other modalities demand more investment and a higher level of preparedness, which many healthcare systems do not have. However, the other modalities could become more available if governments and healthcare managers invest in THS solutions in the long term.

The few empirical studies on patients' satisfaction with THS via videoconferencing have reported a high level of satisfaction (Green et al., 2020; Watts et al., 2020). HCWs are nevertheless aware of its

risks and limitations, and they have been discussing how to make the best use of it (Thompson & Kramer, 2020; Waller et al., 2020). The resulting clinical recommendations shall be used by healthcare managers to provide adequate training and support for HCWs engaged in THS.

Ethics and other topics

The papers addressing ethical issues show that dilemmas play a major role in frontline HCWs' struggle against Covid-19. These dilemmas represent contradictory, difficult demands under situations of enormous restrictions and uncertainties. Society's expectations and professional ethics push HCWs to expose themselves to considerable risk whenever necessary to treat patients; however, even rich countries have often suffered from scarce resources to handle the pandemic. This may result in HCWs facing traumatic situations in which neither are they able to properly treat patients nor protect themselves and their families. Feelings such as anxiety, guilt, and confusion may arise, consequently impairing mental health (Kalra et al., 2020; Pawlikowski, 2020).

Based on Menon and Padhy's (2020) classification and other papers addressing ethics in healthcare work, three types of dilemmas faced by frontline HCWs can be identified:

1. How should I allocate respirators and other resources when they are insufficient to provide all patients adequate treatment?
2. How can I balance the duty to treat patients, on the one hand; and the preoccupation with contracting Covid-19, falling sick, and contaminating my family, on the other hand?
3. If I am feeling exhausted or if I have Covid-19 symptoms, can I talk frankly to my co-workers and stay home without being discriminated? Or should I keep working so as to avoid discrimination, at the cost of risking my and my co-workers' health?

Medical literature has traditionally focused on the first dilemma (Kalra et al., 2020), while the papers of our sample actually focus more on the second than on the first dilemma (Culbertson, 2020; Iseron, 2020; McConnell, 2020; Solnica et al., 2020). Only one of the papers explicitly points to the third dilemma (Menon & Padhy, 2020), which may reflect the scarcity of qualitative research on HCWs fighting the pandemic. The second and third dilemmas are directly involved in HCWs' decision between attending or not to work, which is also a matter of workforce safety, wellbeing, and productivity that should concern healthcare managers too.

There are no straightforward, universal answers to the aforementioned dilemmas. Each HCW faces them uniquely since the risks and available symbolic and material resources vary along time and among individuals and organizations. Healthcare team leaders and managers can nevertheless use the existing literature on ethical dilemmas to improve training and encourage open discussions, thus alleviating the emotional burden of HCWs and showing them support. Managerial and political actions that improve working conditions and promote HCWs' health can also provide them more resources to handle ethical dilemmas (Menon & Padhy, 2020; Pawlikowski, 2020).

3.2.2 | Education workers and higher education institutions (HEIs)

Academic work was the second most studied professional category. HEIs and academic community, that is, professors, researchers, students, and university staff, had to adapt work due to the pandemic.

Korbel and Stegle's (2020) survey was responded to by 881 participants, including professors, support staff, and trainees from several countries. Among the respondents, 77% affirmed that their institution had been almost totally closed down, with only essential services staff on site; 19% stated a partial closedown, with half or less of the activities being performed; and the others related an almost completely operational institution.

Studies on changes in academic work have raised interrelated issues that also constitute research opportunities. These issues regard:

1. *Psychological and emotional support.* Quarantine has undermined students' performance and made them feel detached from family, fellows, and friends (Meo et al., 2020). Moderate to extreme levels of anxiety, depression, and stress were reported by 50.43% of 2530 academic workers in Spain (Odriozola-González et al., 2020). Scientists, especially young ones with short-term contracts, are prone to become preoccupied with their careers (Korbel & Stegler, 2020). Their work as "someone whose job is to think, reflect and critique" may be seen as nonurgent and irrelevant amid the Covid-19 outbreak (Hage, 2020, p. 1);
2. *Workload.* Educators and scholars need support to deal with the additional burden (Cleland et al., 2020). Educators have performed extra work and extra role tasks, such as providing emotional support and free extra help to students. They have felt constrained to do so, sometimes to the detriment of family time (Fagell, 2020), a problem that particularly affects women (Boncori, 2020; Gao & Sai, 2020; Korbel & Stegle, 2020). Other important issues are the virtual invasion of home space (Boncori, 2020) and the inaccurate expectations of productivity held by co-workers and supervisors (Ryvasy & Michalak, 2020);
3. *Resources and infrastructure.* Both faculty members and students have had problems on this matter, which includes difficulties with Wi-Fi connection (Reyes-Chua et al., 2020), online teaching, software, and technical failures (Pather et al., 2020);
4. *Skills.* Educators lack training on technological tools for teaching and assessment (Reyes-Chua et al., 2020), new pedagogies, effective communication strategies (Pather et al., 2020), and skills to succeed as a remote worker (Ryvasy & Michalak, 2020);
5. *Research.* Editors and reviewers can discuss how to adapt the peer-review process given that publishing on topics related to Covid-19 are strategic, but simultaneously academics have been facing work overload during the pandemic (Eisen et al., 2020).

Faced with so many challenges, HEIs should keep records of transformations in the field of research, training, and education (Cleland et al., 2020).

3.2.3 | Other economic sectors

Although studies on workers of other economic sectors are few, they provide valuable contributions not only to understand the impact of Covid-19 on specific sectors but also on management and organizations in general.

Research on manufacturing firms has revealed effects regarding flexible work arrangement (FWA), job satisfaction, and innovative work behavior. On the one hand, FWA can positively influence work-life balance, psychological wellbeing, work motivation, and work effectiveness, especially among millennial employees. Work effectiveness, in particular, can benefit from adaptability (Sedaju et al., 2020). On the other hand, the fear of being replaced by digital technologies has increased. Manufacturing employees may be impelled to show more engagement and innovation since they face the threat of job loss amid the Covid-19 crisis and the rapid advances in digital technologies and artificial intelligence. Younger employees seem to be more comfortable with and more capable of coping with organizational changes caused by the pandemic (Ren et al., 2020). These effects must be considered by managers in light of sociocultural and economic diversity (Sedaju et al., 2020; Tran et al., 2020).

The impact of the pandemic on information technology (IT) is addressed from two perspectives: cybersecurity and HRM. With much more staff working from home than many IT teams have likely ever prepared for, organizations are especially vulnerable, which affects both IT professionals and workers in general. As people lack cyber knowledge, IT professionals are urged to develop new methods of work control, measures, and policies to ensure digital security for teleworkers, who may be required to install security software (Chapman, 2020). This can result in increased pressure, permanent alertness, feeling of being watched, and fear of 24/7 reporting, thereby impairing internal communication, relationships, organizational climate, job satisfaction, and wellbeing (Prasad et al., 2020). In a post-Covid-19 world, HRM departments may be reoriented to broaden the recruitment approach and move away from traditional funnels, that is, seeking professionals with different backgrounds and not only graduates of top universities (Chapman, 2020).

In the food industry, specifically in meat and poultry processing facilities, effective prevention and control of Covid-19 entail challenges in different dimensions: operations (e.g., maintaining physical distancing, including during breaks and when entering or exiting facilities), communication and culture (e.g., dealing with language and cultural barriers), and HRM (e.g., employees incentivized to work despite feeling sick, particularly when there are productivity bonuses) (Dyal et al., 2020). Despite the vital contribution of catering, retail, and other sectors of the food industry to societies, and the fact that many workers of these sectors cannot work remotely, the impact of Covid-19 on them remains virtually unaddressed in the scientific literature.

In the airline industry, as travel restrictions increase, the most affected employees are the ones responsible for flight operations and handling passengers. Business models have been differently impacted: regional, lean airline companies have received more

passengers, while major airlines have contracted routes out. Lean organizations benefit from lower costs and may substitute part of major airline capacity (Sobieralski, 2020).

Lastly, in the apparel industry retailers' shops are being closed with zero turnovers, which leads to ordering cancellation. Due to the relation with the fashion industry, entire seasons may be lost (Sen et al., 2020).

4 | DISCUSSION: CONTRIBUTIONS FROM ERGONOMICS AND PDW

In the previous section, the analysis of the sample of articles allowed us to reach our first research objective, that is, to reveal the research gaps and managerial challenges concerning the impact of Covid-19 on work and workers. To achieve the second objective, namely, helping organizations understand how to adapt work while remaining competitive, we will discuss the results based on concepts of ergonomics and PDW (Figure 4). Both disciplines not only focus on workers' activities and challenges but also conceive work, organization, and management inseparably.

4.1 | Adapting work to workers

The pandemic has caused a major impact on work, impelling managers to change work organization and production systems. As advised by ergonomics, this should be done by adapting work to

workers and seeking a balance between system performance and human wellbeing (IEA, 2020). This concept can be applied to all managerial challenges found in the systematic literature review and serve as a basis for our discussion. Nevertheless, the actual ability of companies to adapt work and promote safety in the specific context of the pandemic, and how this may depend on variables such as company size and type of employment contract, is a matter that deserves further empirical investigation.

4.2 | Construction of health and centrality of work

Amid the health risks in the Covid-19 pandemic scenario, we highlight that work plays a key role in the dynamic *construction of health*. In contrast to the classic view focused on reducing health risks, the perspectives of ergonomics and PDW argue that work can foster physical and mental health associated with social wellbeing. This relates to another concept of PDW, namely the *centrality of work* (Dejours & Deranty, 2010), according to which work is central to the lives of individuals and the construction of society. These two concepts can assist managers in dealing with the challenge of developing *support systems for workers*.

4.3 | Multifaceted characteristic of health at work

Besides the fear of contamination by Covid-19, managers should not forget various other aspects affecting workers' health. These aspects

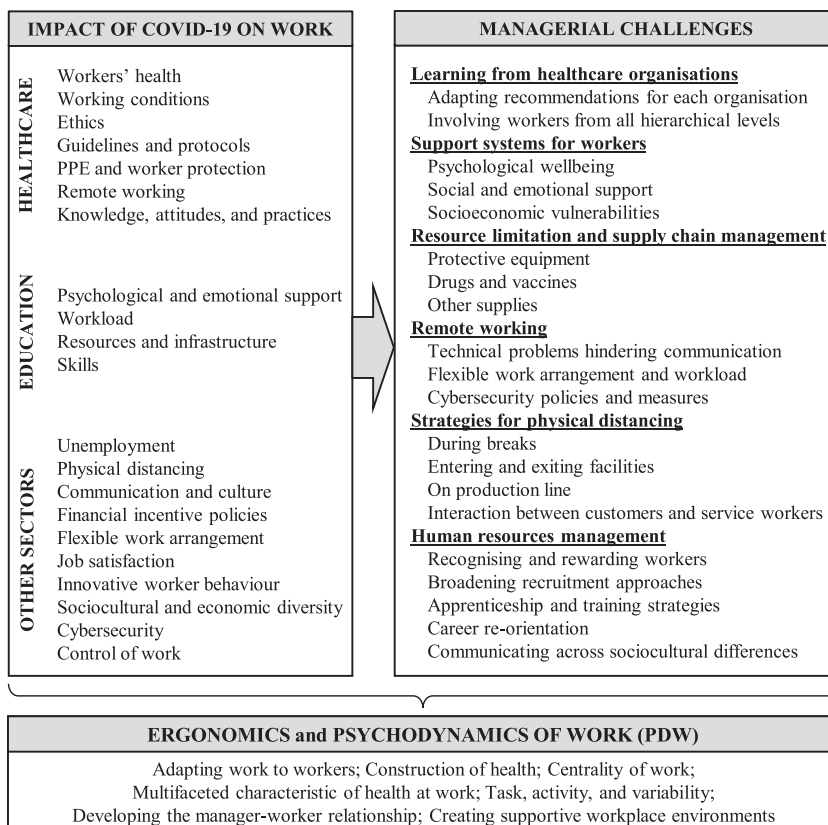


FIGURE 4 Impact on work and managerial challenges from ergonomics and psychodynamics of work (PDW) perspectives

may be directly, indirectly, or even not connected to Covid-19. Ergonomics can help to map them based on different domains of specialization: physical-environmental, psychosocial-cognitive, and organizational (Falzon, 2004). Regarding the physical-environmental aspects, the risk of exposure to Covid-19 should certainly be reduced. This has been studied in scholarly literature, especially in the context of hospital care, and can be associated with the managerial challenge of dealing with *resource limitation and supply chain management*, given the risk of a shortage of PPE, tests, drugs, and vaccines. However, managers must not neglect other physical and environmental risks, for example, those related to biomechanical issues—including when *remote working* is implemented. When working at home, uncomfortable equipment and furniture, long work hours, and inappropriate postures can damage workers' health (Davis et al., 2020).

Managers should also strive to minimize psychosocial-cognitive risks. Literature is extensive on this subject, which can be associated with the managerial challenge of promoting *psychological wellbeing*. It should be reminded that workers under considerable risk of contamination by Covid-19, for example, the ones in the frontline of manufacturing and service industries, are also vulnerable to emotional and ethical issues, which may generate stress, anxiety, depression, and burnout (Silva & Neto, 2021). The impact of the pandemic on people's personal and professional lives can make them feel isolated. Thus, *strategies for physical distancing* should be created, taking into account workers' mental health and *support systems* (Bentley et al., 2016).

Finally, organizational aspects—which particularly concerns macroergonomics (Brown, 1990; Hendrick & Kleiner, 2001)—must be considered since the pandemic has imposed changes and limitations on production processes and work in organization. Two aspects that managers should particularly consider are job insecurity and work-life balance. The first is inherent to the economic consequences of the pandemic, which results in managerial challenges linked to *economic vulnerabilities*, especially in developing countries (Khanna, 2020). The second aspect is strongly related to *remote working*. Other aspects can also be mentioned: increased work rhythm, greater cognitive effort, need for training, and rethinking professional development. Therefore, organizational aspects are not only related to *human resources management* but also to the centrality of work to individuals' lives and society.

4.4 | Task, activity, and variability

An important theoretical contribution of ergonomics is the distinction between task and activity (Wisner, 1995). Task is the work prescribed a priori by the organization, whereas activity is the work effectively carried out by the worker. An accurate view of work situations must take into account the difference between task and activity since tasks themselves are not enough to determine what workers should do. They have to deal with variability and unforeseen events in the inputs and processes of production, which can be

intensified due to events that either cannot be or had not been accurately foreseen by managers, such as a pandemic. Among the challenges identified in the systematic literature review, *adapting general recommendations for each organization, protective equipment, and strategies for physical distancing* indicate that organizations must update procedures. Managers should consider the reality of and variability in activities so that new prescriptions are effective. For example, if the provided PPE greatly hinders the performance of activities, it is likely not to be used by workers; or if the new recommendations are perceived as too bureaucratic, they are likely not to be implemented. Prescriptions are thus more likely to be effective when based on a detailed analysis of work activities, which affords realistic expectations on what workers can actually achieve and endure (Daniellou et al., 2010).

4.5 | Developing the manager-worker relationship and creating supportive workplace environments

Ergonomics defend that work should first be understood to be adequately transformed (Guérin et al., 2007). By developing a close and trustful relationship with workers, managers become more able to understand activities and how to successfully improve work organization. Also, workers should be allowed to be actively involved in (re)designing work, as argued by constructive ergonomics (Arnoud & Falzon, 2015). This participatory approach increases the chances of organizational changes to be actually embraced by workers, therefore avoiding waste of resources in solutions eventually rejected by workers. In this sense, we point to the managerial challenge of *involving workers from all hierarchical levels*.

PDW, in its turn, provides concepts that help to develop *supportive workplace environments*. The *subjective relationship with work* is key in the construction or deterioration of health (Dejours, 2015, p. 2), but managers' role in this process is often poorly discussed. From the point of view of PDW, work-related pathogenic suffering typically begins when the relationship between individual and organization is blocked, and when the worker has done all he/she could to deal with difficulties and dissatisfactions, but eventually achieved no success. This means the worker has exploited all personal resources (e.g., knowledge, abilities, creativity, vigor, support from family) and is now unable to meet and vulnerable to the rigid demands of the organization, such as tasks, goals, and deadlines. Hence enabling workers to discuss tasks and organizational choices is essential to preserve workers' health (Dejours, 1992, p. 52). Nevertheless, it depends on creating a supportive workplace environment, where workers can rely on their colleagues and supervisors to open up about their difficulties without fear of pejorative judgments (Brunoro et al., 2020). We stress managers' shared responsibility in this process. Regarding work-related health issues, simply implementing solutions (e.g., providing external psychological support) without addressing work organization is unlikely to be successful.

Furthermore, we argue that supportive workplace environments contribute to *enabling environments* from the point of view of ergonomics. Enabling environments mean “debatable” organizations where workers can use their knowledge to adapt its characteristics (e.g., rules, goals, layout, equipment), thus developing both *organizational and individual capabilities* (Arnoud & Falzon, 2015). This can help managers, especially in the pandemic scenario, where many assumptions underlying previous organizational choices do not apply anymore. Managers are, therefore, impelled to collaborate with their subordinates to diagnose a complex, novel situation and reorganize work based on updated assumptions and realistic expectations.

With respect to the service industry, so far, it has not been investigated how to establish sanitary safety rules for clients (e.g., use of masks, physical distancing) and how to deal with clients that do not or refuse to comply with these rules. These issues are challenging, but they are also an opportunity for managers to express support for frontline service workers. According to the principles of ergonomics (Arnoud & Falzon, 2015; Guérin et al., 2007), the rules for clients should be designed together with frontline workers and consider the specificities of the work situation.

We can observe novel ways in which work is central to but also made invisible by individuals and societies. For example, many occupations officially recognized as “essential work,” such as the ones responsible for cleaning and delivery services, have so far received little scholarly attention. In various countries, these occupations have been subject to a downgrade in labor rights and working conditions, which means governments are failing in properly recognizing their contribution to society. Healthcare work also deserves to be discussed vis-à-vis effective labor rights and working conditions, and not only the “heroic” sacrifice societies expect from them. It is also a matter of social injustice that “essential workers” often work under poor working conditions, earn low wages, and cannot refuse unsafe work due to financial restrictions, thus risking their lives and their families. Concerning teleworking, middle and particularly top managers should be aware that, in general, women and workers of lower ranks have fewer chances to keep high productivity levels. Various factors are involved, for example, children or elderly to care for, support from family members, house size, availability and cost of office supplies, the comfort of office furniture, and quality of internet connection. Hence managers should investigate these factors, strive to provide organizational support and be careful in defining reasonable goals, thereby forestalling exhaustion of the workforce.

We add that, due to the vast impact of the pandemic, people may be induced to believe that all should make sacrifices to maintain social functioning, which can particularly affect workers of sectors such as health and education. The expectations on subordinates, colleagues, and even ourselves, are therefore prone to be unrealistic since individuals face different conditions. According to ergonomics, understanding *interindividual variability* among workers is key to designing sound and suitable work guidelines, processes, and goals (Guérin et al., 2007).

Lastly, although the healthcare sector has been predominant in the literature of Covid-19 effects on work, it provides managers from all sectors important lessons:

1. Creating spaces for workers to express their difficulties without fear of retaliation or workplace discrimination is essential to understand what managers can do and how they can tailor solutions considering the specificities of each team and organization. Furthermore, it shows workers support and consideration, thus helping to alleviate their emotional burden and foster trust in the workplace.
2. Given the enormous restrictions imposed by the Covid-19 pandemic and its consequences, managers' capacities are also expected to diminish. Thereby we stress that not only what managers can effectively do counts but also how they relate with their subordinates and communicate them their efforts and limitations in improving organizational support.

5 | CONCLUSION

The scholarly literature on the impact of the Covid-19 pandemic on work has so far focused on frontline HCWs. This unbalanced coverage is not only understandable but also points to many research opportunities. Literature is rapidly advancing and providing healthcare managers valuable ideas to reduce the negative impact of the pandemic on HCWs, for example, improving training, information, and communication strategies; adapting procedures to optimize the use of PPE; investing in solutions that increase the protection of HCWs and their families; and supporting HCWs engaged in telemedicine. Scholars can contribute by making analogous advances in other economic sectors, that is, investigating the specific challenges of each occupation—including those understood as “essential work”—and providing managers recommendations. Even in the health sector, though, it is still not clear how middle and top managers' work is being affected, nor how they can solve or resolve the challenges imposed by the pandemic. Additionally, given the need for physical distancing, researchers of work sciences can benefit from discussing and exploring new methods for field research, thereby becoming more able to investigate the impact of Covid-19 on the various occupations.

Regarding the limitations of this study, we have not focused on how decisions by public authorities affect work, although this is an important issue to respond to the pandemic and also an opportunity for future research. Also, when selecting the papers of the sample, conference papers were not considered due to the reliability of information and the sample size.

The Covid-19 pandemic implies numerous managerial challenges. In this article, we raised some concepts from the scientific disciplines of ergonomics and PDW that can assist managers in dealing with or overcoming these challenges. Specifically, we pointed to the construction of health, interindividual diversity and variability, subjective relationship with work, supportive workplace environment, and

organizational and individual capabilities. More than before, increasing the flexibility and resilience of organizations through a communicational approach, and involving workers in decision-making processes, can be critical success factors.

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DATA AVAILABILITY STATEMENT

The data that supports the findings of this study are available in the supplementary material of this article.

ORCID

Tiago F. A. C. Sigahi  <http://orcid.org/0000-0002-2595-5220>

Bruno C. Kawasaki  <http://orcid.org/0000-0002-8258-0349>

Ivan Bolis  <http://orcid.org/0000-0003-0688-0742>

Sandra N. Morioka  <http://orcid.org/0000-0003-1741-4317>

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SUPPORTING INFORMATION

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